STOCK MARKET EFFICIENCY RESPONSES TO STRATEGIC STOCK EXCHANGE REGULATORY CHANGES: EVIDENCE FROM VIETNAM

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ABSTRACT

Since 2012, restructuring of the securities market has been the primary strategic project in Vietnam – the top-performing Asian economy in recent years, and several regulatory changes have been made to enhance the market stability and efficiency as well as facilitate its sustainable development. This study strives for investigating the Vietnamese stock market efficiency and evaluating the impacts of market behaviours on listed companies due to recent regulatory changes in the stock market. The mixture of quantitative, qualitative, and documentary data is utilised to meet the research requirements. The quantitative analysis in this study show that HOSE is firmly efficient while HNX is inefficient. On this subject, the managers and experts in the stock market consistently support that HOSE has better market efficiency than HNX. In the key factors of the Vietnamese stock market efficiency, the access to the information and the market valuation are the two most crucial ones from the viewpoint of the managers of the listed companies, the officer of HOSE, and the experts in this field. In comparison with the existing studies on this stock market efficiency, there is an improvement of the Vietnamese stock market efficiency in general and the market efficiency of HOSE in specific. The informational efficiency of this stock exchange market is enhanced from the inefficiency to the weak form efficiency. The findings in this research consistently show that recent regulatory changes designed to improve the operations and the efficiency of the Vietnamese market have been effective. Listing, trading, and conforming to the current regulations in the stock market create tremendous opportunities and beneficial impacts on the performance of listed companies regarding business management and development, enhancement of funds as well as value and brand growth. Furthermore, the current regulations in the market and especially on HOSE greatly encourage and support the listed companies, but few limitations exist from the perspectives of the managers of listed companies on HNX and the experts in the stock market. The original contribution of this study is providing a theoretical framework to examine the responses of the stock market efficiency to crucial regulatory changes in the emerging stock exchange markets as well as evaluate its impacts and implications on the business performance. This research methodological design allows the researcher to investigate at the market level and the market participants' levels by using the mixture of quantitative and qualitative approaches to provide a thorough understanding of the linkages between stock market efficiency and business performance in emerging markets. This study also analyses different sizes of the listed companies in various sectors in addition to the market indices to ensure the reliability and the validity of testing the Vietnamese stock market efficiency. The findings and contributions of this thesis identify major implications for financial policies and management practice to further improve the stock market efficiency and enhance the benefits of the listed companies.

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AAA	An Phat Bioplastics Joint Stock Company
ACB	Asia Commercial Bank
ADF	Augmented Dickey-Fuller
AMC	Asia Mineral Joint Stock Company
AR	Abnormal return
ARCH	Auto regressive conditional heteroskedasticity model
ASEAN	Association of South East Asian Nations
ATC	At the closing order
ATO	At the opening order
BRIC	Brazil, Russia, India, and China
BWE	Binh Duong Water Environment Joint Stock Company
CAR	Cumulative abnormal return
CDN	Danang port Joint Stock Company
CET	Tech - Vina Joint Stock Company
COVID	Coronavirus disease
DAG	Dong A Plastic Group Joint Stock Company
DBD	Binh Dinh Pharmaceutical and Medical Equipment Joint Stock Company
DGW	Digiworld Corp
DRC	Danang Rubber Joint Stock Company
GARCH	Generalised autoregressive conditional heteroskedasticity
GDP	Gross Domestic Product
HaSTC	Hanoi Securities Trading Centre
HNX	Hanoi Stock Exchange
HOSE	Ho Chi Minh Stock Exchange
HoSTC	Ho Chi Minh City Securities Trading Centre
KHS	Kien Hung Joint Stock Company
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
K-S	Kolmogorov Smirnov Goodness of Fit
LDP	Lam Dong Pharmaceutical Joint Stock Company
MAS	Danang Airports Services Joint Stock Company
NDN	Danang Housing Investment Development Joint Stock Company
OECD	Organisation for Economic Co-operation and Development
P/B	Price to book value
PLX	Viet Nam National Petroleum Group
PP	Phillip Perron

ROE	Returns on equity
RW1	Random walk type 1
RW2	Random walk type 2
RW3	Random walk type 3
S.E.	Standard Error
SAB	Saigon Beer – Alcohol – Beverage Corporation
SCR	Sai Gon Thuong Tin Real Estate Joint Stock Company
SMM	Studentised maximum modulus
SSC	State Securities Commission of Vietnam
TA9	Thanh An 96 Installation And Construction Joint Stock Company
TVC	Tri Viet Asset Management Corporation Joint Stock Company
VCB	Joint Stock Commercial Bank for Foreign Trade of Viet Nam
VDS	Viet Dragon Securities Corporation
VLA	Van Lang Technology Development and Investment Joint Stock Company
VNX	Vietnam Exchange
VR	Variance ratio
YEG	Yeah1 Group Corporation

CHAPTER 1: INTRODUCTION

1.1. Introduction and rationale for the choice of research topic

This opening chapter provides an overview of the research demonstrated in this thesis. This research studies how the Vietnamese stock market efficiency responds to the strategic restructuring of the stock exchange market in recent years. The primary focus of this thesis is to examine the Vietnamese stock market efficiency and evaluate the impacts of market behaviours on listed companies by investigating the evidence of the market level and the market participants' levels. This research pursues investigation by taking a case study of Vietnam as an example, and this chapter starts with a rationale for the choice of research topic.

The upward trend in financial interconnectedness and globalisation boosts the degree of informational efficiency yet incurs financial contagion risks and crises between emerging markets and developed markets (Thakor, 2015; Vithessonthi & Kumarasinghe, 2016). It is essential to undertake research on these developing markets to make the right decisions on financial investment and business management due to unique characteristics of emerging and frontier stock markets (Barry, Peavy III, & Rodriguez, 1998; Chen, Chen, & Lee, 2014; Speidell, 2016). In this decade, the emerging and frontier markets have become more prosperous and more Asian, and they expand dominantly in correlation with the global economy as well as are regarded as key contributors to the global economic growth (Christensen & Miklashevsky, 2016; The Economist, 2017). Furthermore, Vietnam has become one of the most dynamic frontier and emerging stock markets in Asia in recent years (Pham, Nguyen, & Vo, 2018). There has been a significant and gradual development of the Vietnamese stock market and this market has been quite active with relatively high market capitalisation and market liquidity as compared to the other regional markets (The World Bank, 2019). Moreover, the Vietnamese stock market is expected to achieve a tremendous growth in the future to gradually narrow the gap between this emerging market and the other regional ones (National Center for Socio-economic Information and Forecast, 2021). Therefore, it is vital to carry out research on the Vietnamese stock market to offer considerable academic and practical support to policymakers, managers, specialists, academics, and other stakeholders.

The financial market efficiency has performed a pivotal role in the development of global financial markets (Guermezi & Boussaada, 2016). Informational market efficiency is fundamental to open and transparent distribution of information in the market, and it is a key concept in the literature of financial management (Rehman, Chhapra, Kashif, & Rehan, 2018). Informational efficiency brings about huge contributions to obtain allocative and operational

efficiency of a market (Howells & Bain, 2008). In a market with informational efficiency, stock prices provide reliable indicators for managers, shareholders, and investors to make right investment decisions and have efficient business management (Ali, Shahzad, Raza, & Al-Yahyaee, 2018). Thus, most controversies and empirical studies on the financial market efficiency focus on informational efficiency (Dong Loc, Lanjouw, & Lensink, 2010; Do, Le, & Nguyen, 2015; Guidi & Gupta, 2013; Gupta, Yang, & Basu, 2014; Luu, Pham, & Pham, 2016; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran & Mai, 2015). According to Malkiel & Fama (1970), it is based on the information reflected in the share price to classify the market efficiency into three major levels, including weak form, semi-strong form, and strong form.

Furthermore, Vietnam thrived to become Southeast Asia's best-performing stock market in 2019 with a 12% gain for VN Index on HOSE (Preiss, 2019). Vietnam was the third-best performing market in the world over the five years from 2014 to 2019 (Preiss, 2019). Additionally, in order to re-establish a position of trust in investors and stakeholders after the crisis, restructuring of the securities market has been the primary strategic project of the Government of Vietnam and the Ministry of Finance since 2012, and reforming the two current stock exchanges has been one of essential strategic activities (The Prime Minister, 2012a; The Prime Minister, 2012b). Several regulatory changes have been introduced and made to improve the market stability and efficiency, facilitate its sustainable development, and contribute to the enhancement of the financial market and economy (Tuong & Huu, 2016; VnEconomy, 2016). However, there is insufficient evidence that examines this emerging stock market efficiency due to recent regulatory changes in the market as well as evaluates the effects of market behaviours on the performance of the listed companies (Dong Loc, Lanjouw, & Lensink, 2010; Do, Le, & Nguyen, 2015; Guidi & Gupta, 2013; Gupta, Yang, & Basu, 2014; Luu, Pham, & Pham, 2016; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran & Mai, 2015).

Therefore, this research attempts to investigate the Vietnamese stock market efficiency and its improvement due to recent regulatory changes in the stock market as well as evaluate the impacts of market behaviours on the business performance of the listed companies. This chapter identifies the research question and objectives and then discusses the contributions of this research as well as briefly introduces the thesis structure.

1.2. Research question and objectives

This research examines the market efficiency and its improvement due to recent regulatory changes in the emerging stock market as well as evaluates the effects of market

behaviours on the business performance of the listed companies. The research conducts investigation by taking a case study of Vietnam as an example. The following question and objectives are identified for this research:

1.3. Research question

The key research question of this research is: How efficient is the Vietnamese stock market, and how have listed companies been impacted by market behaviours?

1.4. Research objectives

The research question requires testing market efficiency in terms of quantitative and qualitative perspectives and is achieved by the below listed research objectives:

(1) Evaluate and determine the efficient form of the Vietnamese stock market by testing historical data.

(2) Examine the current market efficiency and its improvements due to recent policies and regulations related to the stock market.

(3) Examine advantages and challenges to listed companies due to listing, trading, and complying with the current policies and regulations in the stock market considered by listed companies and stakeholders.

(4) Evaluate impacts of market behaviours on the business performance of listed companies.

1.5. Contributions of this research

The research aims to appraise the Vietnamese market efficiency and how the market behaviours could impact the performance of listed companies. This research offers two general contributions that could be applied in not only Vietnam but also other countries and one specific contribution that focuses on the case study of Vietnam as follows:

- Firstly, the current empirical studies on efficient market hypothesis related to the emerging stock markets evaluate the market efficiency by only investigating the market level and mainly using quantitative methods (Dong Loc, Lanjouw, & Lensink, 2010; Do, Le, & Nguyen, 2015; Guidi & Gupta, 2013; Gupta, Yang, & Basu, 2014; Luu, Pham, & Pham, 2016; Nghia & Blokhina, 2020; Nguyen, Tran, & Zeckhauser, 2017; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran & Mai, 2015; Tran, Nguyen, & Pham, 2016). However, it would be pointless without appraising its empirical implications in the listed companies as there is a crucial linkage between the market efficiency and the

performance of the companies (Anhar, 2015; Ang, Goetzmann, & Schaefer, 2011; Rejeb & Boughrara, 2013; Uwah & Asuquo, 2016). In this respect, this research makes original contributions to the literature by providing a theoretical framework to examine the efficient forms of the stock market as well as evaluate its impacts and implications on the business performance. In addition to statistically appraising random walk model, this framework allows to investigate whether companies do business better because the market efficiency became better. In other word, this research contributes to knowledge of the linkages between financial market efficiency and business performance of listed companies in emerging markets by using mixed methods to investigate at the level of market and the market participants' levels. The conduct of this research helps to bridge the existing gap in the literature on market efficiency and its potential benefits to the listed companies in the stock exchange markets. Thus, from now on, the other authors could follow up and apply this theoretical framework in not only Vietnam but also other countries.

- Secondly, there is insufficient research assessing the impact of recent strategic decisions and regulatory changes in the emerging stock markets on the market efficiency (Dong Loc, Lanjouw, & Lensink, 2010; Guidi & Gupta, 2013; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran & Mai, 2015; Tran, Nguyen, & Pham, 2016). Therefore, this research contributes to the literature by examining the current market efficiency and its improvement due to recent policies and regulations in the emerging stock exchange markets by taking the case study of Vietnam as an example. The research methodological design of this research could be deployed in not only Vietnam but also other emerging markets to investigate the responses of the stock market efficiency to crucial regulatory changes in the emerging stock exchange markets.

- Thirdly, most of the existing studies on the Vietnamese stock market efficiency conduct tests based on only market indices or the five oldest listed shares (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Luu, Pham, & Pham, 2016; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017). However, market indices in emerging countries are not the criteria that fully and accurately reflect the characteristics of all stocks listed and traded in the emerging market, so using only the market indices could bring about distorted results. Companies with different sizes from various sectors have dissimilar behaviours and diversified impacts due to some unique attributes, hence it is crucial to consider the attributes from different sectors and sizes of companies (Duy & Phuoc, 2016; Handayani, Muharam, Mawardi, & Robiyanto, 2018). Thus, this research considers different sizes of the listed companies in several sectors

in addition to market indices to ensure the reliability and the validity of testing the Vietnamese stock market efficiency.

These mentioned gaps will be addressed in this study, and this research offers two general contributions that could be applied in not only Vietnam but also other countries and one specific contribution that focuses on the case study of Vietnam. Moreover, this empirical and practical investigation provides policymakers, experts and managers with constructive suggestions and advice on improving the market efficiency and enhancing the business performance.

1.6. Structure of this thesis

This study strives for investigating the Vietnamese stock market efficiency and evaluating the impacts of market behaviours on listed companies due to recent regulatory changes in the stock market. The thesis consists of eight chapters, and a brief overview of each chapter is provided as follows:

Chapter 1 is the introduction of this thesis, which includes rationale for choice of research topic, research question and objectives, contributions of this research and the thesis structure.

Chapter 2 focuses on the Vietnamese stock market. This chapter consists of unique characteristics of the emerging and frontier markets, establishment of the Vietnamese stock market and its organisational structure since 1990s, operations and development of the Vietnamese stock exchanges in recent years, and strategic decisions and activities related to restructuring the Vietnamese stock exchange markets**.**

Chapter 3 reviews empirical studies related to the efficient market hypothesis. Its main content covers the importance of informational market efficiency of the emerging and frontier markets, the efficient market hypothesis in these markets, recent studies related to the impacts of restructuring stock exchange markets on stock market efficiency, and previous studies on the Vietnamese stock market efficiency.

Chapter 4 explains research methodology. The methodology of this empirical research is essentially determined by the research question and objectives. The work adopts several methods, different world views, and diversified types of data collection and analysis to best achieve the research requirements. The content in this chapter consists of research philosophy, research approach, methodological choice and design, data collection and sampling, techniques and tests in statistical data analysis, reliability and validity of quantitative methods, the use of NVivo software, and ethical considerations. In addition, an ethical

application (reference number: 003546) was implemented on 16 January 2019, and it was approved on 18 February 2019.

Chapter 5 presents quantitative data analysis on the statistical findings. This chapter refers to quantitatively examining and determining the efficient form of the Vietnamese stock market by testing historical data on the two main stock exchanges. Moreover, it targets to examine and discuss the improvement of the stock market efficiency due to recent regulatory changes in comparison with findings of the existing literature review investigating the Vietnamese stock market efficiency. This chapter involves analysing histogram and statistics of VN Index and HNX Index, examining market efficiency of HOSE, and appraising market efficiency of HNX.

Chapter 6 discusses qualitative data collection and analysis. This chapter aims to conduct interviews with managers of listed companies as well as officials of stock exchanges and experienced experts in the field of finance and the stock market to recheck and reassure the quantitative findings. This chapter includes semi-structured interviews, methods of qualitative data analysis, and qualitative data analysis. There are five major points in the qualitative data analysis section. Firstly, it identifies the key factors of the Vietnamese stock market efficiency before providing the explanations for differences in the market efficiency of these two stock exchanges based on the opinions of professional and experienced experts in this field. Furthermore, it discovers potential opportunities and challenges of the listed companies when listing, trading, and complying with the current policies and regulations in the stock market. Moreover, it examines the effects of market behaviours on the business performance, which are regarded as time valuation of the company, capital enhancement, business management or corporate expansion. Following that, suggestions on enhancing the stock market efficiency and increasing benefits for the listed companies are briefly discussed.

Chapter 7 summarises and presents key findings, implications, and limitations of this research. This chapter strives to summarise and evaluate the main findings based on the quantitative and qualitative data analysis, identify implications for practice based on the insights obtained from this research, and acknowledge the limitations of this research.

After that, chapter 8 draws conclusions of this thesis. This final chapter highlights the original contributions as well as discusses avenues for future research.

1.1. Conclusion

This chapter offers a brief introduction and insight into the research. It firstly discusses rationale for choice of the research topic before identifying the research question and the

objectives that needs to be accomplished. In addition, the possible contributions of doing this research to knowledge have been recognised as well as the thesis structure with a brief overview of each chapter is provided. Further in-depth information of this thesis will be provided and discussed in the following chapters.

CHAPTER 2: THE VIETNAMESE STOCK MARKET

2.1. Introduction

In recent times, emerging and frontier markets have become more prosperous and more Asian (The Economist, 2017). The emerging markets have been expanded dominantly to the global economy and they have been regarded as key contributors to the global economic growth (Christensen & Miklashevsky, 2016). Because of unique characteristics of emerging and frontier stock markets, it is crucial to do research on these developing trading platforms to make right decisions in business management and financial investment (Barry, Peavy III, & Rodriguez, 1998). Over the last few years, Vietnam has become one of the most dynamic frontier and emerging stock markets in Asia (Pham, Nguyen, & Vo, 2018). Therefore, it is vital to thoroughly research the Vietnamese stock exchange market not only to make contributions to the academic literature but also have implications for practice and policy. This chapter comprises: unique characteristics of emerging and frontier markets, establishment of the Vietnamese stock market, operations and development of the Vietnamese stock exchanges in recent years, and strategic decisions and activities related to restructuring the Vietnamese stock exchange markets.

2.2. Unique characteristics of emerging and frontier markets

The emerging and frontier markets have liberated their stock markets by opening their stock markets to encourage economic growth (Arshad, Rizvi, Ghani, & Duasa, 2016). Driven by dynamic economics and diversification potential, these markets have attracted both domestic and international investors (Plagge, 2015). The significant and gradual economic growth of the emerging capital markets has been associated with their massive potential for high returns as well as diversification advantages (Barry, Peavy III, & Rodriguez, 1998).

In particular, Cheng, Jahan-Parvar, & Rothman (2010) did research on nine emerging and frontier equity markets in Middle East and North Africa. By testing variations of the capital asset pricing model, the results reflected a low level of integration between most emerging markets with the global capital markets (Cheng, Jahan-Parvar, & Rothman, 2010). Additionally, Berger, Pukthuanthong, & Yang (2011) appraised frontier market equities in regard to the global market integration and diversification. It was consistently revealed from the sub-period analysis, the out-of-sample performance tests, and the use of exchange traded funds that there was a low integration between frontier markets and the world market (Berger, Pukthuanthong, & Yang, 2011). Meanwhile, they offered huge potential diversification benefits to international investors (Berger, Pukthuanthong, & Yang, 2011).

A work of De Groot, Pang, & Swinkels (2012) investigated over 1400 stocks from 24 highly liquid frontier emerging markets between 1997 and 2008. It was indicated that investment strategies based on value and momentum of these markets could offer economically and statistically significant excess returns of approximately 5% to 15% annually, and they largely enhanced the efficiency of investment portfolios (De Groot, Pang, & Swinkels, 2012). In other words, the emerging and frontier markets could offer a greater long-term investment opportunity and better profits than developed economies (Chen, Chen, & Lee, 2014; Ioana-Cristina & Gheorghe, 2014). Thus, these emerging markets have been considered as important asset class in the current portfolio management in recent years (Plagge, 2015). Several international investors and experts have admitted that higher profit could be earned by investing in the emerging financial markets than the mature ones (Ioana-Cristina & Gheorghe, 2014).

According to the principle of high risks – high returns, investments in emerging and frontier stock markets involve higher risks than investments in mature and developed markets (Ioana-Cristina & Gheorghe, 2014). Hull & McGroarty (2014) appraised a 16-year sample of 22 emerging countries by using Hurst–Mandelbrot–Wallis rescaled range statistic to measure returns and volatility. The output revealed that price volatility was one of the most crucial risks inherent in the financial investments, and different emerging markets would have different levels of efficiency in returns and volatility (Hull & McGroarty, 2014; Plagge, 2015). The volatility is attributed to diversified risks including political risk, floating exchange rate, inflation rate and other socio-economic risks (Plagge, 2015). In addition, lower liquidity and regulatory standards in the emerging and frontier markets create difficulties for foreign investors with direct investments in the emerging and frontier countries (Barry, Peavy III, & Rodriguez, 1998). The international specialists and investors could also encounter challenges and barriers to languages and information in emerging and frontier markets (Barry, Peavy III, & Rodriguez, 1998). In addition, Speidell (2011) pointed out that there were unique and different features, opportunities and challenges in Africa, Asia, Europe, Latin America, and the Middle East distinct frontier regions. It implies that investigation of financial frontier and emerging markets should be implemented on the country level or a specific region (Chen, Chen, & Lee, 2014; Speidell, 2016).

Furthermore, the emerging and frontier markets are associated with “progress, uplift and dynamism”, and this group has recently become more prosperous and more Asian (The Economist, 2017). As International Monetary Funds’ annual meeting special of Christensen & Miklashevsky (2016), emerging markets are increasingly predominant to the global economy, and they set to be main drivers of the global economic growth. Growth in emerging Asia was

estimated to pick up further – from 5.3 percent in 2017 to 6.2 percent in 2019 – 2020 (International Monetary Fund, 2018; International Monetary Fund, 2019a). The positive and high growth rate indicated the continuous enhancement of economic performance in emerging Asia (International Monetary Fund, 2018; International Monetary Fund, 2019a). From 2012 to 2019, financial conditions remained supportive of an acceleration in economic activities, strengthening the equity markets (International Monetary Fund, 2018; International Monetary Fund, 2019a). According to ***Figure 2.1***, Emerging Asia excluding China's Equity Markets index rose by 80 points to 200 points in March 2018, which was much higher than indexes of the other areas.

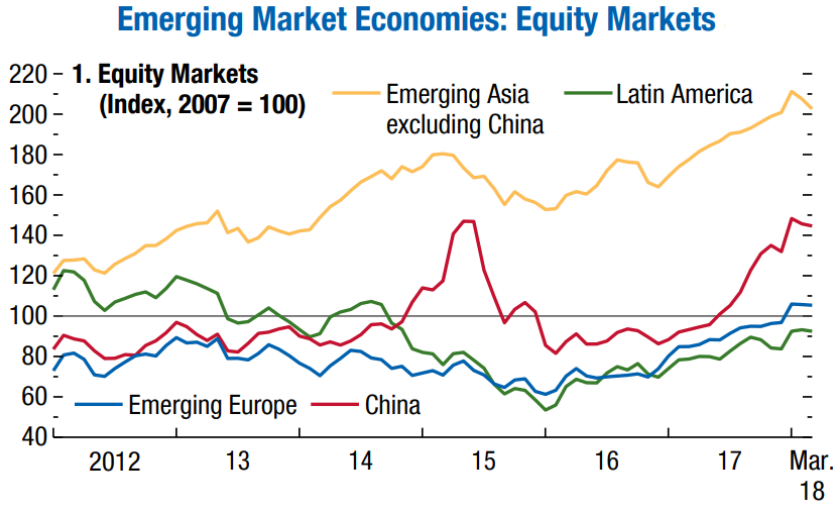

Figure 2.1: Emerging market economies – Equity markets

Source: International Monetary Fund, 2018.

Because of the mentioned unique characteristics of the emerging and frontier stocks markets, it is essential to undertake research on these developing markets to make right decisions in financial investment and business management (Barry, Peavy III, & Rodriguez, 1998). Additionally, Vietnam has become one of the most dynamic frontier and emerging stock markets in Asia in recent years (Pham, Nguyen, & Vo, 2018). Therefore, it is pivotal to conduct research on the Vietnamese stock market to offer academic contributions to the literature as well as provide practical support to policymakers, managers, investors, and specialists.

2.3. Establishment of the Vietnamese stock market and its organisational structure since 1990s

In 1980s, Vietnam ran a centrally planned economy which principally entailed the nationalisation and centralisation of its entire economy (Bui, 2001). The economy was subjected to low level of economic development with continuous lack of product, deficit in the trade balance, inefficient investment, and low levels of per capita consumption (Bui, 2001). To

overcome weaknesses in terms of bureaucratic centralisation and lack of material incentives of the economic system, Doi Moi was launched at the Sixth Party Congress in 1986 (Van Arkadie & Mallon, 2004). It remarked the beginning of Vietnam's transition from a centrally planned economy to a socialist-oriented market economy (Van Arkadie & Mallon, 2004).

To industrialise and modernise the economy, achieve stable and sustainable economic growth, and restructure the financial system to improve its efficiency and competition, it has been crucial to establish a new channel of capital mobilisation for development of investment (State Securities Commission of Vietnam, 2018). Launching and developing securities market in Vietnam has been considered as an urgent demand to attract mid-term and long-term capital from national and international investors and sources through debt securities and capital securities (Ho Chi Minh Stock Exchange, 2016). Additionally, equitization of state-owned enterprises in conjunction with formation of this market could significantly enhance openness, efficacy, and healthiness of business environment (Ho Chi Minh Stock Exchange, 2016).

Furthermore, stock market has been recognised as a symbol of capitalism and it plays a key role in mobilising sources of ideal capital to enhance market capitalisation (Nguyen, Oates, & Dunkley, 2014). In addition, the research of Boubakari & Jin (2010) on roles of stock market in economic growth suggested that an efficient stock market contributed into promoting efficacy of investment and proficiency of capital allocation in a market. Moreover, it could encourage entrepreneurial spirit and performance, boost competition for funds between listed companies, and reduce risk by diversifying portfolio internationally and domestically (Boubakari & Jin, 2010). Subsequently, establishment and development of an efficient stock market could stimulate potential economic growth in Vietnam.

2.3.1. From 1990 to 2004

In 1900s, the Ministry of Finance and the State Bank of Vietnam were authorised by the Government of Vietnam to conduct research on building and developing the securities market in Vietnam (State Securities Commission of Vietnam, 2018). One of the initial preparatory works to kick-start the securities market of Vietnam was the establishment of the Capital Market Development Board under the State Bank of Vietnam according to Decision No. 207/QD-TCCB dated 06 November 1993 of Governor of State Bank of Vietnam (Le Minh & Walker, 2009). Its missions included researching, designing the project, and preparing essential conditions for building the securities market in clearly defined and strategic directions (State Securities Commission of Vietnam, 2018).

Nevertheless, as an agency under the State Bank of Vietnam, there had been a variety of difficulties and limitations to research, build the project and determine adequate model of the securities market in Vietnam (State Securities Commission of Vietnam, 2018). Furthermore, establishing and developing the securities market required efficient cooperation and coordination of several organisations and industries (State Securities Commission of Vietnam, 2018). Consequently, in November 1996, the Government of Vietnam decided to set up State Securities Commission of Vietnam (SSC) under the Decree No. 75/CP (hereinafter referred to as Decree No. 75) (Le Minh & Walker, 2009). The SSC was a governmental agency with full and complete functions, duties, and powers of regulating and supervising securities market operations, developing the securities market, and protecting rights and interests of the investors (Le Minh & Walker, 2009). According to Decree No. 75, Chairman and Vice-Chairmen were appointed by the Prime Minister and there were eight units and divisions in the organisational apparatus of the SSC ***(Figure 2.2)***.

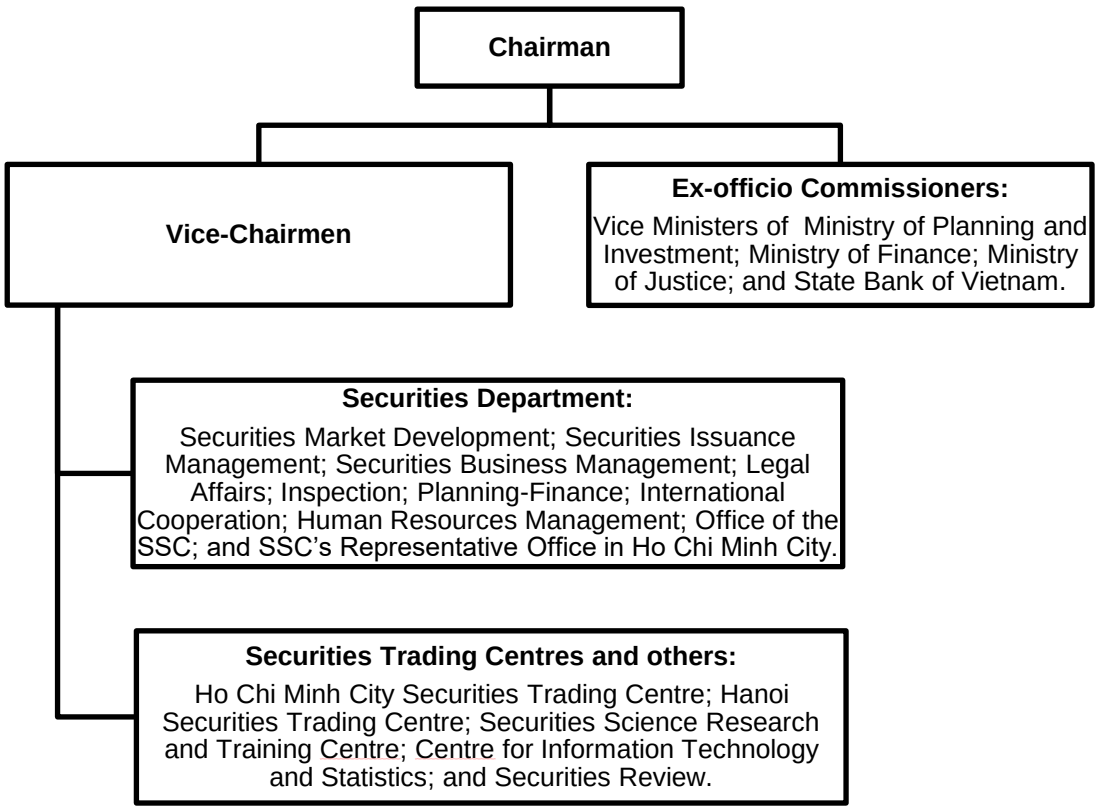

Figure 2.2: Organisation apparatus of the SSC (Decree No. 75)

Source: The SSC, as cited in Le Minh & Walker (2009).

The establishment of securities regulators hugely supported the formation and development of the securities market in Vietnam and the inaugural of the securities market over three years later (State Securities Commission of Vietnam, 2018). On 11 July 1998,

Decision No. 127/1998/QD-TTg was issued regarding the establishment of two securities trading centres in Hanoi and Ho Chi Minh City. Under the mentioned decision, the Vietnamese securities market was officially launched on 20 July 2000 with the establishment of Ho Chi Minh City Securities Trading Centre (HoSTC) (Ho Chi Minh Stock Exchange, 2017a). On 28 July 2000, the first securities trading session occurred with two first listed stocks – namely Refrigeration Electrical Engineering Corporation and Saigon Cable and Telecommunication Material Company (Asia Frontier Capital, 2016).

In August 2003, Decree No. 75 was replaced with Decree No. 90/2003/ND-CP (hereinafter referred to as Decree No. 90) by the Government to further consolidate the organisational structure of the SSC (State Securities Commission of Vietnam, 2018). Decree No. 90 revised the functions, duties, and powers of the SSC to appropriately meet the requirements of developing securities market in the new context ***(Figure 2.3)***.

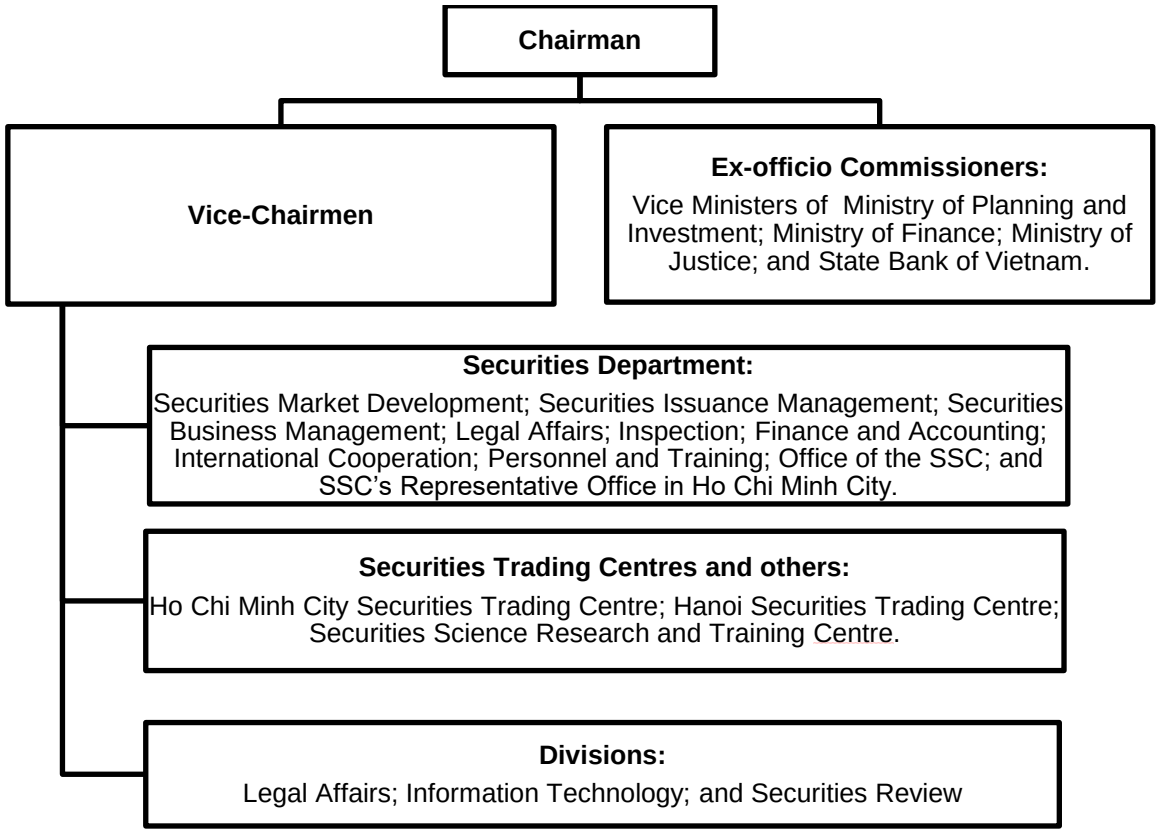

Figure 2.3: Organisation apparatus of the SSC (Decree No. 90)

Source: The SSC, as cited in Le Minh & Walker (2009).

2.3.2. From 2004 until now

In 2004, Decree No. 66/2004/ND-CP and Decision No. 161/2004/QD-TTg were promulgated to enhance efficiency of collaboration between the ministries and the industry

(State Securities Commission of Vietnam, 2018). According to them, the SSC transferred to be an agency operating under management of the Ministry of Finance ***(Figure 2.4)***.

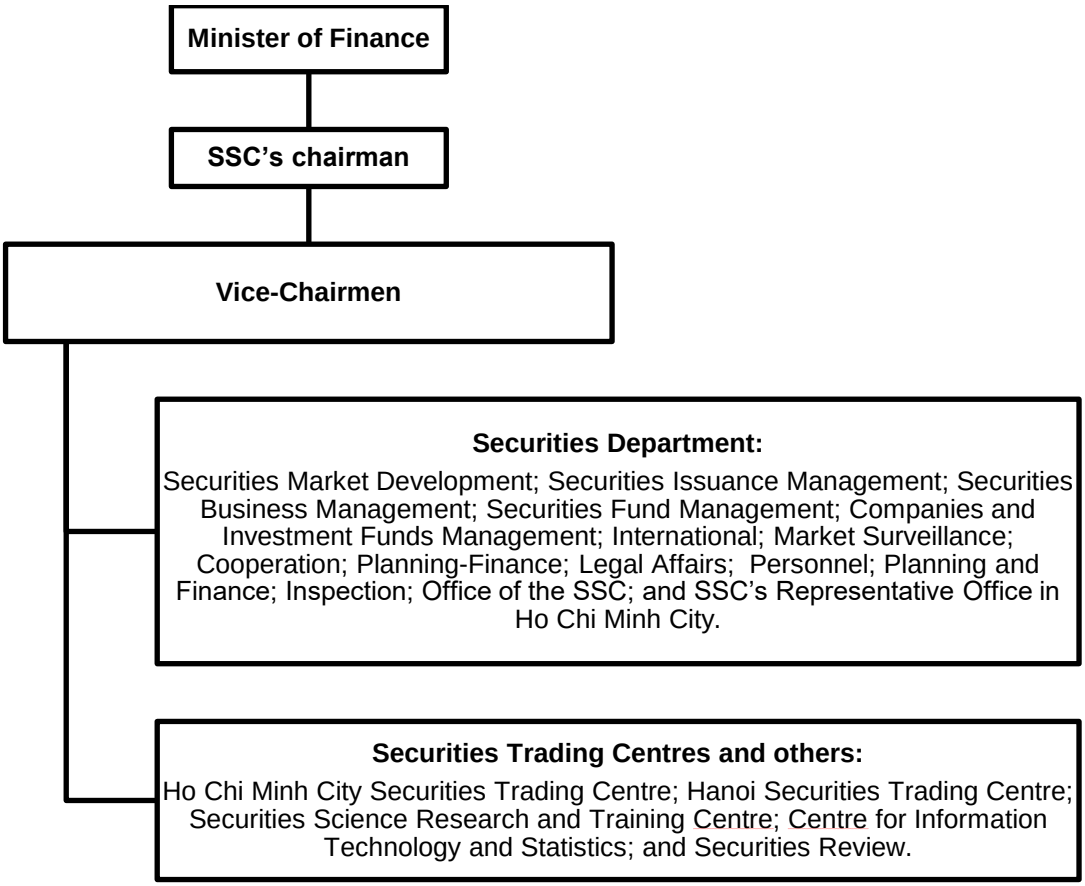

Figure 2.4: Organisation apparatus of the SSC (Decree No. 66 and Decision No. 161)
Source: The SSC, as cited in Le Minh & Walker (2009).

The Ministry of Finance played vital roles and functions in legislating macro-financial policies regulating the financial markets. It ensured safety and improved efficacy, uniformity, and consistency to develop the securities and other financial markets (State Securities Commission of Vietnam, 2018). On 04 November 2004, Decision No. 3595/QD-BTC on the duties, powers, and organisational structure of the SSC's departments was signed by the Minister of Finance. Since then, the SSC has functioned as the regulator as well as the service-provider of this market.

In 2005, the initial share auction was successfully carried out in the Vietnamese stock market with Vietnam Dairy Products Joint Stock Company (Ho Chi Minh Stock Exchange, 2017a). Following the development of the first stock exchange, Hanoi Securities Trading Centre (HaSTC) was officially inaugurated on 08 March 2005. Six initial stocks listed on HaSTC comprised Petroleum Mechanical Stock Company, VTC Telecommunications Joint Stock Company, Vicem Packaging Bimson Joint Stock Company, Da Nang Plastic Joint Stock

Company, Ha Long Canned Food Joint Stock Corporation, and Sai Gon Hotel Corporation (Hanoi Stock Exchange, 2016).

On 29 June 2006, Law on securities No. 70/2006/QH11 was established and enacted by the National Assembly of the Social Republic of Vietnam. On 11 May 2007, Decision No. 599/QD-TTg was signed to transfer HoSTC to Ho Chi Minh Stock Exchange (HOSE). On 08 August 2007, HOSE officially started to run as a limited company with the charter capital of VND 1,000 billion (Vuong, 2010). HOSE has been recognised as the largest stock exchange of Vietnam, and it is a platform for trading stocks of large corporations.

On 01 February 2009, Decision No. 01/2009/QĐ-Ttg was promulgated on transforming from HaSTC into Hanoi Stock Exchange (HNX). The income-generated State agency was remodelled into a State-owned single-member limited liability company with the capital charter of VND 1,000 billion in 2009 (Hanoi Stock Exchange, 2016; Vuong, 2010). HNX is involved with trading stocks of small, medium, and large enterprises, and it is responsible for organising and managing share auctions and Government Bond biddings for mobilising capital for the State budget. Moreover, HNX has run four secondary trading markets – including listed stock market, Government bond market, unlisted public company market (UPCoM), and derivatives market on a technological structure (Hanoi Stock Exchange, 2018a) ***(Figure 2.5)***.

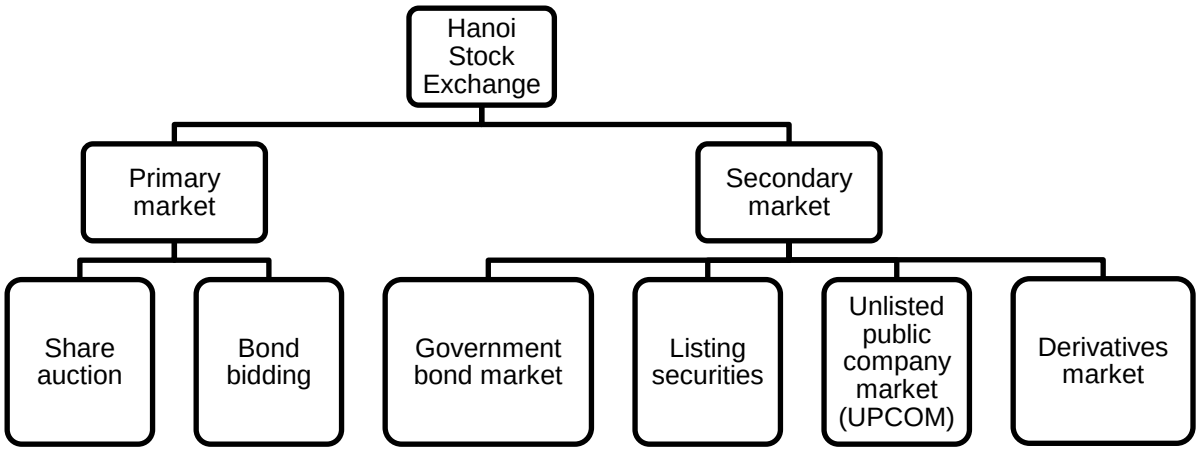

Figure 2.5: HNX market structure

Source: Hanoi Stock Exchange, 2018a.

After many changes in historical changes of organisational structure, the organisation structure was updated according to the Securities Law 2006, Decision No. 63/2007/QD-TTg and Law 62/2010/QH12 amending and supplementing several articles of law on securities (Le Minh & Walker, 2009). Since the mentioned transformation, both HOSE and HNX have been partly self-regulated with supervision and administration by the Ministry of Finance and the

SSC (Maskay, 2014). It is disallowed to have cross-listing stocks between the two exchanges. The Vietnam Securities Depository provides full data and periodical reports to the SSC in accordance with the applicable regulations on supervision and statistics to serve the work of supervision of the SSC and the stock exchanges. ***Figure 2.6*** provides the details.

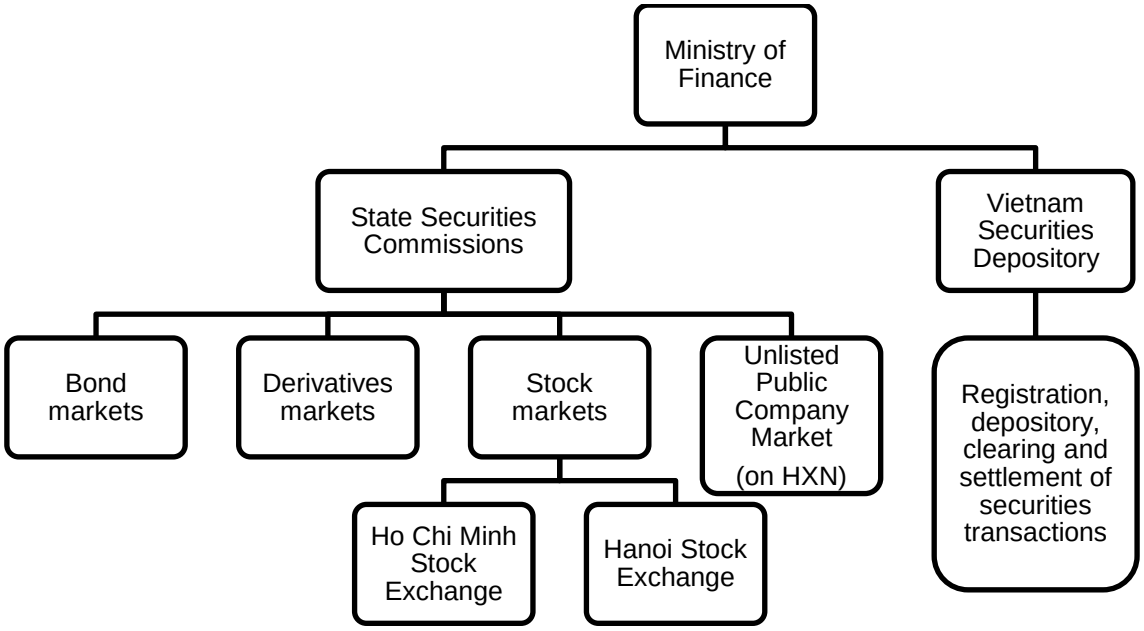

Figure 2.6: Regulatory framework (Securities Law 2006 and Decision No. 63)
Source: Yen & Vu, 2016.

In the strategy of developing the stock exchange market from 2012 to 2020, the Government of Vietnam implemented gradual equitization of stock exchanges and restructured the stock market to facilitate an organisational model of only one security exchange by combining HOSE and HNX as well as ensure consistency in performance, increase convenience in raising governance capacity and attract capital from the market participants (Chung Khoan Viet Nam, 2013).

On 26 November 2019, the National Assembly of Vietnam adopted the new Law on Securities (Law on Securities No. 54/2019/QH14) to replace the Law on Securities in 2006. The Law on Securities No. 54 regulated activities in the field of securities and securities market, rights and obligations of organisations and individuals in the securities sector, securities market organisation as well as State management on securities and securities market (National Assembly of the Socialist Republic of Vietnam, 2019). Regarding the securities market organisation, two major changes included establishment of one stock exchange and establishment of Vietnam Securities Depository and Clearance Corporation. The Law on Securities No. 54 stipulated that there would be only one concentrated Stock Exchange to ensure consistency and transparency when implementing the law. Over 50% of

charter capital or voting shares of the Vietnam Stock Exchange shall be held by the State. In addition, Vietnam Securities Depository and Clearance Corporation would replace the current Vietnam Securities Depository Centre. It would be established and supervised by the SSC and be responsible for securities registration, depository, clearance, and payment, like the current Vietnam Securities Depository. The new law added regulations on clearance members and clearance fund besides depository members already provided in the previous law. The Vietnam Securities Depository and Clearance Corporation would ensure limitations on foreign investors' ownership ratios and monitor performance of their members. It would also initiate central counterparty for the securities market. The Law on Securities No. 54/2019/QH14 came into effect from 01 January 2021.

On 23 December 2020, the Prime Minister issued Decision No. 37/2020/QD-TTg to establish the Vietnam Stock Exchange. Accordingly, Vietnam Exchange (VNX) was headquartered in Hanoi, operating under the model of one-member limited liability company with 100% charter capital held by the State. VNX held 100% of charter capital on HNX and HOSE. The Decision took effect from 20 February 2021.

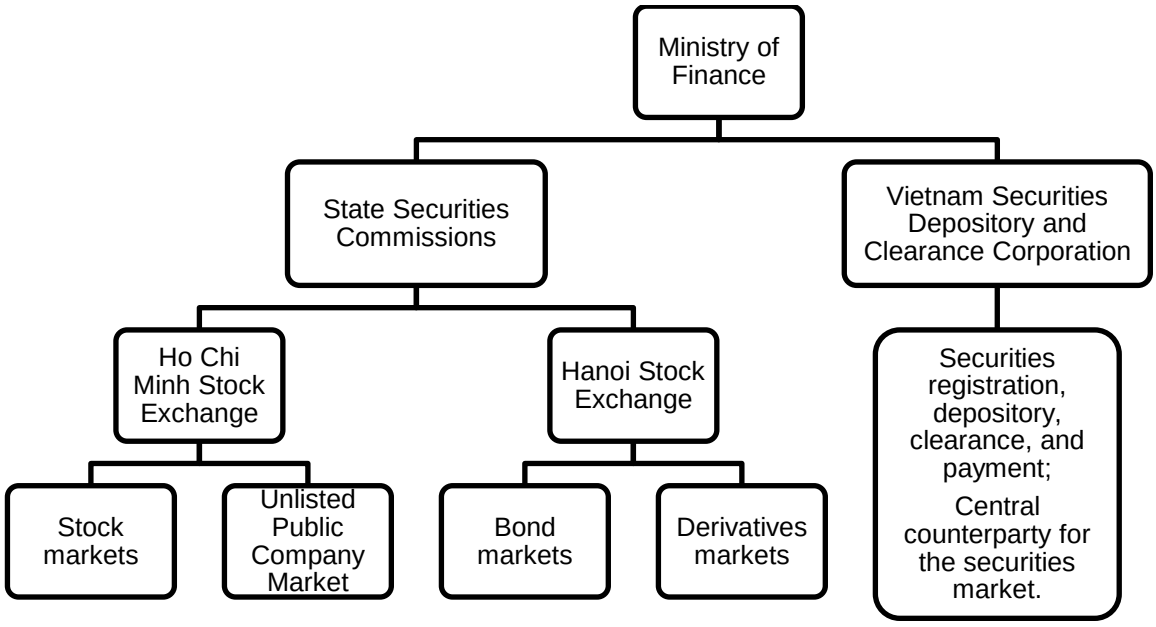

Figure 2.7: Regulatory framework (Law on Securities No. 54 and Decision No. 37)

Source: Compiled by author.

Figure 2.7 gives regulatory framework following Law on Securities No. 54 and Decision No. 37. Accordingly, HNX will be responsible for organising and operating the derivative securities market, bond trading market, and other securities trading markets while HOSE will organise and operate the stock trading market and other securities trading markets in the future. At the latest by the end of 2023, HOSE will receive all shares listed on HNX. By June

2025, HOSE will receive shares of enterprises registered for trading on UPCOM. For HNX, before the deadline of 01 July 2023, this agency will continue to organise a trading market for listed and unlisted public shares on UPCOM at HNX until finishing the transfer of listed shares and registration for trading shares from HNX to HOSE (VNBusiness, 2021).

2.4. Operations and development of the Vietnamese stock exchanges in recent years

Since the initial milestones of establishing the Vietnamese stock market, there has been a massive enhancement and growth, so it has attracted widespread concern and interest from policymakers, managers, investors, academics, and the public. The regulations in the stock market are continuously changed and updated to enhance the market efficiency and boost the market performance. This section provides a brief overview of two stock exchanges' operations and development in recent years.

2.4.1. Overview of the Vietnamese stock exchanges

HOSE and HXN have been recognised as two crucial platforms for trading listed stocks in Vietnam (Nguyen & Nguyen, 2016). Since 2006, the market has enhanced more significantly. Firstly, the changes in organisational regulations on the Vietnamese stock exchanges in 2005 and 2006 motivated the investors and companies to get access to the stock market (Le Minh & Walker, 2009; Vuong, 2010). Additionally, Vietnam was approved to become the 150th member of WTO on 07 November 2006, which provided as a sign of potential development attracting the domestic and foreign investors (The Prime Minister, 2012a).

However, the adverse impacts of the global crisis on the Vietnamese economy resulted in a massive decrease in the VN Index and HNX Index (Le, 2011). A profound lack of strict regulations and tight connection between the two stock exchanges as well as inadequacy of efficient management were revealed in this stock market (BBC, 2012). Around the period of the global financial crisis, a huge number of severe illegal economic errors and frauds, especially in financing and investing activities, were detected with litigations and arrests in large banks and securities companies (BBC, 2012). This resulted in a significant drop in trust and belief of investors and stakeholders. To illustrate, VN Index and HNX Index dropped significantly from 2010 to 2012 and hit the bottom ***(Figure 2.8)***. To recover efficiency and performance of the Vietnamese stock exchange, the Government of Vietnam has decided to conduct restructuring of the economy and the securities market since 2012 (The Prime Minister, 2012a).

Figure 2.8: VN Index and HNX Index since establishment of the stock exchanges

Source: https://tradingeconomics.com/vietnam/stock-market

State-owned enterprises restructuring has been considered as a core focus in strategic plan of Vietnam in recent years (O'Toole, Morgenroth, & Ha, 2016). The equitization of the state-owned enterprises processes were stimulated with promulgation of Decree No. 59/2011/ND-CP on 18 July 2011 (The Government, 2011). Major objectives of the transforming activities included improving financial capacity, mobilising capital from domestic and foreign investors, and boosting the efficiency and competitiveness of the economy (The Government, 2011). In order to remove existing obstacles to accelerate the equitization, Decree 126/2017/ND-CP was legislated to replace Decree 59 of 2011, Decree 189 of 2013, and Decree 116 of 2015 with respect to the transformation of the state-owned enterprises into joint stock companies on 22 November 2017 (Vietnam Law & Legal Forum, 2017).

From 2012 to 2017, 530 state-owned enterprises were equitized (Mai, 2017). Significantly, in 2017 – 2018, great state divestments from state-owned enterprises, such as Saigon Beer Alcohol Beverage Corporation – Vietnam's largest brewer and Vietnam Dairy Products Joint Stock Company – Vietnam's largest dairy company, helped the State to fetch massive funds and attraction from the domestic and foreign financial markets (Nhan Dan, 2018a). Additionally, the equitization and listing of the state-owned enterprises promoted diversification of shareholding structure and then increased efficiency of supervision and performance. As a result, there has been a gradually and consistently improving trend in the economy of Vietnam (Nga, 2017). Especially, it had a Gross Domestic Product (GDP) growth rate of 7.076% in 2018, the best performance in the past ten years ***(Figure 2.9)***. Enhancing

market liquidity has hugely stimulated performance of state-owned enterprise equitization and state capital divestment (Hanoi Stock Exchange, 2018a).

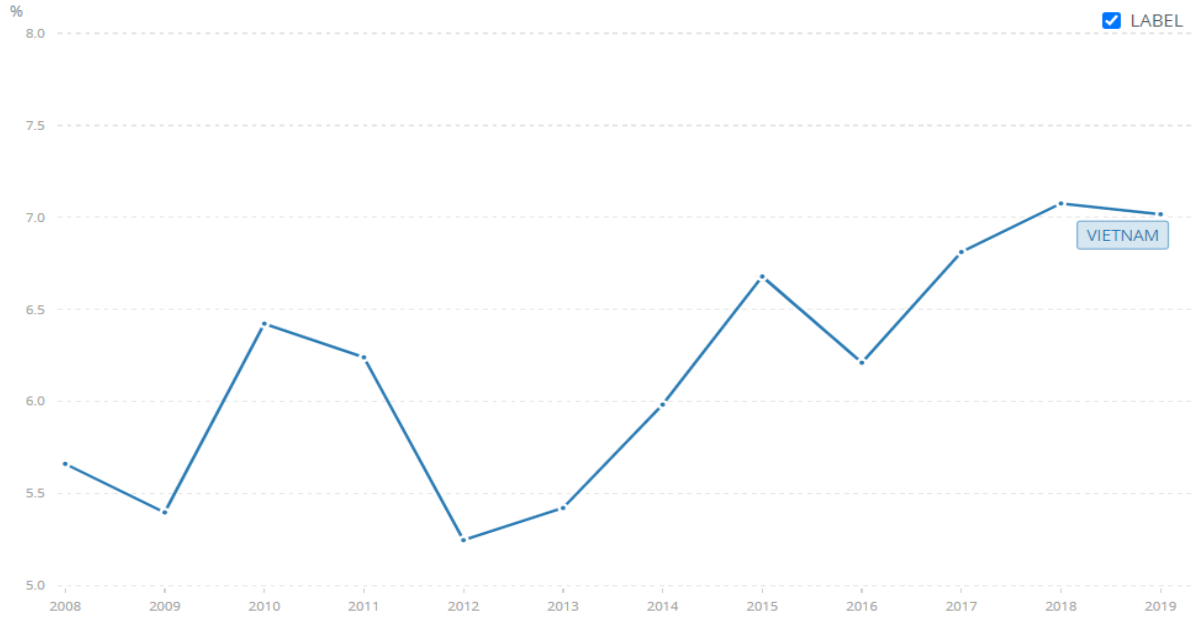

Figure 2.9: Vietnam's annual GDP growth over the past decade

Source: https://data.worldbank.org/country/vietnam

Further, efficient capital allocation plays crucial roles in boosting long-term growth prospects and expanding productive and economic capacity of a country (Nhung & Okuda, 2015). O'Toole, Morgenroth, & Ha (2016) appraised the impact of privatisation and equitization policies on investment efficiency of the state-owned enterprises. It was found that the equitization with minority state-owned enterprises shareholdings positively contributed to the development of their investment efficiency (O'Toole, Morgenroth, & Ha, 2016). Therefore, the equitization of state-owned enterprises has contributed to the enormous growth of the stock market (Nhan Dan, 2018a). Thanks to impressive and positive economic developments, the Vietnamese stock market achieved the highest growth rate with a massive boost to stock market size since 2008 (Hanoi Stock Exchange, 2018a).

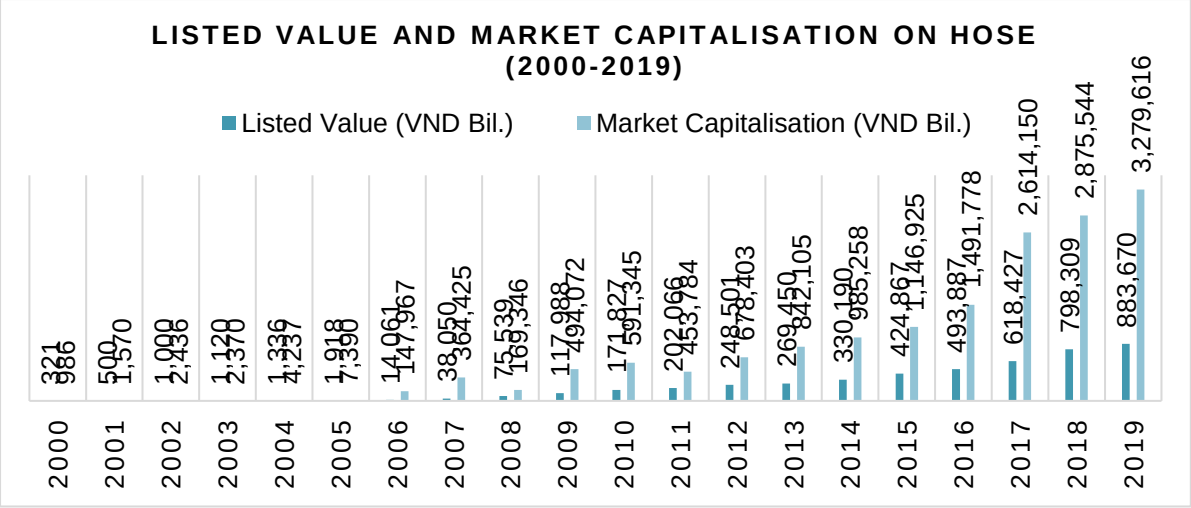

Figure 2.10: Listed value and market capitalisation on HOSE from 2000 to 2019

Source: Ho Chi Minh Stock Exchange, 2016; Ho Chi Minh Stock Exchange, 2020.

From 2000 to 2019, listed value at HOSE jumped to VND 883,670 billion ***(Figure 2.10)***. The market liquidity in 2019 remained stable and the average trading volume per session in 2019 was about 182.5 million shares, equivalent to the average trading value of VND 4,128 billion per session (Ho Chi Minh Stock Exchange, 2020). Market capitalisation at HOSE in 2019 peaked at nearly 3,279.62 trillion VND, which was over twice the market capitalisation at HOSE in 2016 ***(Figure 2.10)***. The market capitalisation at HOSE accounted for more than 94% of equity market capitalisation nationwide.

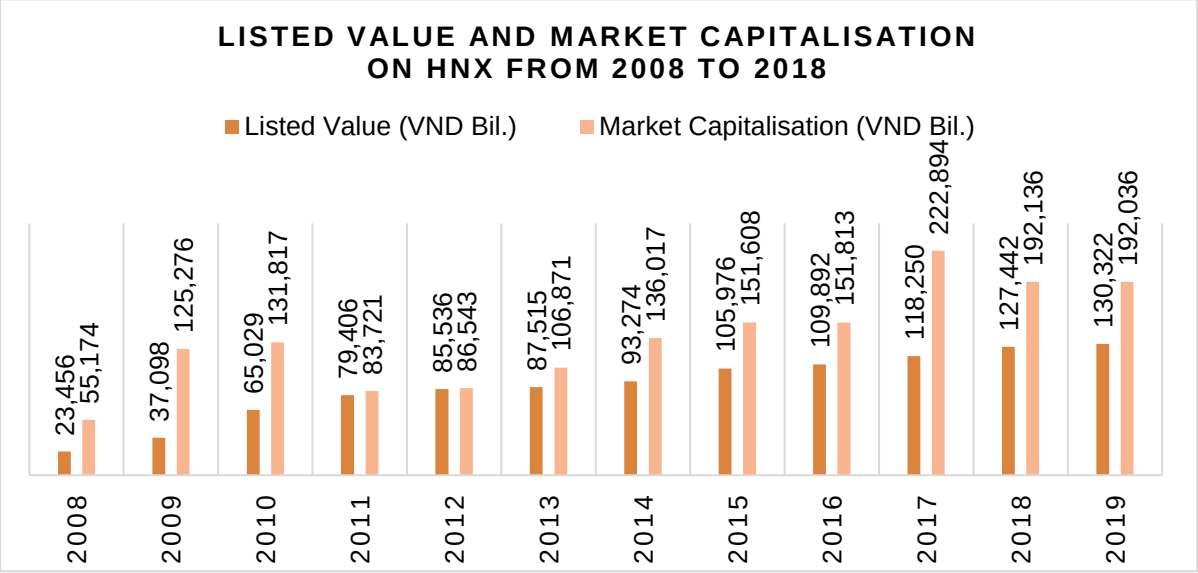

Figure 2.11: Listed value and market capitalisation on HNX from 2000 to 2019

Source: *Hanoi Stock Exchange, 2014; Hanoi Stock Exchange, 2019a.*

The listed value of HNX rose by VND 106,866 billion between 2008 and 2019 ***(Figure 2.11)***. Market capitalisation of HNX was at VND 192,036 billion in 2019, slightly decreasing by

0.052% from the previous year ***(Figure 2.11)***. The combined stock market capitalisation of HOSE and HNX completely totalled VND 3,471,652 billion, equivalent to over 57% of the GDP in 2018 ***(Figures 2.10 and 2.11)***. Especially, in 2019, there was a total of 373 listed stocks and 5 listed fund certificates on HOSE (Hanoi Stock Exchange, 2020; Ho Chi Minh Stock Exchange, 2020). From 2015 to 2019, the number of listed companies on HOSE increased by 106 companies (Ho Chi Minh Stock Exchange, 2020). Additionally, HNX had 76 newly listed companies between 01 January 2015 and 31 December 2019, and there were 365 listed companies on HNX in 2019 (Hanoi Stock Exchange, 2019a). Therefore, there has been a substantial growth in total listed value and total market capitalisation on both HOSE and HNX over the five years ***(Figures 2.10 and 2.11)***. It implies that the Vietnamese stock market has attracted investors more significantly with a great rise of investment on these two stock exchange markets (Ho Chi Minh Stock Exchange, 2017b).

Thanks to the national strategic plans to improve the economy, develop the private sector and attract the investors, the Vietnamese stock market has been strengthened in recent years (Vu, 2018). In 2017, the benchmark VN Index on HOSE closed at 984.24, equivalent to a 47 percent gain (Shira, 2018). It was the greatest value in ten years, leading to the fact that the Vietnamese stock market became the best performing stock market in Asia (Shira, 2018). Over the first two months of 2018, VN Index hit a new record of 1,120 points, equivalent to 14 per cent growth (Shira, 2018). As a result, the Vietnamese stock market was the fastest growing markets in the world (Vietnam Investment Review, 2018a). Thus, it has been considered as one of the most investment-worthy markets thanks to substantial increase in profitability and capital attraction (Vietnam Investment Review, 2018a).

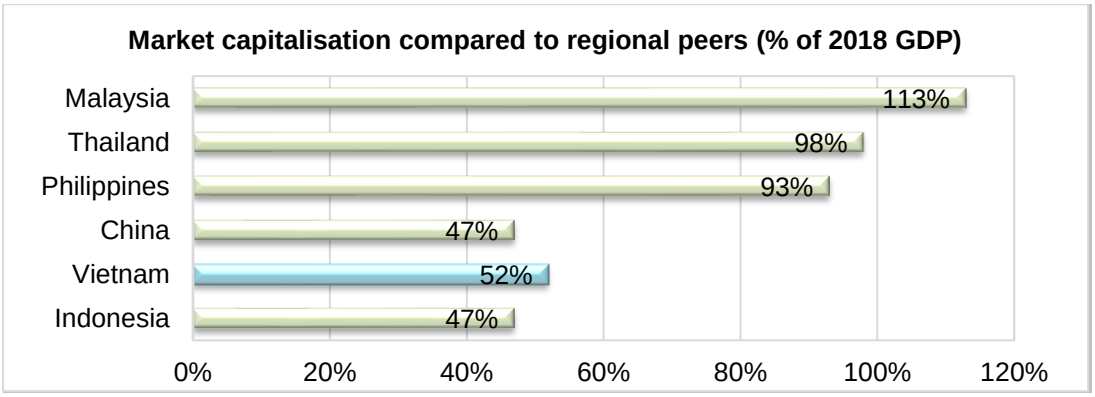

Figure 2.12: Market capitalisation compared to regional peers

Source: The World Bank, 2019.

The market capitalisation at HOSE in 2018 was 2,875.54 trillion, equivalent to nearly 52% of the GDP of Vietnam (Ho Chi Minh Stock Exchange, 2019a) ***(Figure 2.12)***. It was slightly more than the ratio of Indonesia and China but far from the levels reported in the

Philippines, Malaysia, and Thailand in 2018 (The World Bank, 2019). The performance of HOSE could be explained by abundant liquidity as well as positive market expectations on the state-owned enterprise equitization process (The World Bank, 2019). The market capitalisation at HOSE in 2019 was equivalent to nearly 54% of the GDP of Vietnam in 2019, which rose by 2% as compared to the market capitalisation at HOSE in the previous year (Ho Chi Minh Stock Exchange, 2020).

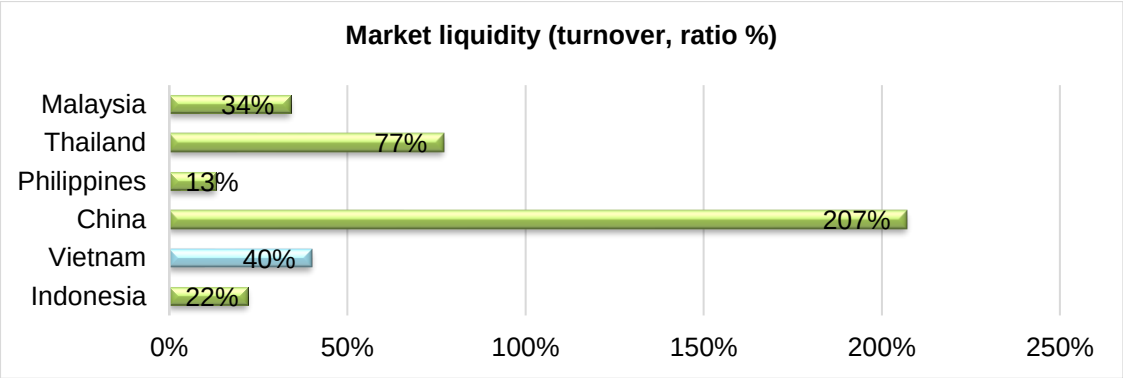

Figure 2.13: Market liquidity compared to regional peers

Source: The World Bank, 2019.

Further, the market liquidity of Vietnamese stock market was compared to regional peers in ***Figure 2.13***. The Vietnamese stock market was more active, with a moderate turnover ratio of 40%, which was in the midrange in comparison to the ratios obtained by the other frontier and emerging markets in the region (The World Bank, 2019).

Table 2.1: Price to earnings ratio of VN Index and other indices in the Southeast Asia

Market indices	Countries	Expected GDP 2019-2023 (%)	P/E	P/E forward 1 year
VN Index	Vietnam	6.5	16.5	16.8
PCOMP Index	Philippines	3.7	19.4	16.7
SET Index	Thailand	6.6	18.7	20.1
FBMKLCI Index	Malaysia	5.2	21.2	21.9
JCI Index	Indonesia	4.6	19.8	19
Average		5.32	19.12	18.9

Source: KB Securities Vietnam, 2019; OECD, 2019.

As in 2019, the price to earnings ratio (P/E) of VN Index was 16.5 ***(Table 2.1)***. In comparison with P/E of other peer markets in Southeast Asia, P/E of VN Index was the lowest and below the average P/E of 19.12. Regarding the economic growth potential using GDP growth forecast in the period of 2019 – 2023 of the Organisation for Economic Co-operation and Development (OECD), Vietnam is one of the economies which are predicted to obtain the greatest growth rate. Thus, this stock market is expected to achieve a considerable development in the future to gradually bridge the gap between this stock market and the other regional markets.

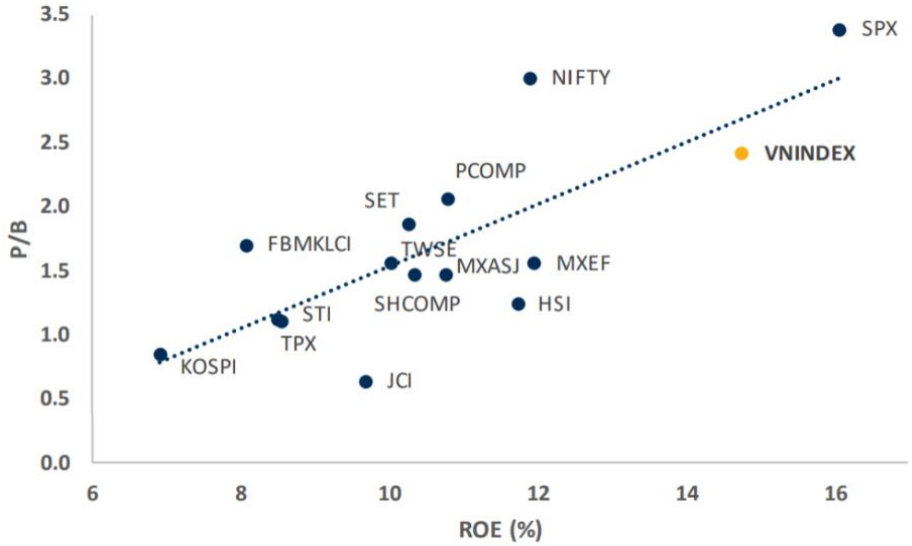

Figure 2.14: Returns on equity and price to book value of Asian countries in 2019

Source: KB Securities Vietnam, 2019.

Additionally, the correlation between returns on equity (ROE) and price to book value (P/B) of Asian countries was presented in ***Figure 2.14***. VN Index had a high ROE and high P/B index as compared to the ratios of other Asian countries. Furthermore, Vietnam thrived to become Southeast Asia's best-performing stock market in 2019 with a 12% gain for VN Index on HOSE (Preiss, 2019). Vietnam was the third-best performing market in the world over the five years from 2014 to 2019 (Preiss, 2019). Moreover, compared to other countries, the Vietnamese stock market keeps a lower P/E ratio than the other international markets with a higher growth rate of GDP (National Center for Socio-economic Information and Forecast, 2021) ***(Figure 2.15)***. In addition, the P/E of VN Index in February 2021 reached 16.4 points, which was lower than the P/E in the same period in 2020 (18.5 points). Thus, the evidence not only provides a considerable growth potential of this stock market in the future but also indicates that the ability to generate profits from the listed companies in the Vietnamese stock market is increasing.

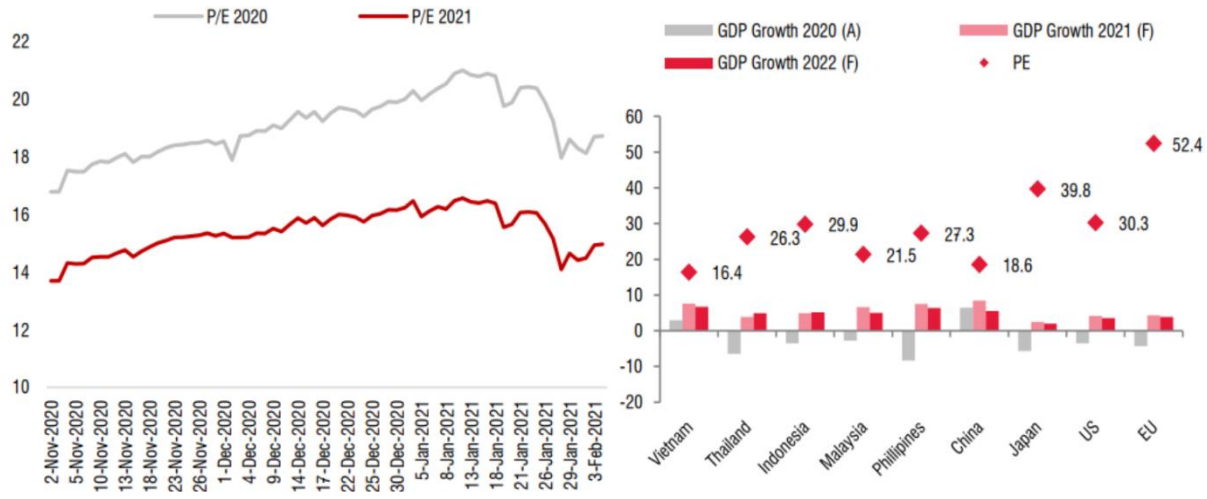

Figure 2.15: Price to book value of VN Index and other countries

Source: National Center for Socio-economic Information and Forecast, 2021.

Therefore, there has been a significant and gradual development of the Vietnamese stock market. Compared to the other stock markets, it is still quite young. However, it has been active with relatively high market capitalisation and market liquidity as compared to the ratios of the other regional markets. Moreover, the Vietnamese stock market is expected to achieve a substantial growth in the future to gradually narrow the gap between this market and the other regional ones. Since the initial milestones of establishing the Vietnamese stock market, there has been a massive enhancement and growth, so it has attracted widespread concern and interest from policy makers, investors, academics, and the public.

2.4.2. Trading regulations on the Vietnamese stock exchanges

The trading regulations on the Vietnamese stock exchanges refer to trading time and trading order, settlement cycle, and daily price limits.

2.4.2.1. Trading time and trading orders

Regarding the trading time and orders on HOSE, this stock exchange regulated rules related to trading stocks on HOSE on Decision No.67/QD-SGDHCM dated 02 March 2018 (Ho Chi Minh Stock Exchange, 2018). On 02 March 2018, trading on HOSE started to follow the trading time listed in ***Table 2.2***.

Table 2.2: Trading time on HOSE

	Session	Trading method	Trading time
HOSE	Morning session	Opening periodic order-matching	09h00' – 09h15'
		Continuous order-matching I	09h15' – 11h30'
		Put-through	09h00' – 11h30'
	Intermission		11h30' – 13h00'
	Afternoon session	Continuous order-matching II	13h00' – 14h30'
		Closing periodic order-matching	14h30' – 14h45'
		Put-through	13h00' – 15h00'

Source: Ho Chi Minh Stock Exchange, 2018.

Besides that, Ho Chi Minh Stock Exchange (2018) also regulated types of orders applied to trade stock as listed in ***Table 2.3***:

Table 2.3: Trading method and orders on HOSE

Trading methods	Trading orders
Opening periodic order-matching	Limit order, At the opening order (ATO)
Continuous order-matching	Limit order, Market order
Closing periodic order-matching	Limit order, At the closing order (ATC)

Source: Ho Chi Minh Stock Exchange, 2018.

Regarding the trading time and orders on HNX, this stock exchange regulated rules related to trading stocks on HNX on Decision No.529/QD-SGDHN dated 25 August 2016 and revised it on Decision No. 653/QD-SGDHN and Decision No. 655/QD-SGDHN dated 12 October 2018. 05 November 2018 was the first trading session of HNX to apply new regulations on trading time of listed securities and deploy more post limit order-matching. Based on the Decision No. 653/QĐ-SGDHN, investors had more time for trading on HNX from 14h45 to 15h00 (Vui, 2018) ***(Table 2.4)***.

Table 2.4: Trading time on HNX

	Session	Trading method	Trading time
HNX	Morning session	Continuous order-matching	09h00' – 11h30'
		Put-through	09h00' – 11h30'
	Intermission		11h30' – 13h00'
	Afternoon session	Continuous order-matching	13h00' – 14h30'
		Closing periodic order-matching	14h30' – 14h45'
		Put-through	13h00' – 15h00'
		Post limit order-matching	14h45' – 15h00'

Source: Hanoi Stock Exchange, 2018b.

In terms of the trading orders on HNX, Decision No.529/QD-SGDHN and Decision No. 653/QD-SGDHN specified classifications of trading orders (Hanoi Stock Exchange, 2018b). It is summarised as follows:

- Limit order: The limit order is valid until the end of the closing periodic order or until the order is cancelled.

- Market order is valid in the continuous order-matching method. It includes market-to-limit order, fill or kill, and fill and kill.
- ATC order is valid in periodic order matching session.
- Post limit order: The order is valid from 14h45' to15h00' on every working day. The post limit order will be matched into the system if and only if there are available reciprocal orders. Execution price is the closing price of the trading day, and the transactions cannot be amended or cancelled.

2.4.2.2. Settlement cycle

The Bank for Investment and Development of Vietnam was assigned to deal with all securities transactions of HOSE and HNX (The State Bank of Vietnam, 2018). Vietnam Securities Depository Centre legislated Decision 112/QD-VSD on the regulations of clearance and settlement of securities transactions on the Vietnamese stock markets (Vietnam News, 2015). According to the new decision, there has officially been a reduction in the settle cycle for stock from three business days to two business days since 01 January 2016 (Vietnam News, 2015). The decision aimed to apply international standards and practices for trading activities and transaction settlement (Vietnam News, 2015).

2.4.2.3. Daily price limits

Since the first trading session in Vietnam on 28 July 2000, daily price limits have been adjusted several times to encourage and stabilise the Vietnamese stock market. Details are outlined in ***Table 2.5***:

Table 2.5: Historical changes in daily price limits on HOSE and HNX

No.	Time	Increase/Decrease	Daily price limits on HOSE	Daily price limits on HNX
1	13 June 2001	Increase	+/- 7%	Not available
2	15 October 2001	Decrease	+/- 2%	Not available
3	01 August 2002	Increase	+/- 3%	Not available
4	23 December 2002	Increase	+/- 5%	Not available
5	27 March 2008	Decrease	+/- 1%	+/- 2%
6	07 April 2008	Increase	+/- 2%	+/- 3%
7	16 June 2008	Increase	+/- 3%	+/- 4%
8	18 August 2008	Increase	+/- 5%	+/- 7%
9	15 January 2013	Increase	+/- 7%	+/- 10%

Source: Hoang, 2013.

The initial daily price limit on the first trading session was at +/- 2% and it supported to stabilise the Vietnamese stock market and encourage domestic and international investors to invest in the newly launching market (Hoang, 2013). After nearly one year, VN Index rose from 100 points to 500 points (Hoang, 2013). Thus, SSC decided to expand the daily price limits on HOSE from +/- 2% to +/- 7% on 13 June 2001 (Vietnamnet, 2013) ***(Figure 2.16)***. However,

the VN Index continuously reduced after the range expansion till the end of October 2001 (Hoang, 2013). Over 4 months, VN Index lost 64% (Hoang, 2013). To stabilise the market and prevent huge ongoing decrease, the daily price limits were narrowed down to +/- 2% that led to a rise in VN Index in the following weeks (Hoang, 2013; Vietnamnet, 2013). To boost the upward trend, the daily price range was enhanced to 3% on 01 August 2002 and 5% on 23 December 2002 (Hoang, 2013). Thus, the daily limits changed four times in the period from 2000 to 2004.

Figure 2.16: Historical changes in daily price limits on HOSE from 2000 to 2004

Source: Hoang, 2013.

The 2008 financial meltdown was considered as the worst economic recession since the Great Depression (Adebambo, Brockman, & Yan, 2015). Especially, the bankruptcy of Lehman Brothers in the United States in September 2008 set off turmoil in the global financial system (The Economist, 2013). The financial crisis led to considerable bank runs, great contagion of financial panic, collapse of several financial institutions and bailouts of banks by the governments, and consequently there was a substantial downward trend in stock markets worldwide (Adebambo, Brockman, & Yan, 2015).

The Vietnamese stock market was significantly affected by the global crisis in 2008. From 12 March 2008 to 25 March 2008, VN Index fell by more than 57% from 1,170.67 points to 496.64 points (Hoang, 2013). To reduce impact of the financial crisis on the Vietnamese

market and restrain investors in the market volatility, the daily price limits were massively narrowed from +/- 5% to +/- 1% on HOSE and from +/- 10% to +/- 2% on HNX on 27 March 2008 (State Securities Commission of Vietnam, 2018) ***(Figure 2.17)***. This decision led to the recovery of market indices (Hoang, 2013). After that, when the market became stable again, the price range was adjusted back to +/- 5% to inspire the investors and stimulate investments and expenditures in the Vietnamese stock market (Ho Chi Minh Stock Exchange, 2009). The increasing time of the daily price limits on both HOSE and HNX were on 07 April 2008, 16 June 2008, and 18 August 2008 (Ho Chi Minh Stock Exchange, 2009). On 18 August 2008, the daily price limits were widened from +/- 3% to +/- 5% on HOSE and from +/- 4% to +/- 7% on HNX (Ho Chi Minh Stock Exchange, 2009). As a result, trading volume and value on both exchanges were significantly boosted on that day (VN Direct, 2008). VN Index had the ninth consecutive increase, and it was the first time that it had surpassed 500 points since 12 May 2008 (VN Direct, 2008). At the close, VN Index reached 508.05 points (increased by 3.91%) with trading volume of 18,829,530 shares (equivalent to 786.12 billion dong) (VN Direct, 2008). The HNX Index also had the sixth consecutive rise and closed at 157.93 (increased by 4.14%) with trading volume of 10,123,500 shares (VND 385.37 billion dong) (VN Direct, 2008).

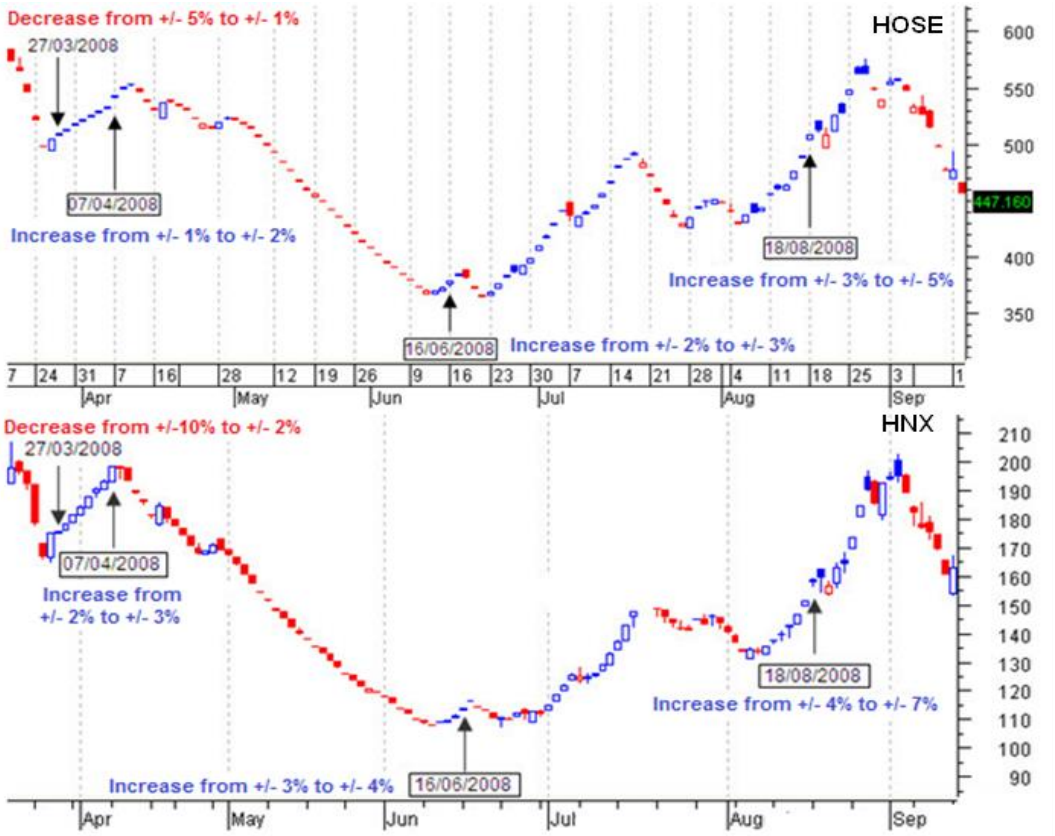

Figure 2.17: Historical changes in daily price limits on HOSE and HNX in 2008

Source: Hoang, 2013.

On 09 January 2013, the SSC approved to adjust the price range on HOSE from +/- 5% to +/- 7% and the price range on HNX from +/- 7% to +/- 10% and the decision took effect from 15 January 2013 (State Securities Commission of Vietnam, 2013). The price range of +/- 7% on HOSE and the price range of +/- 10% on HNX have been applied in the Vietnamese market since then (State Securities Commission of Vietnam, 2013). The change aimed to provide the investors with more price options in buying and selling stocks as well as make an improvement in market liquidity (Ho Chi Minh Stock Exchange, 2014).

Combining with extending trading time, the technical solutions applied in these stock exchanges contributed to positive results in trading activities in 2013 (Hanoi Stock Exchange, 2014). Market capitalisation on HNX on 31 December 2013 was 106,870 billion, which went up by 23.49% as compared to that by the end of 2012 (Hanoi Stock Exchange, 2014; Ho Chi Minh Stock Exchange, 2014). As of the end of the trading session on 31 December 2013, the market capitalisation reached 842,105 billion, an increase of 24.13% as compared to that by the end of 2012 (Ho Chi Minh Stock Exchange, 2014). The average daily trading volume on HOSE rose by 15.11% and the average daily trading value went up by 20.98% as compared to 2012 (Ho Chi Minh Stock Exchange, 2014). VN Index reached 504.63 points at the end of 2013, which climbed by 21.97% as compared to that at the beginning of 2013 and the index achieved the strongest growth in Southeast Asia (Ho Chi Minh Stock Exchange, 2014).

Subsequently, there has been various changes in the trading time and order, the settlement cycle, and the daily price limits of HOSE and HNX. The trading regulations on the Vietnamese stock exchanges were continuously reviewed and amended to enhance their efficiency and performance.

2.4.3. Classification of companies on the Vietnamese stock exchanges.

Since the launch of the Vietnamese stock market, HOSE has been known as a trading platform for relatively large corporations in Vietnam (Nguyen, Diaz-Rainey, & Gregoriou, 2012; OECD, 2018). Meanwhile, Hanoi Stock Exchange has primarily supported relatively small and medium enterprises' stocks Vietnam (Nguyen, Diaz-Rainey, & Gregoriou, 2012; OECD, 2018). In recent years, some new legislations have been adopted to increase clarity, transparency, and consistency in classification of enterprises listed on HOSE and HNX (Hau, 2018).

2.4.3.1. Classifications of companies listed on HOSE and HNX based on system of economic sectors

On 06 July 2018, Decision 27/2018/QD-TTg promulgating the system of economic sectors of Vietnam was issued by the Prime Minister (Quang, 2018). This decision replaced Decision 10/2007/QD-TTg dated 23 January 2007 (Quang, 2018). Correspondingly, several

new industries were added into in the system of economic sectors of Vietnam in order to comfort to reality (Hau, 2018). The improvement in the number and details of sectors in the system of economic sector of Vietnam aims to meet the trend of diversifying business lines in practice (Nhi, 2018). Furthermore, the updated system provides clear guidance and detailed explanation on economic activities categorised in each sector (Nhi, 2018). It plays a pivotal role in dealing with the situation of no suitable professions in the Vietnamese economic branch system when registering business lines of enterprises (Hau, 2018).

According to industrial characteristics of economic activities manifested in the Decision 27/2018/QD-TTg, companies listed on HOSE are divided into 11 industries. The economic sectors comprise industrials; materials; real estate; consumer discretionary; consumer staples; financial; utilities; health care; energy; information technology; and communication services (Ho Chi Minh Stock Exchange, 2019b). The enterprises traded on HOSE mainly belong to industries in terms of industrials and materials, and 28% listed companies on HOSE operated their businesses in the industrials sector (***Figure 2.18)***.

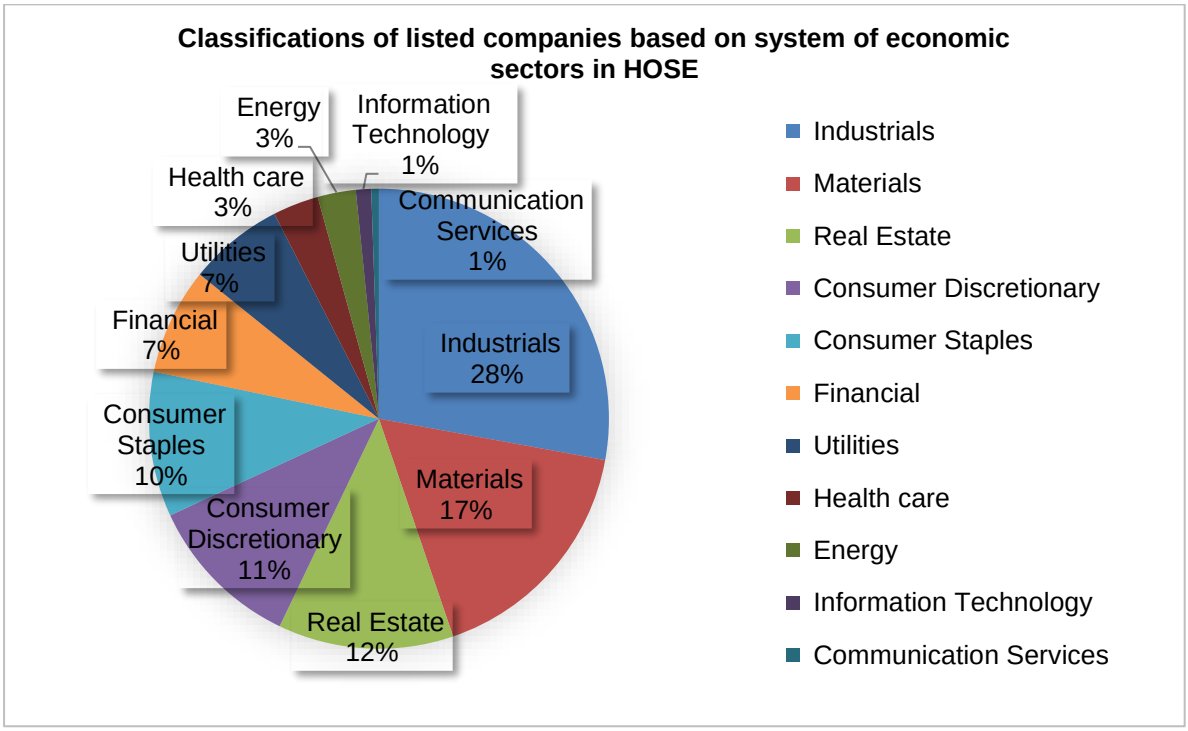

Figure 2.18: Classifications based on system of economic sectors on HOSE (Numbers of companies)

Source: Ho Chi Minh Stock Exchange, 2019b.

Further, according to ***Table 2.6***, the total listing registration volume of the companies listed on HOSE was 82,368,821,867 shares in 2019, which was approximately seven times as much as that listed on HNX. 76% of the total listing registration volume of companies listed

on HOSE belonged to companies in four key industries, comprising financial, real estate, industrials, and consumer staples. Their outstanding volume also accounted for three quarters of the total outstanding volume of companies listed on HOSE.

Table 2.6: Classifications of listed companies based on economic sectors in HOSE

Sector	Number of companies	Listing volume	Outstanding Volume	Listing volume	Outstanding Volume
Industrials	104	10,648,414,480	10,632,892,165	13%	13%
Materials	63	7,031,330,655	7,021,209,670	9%	9%
Real Estate	46	16,258,257,013	16,268,539,027	20%	20%
Consumer Discretionary	41	2,380,578,826	2,513,999,655	3%	3%
Consumer Staples	38	8,277,457,402	8,151,702,960	10%	10%
Financial	28	27,447,031,234	27,294,385,179	33%	33%
Utilities	25	6,546,676,599	6,553,853,708	8%	8%
Health care	12	621,872,440	621,599,022	1%	1%
Energy	10	2,208,627,448	2,085,142,533	3%	3%
Information Technology	4	843,293,888	842,750,448	1%	1%
Communication Services	2	105,281,882	105,281,572	0%	0%
Total	373	82,368,821,867	82,091,355,939	100%	100%

Source: Ho Chi Minh Stock Exchange, 2019b.

Meanwhile, companies listed on HNX are categorised into 11 industries. They include manufacture; construction; wholesale and retail trade, accommodation, and food service activities; transportation and storage; mining and quarrying, oil, and gas; finance; information, communication and other activities; real estate activities; professional, scientific and technical activities, administrative and support service activities and education; health care; and agriculture, forestry and fishing (Hanoi Stock Exchange, 2019a) ***(Figure 2.19)***. The types of the companies traded on HNX are different to the classifications of the companies listed on HOSE (Hanoi Stock Exchange, 2019a; Ho Chi Minh Stock Exchange, 2019b). More than a third of the total number of listed companies on HNX established and developed business in the manufacture sector, and some companies listed on HNX run business in agriculture, forestry, and fishery besides the familiar industrial and services sectors.

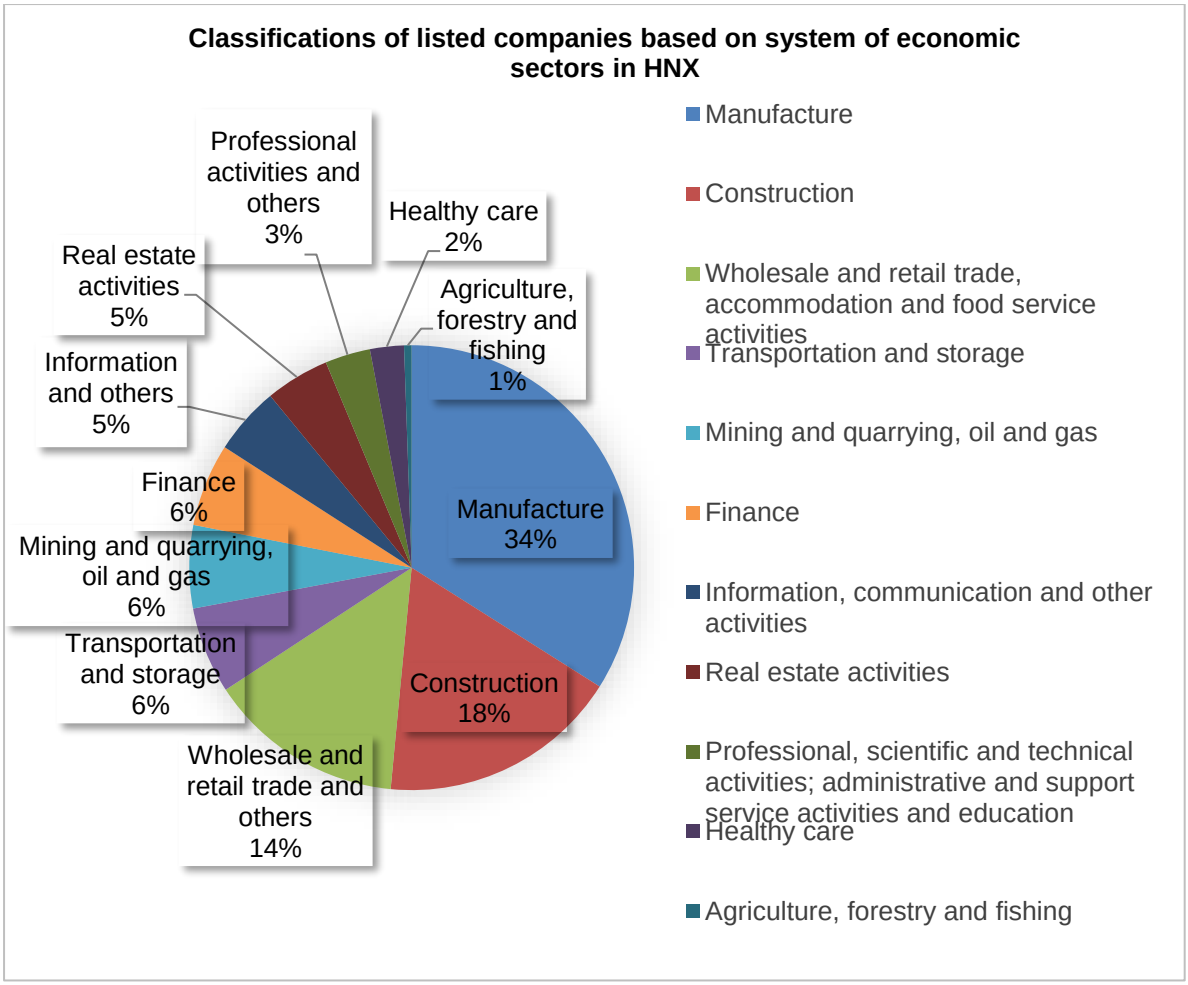

Figure 2.19: Classifications based on system of economic sectors on HNX (Numbers of companies)

Source: Hanoi Stock Exchange, 2019a.

Furthermore, it could be presented from ***Table 2.7*** that the total outstanding volume of the companies listed on HNX was 12,776,738,990 shares. 79% of the total listing registration volume as well as the total outstanding volume of companies traded on HNX were held by companies in finance, manufacture, construction and mining and quarrying, oil, and gas fields. Thus, it means these listed companies in the industrials and manufacture sectors have considerable and influential contributions to the market.

Table 2.7: Classifications of listed companies based on economic sectors in HNX

Sector	Number of companies	Listing volume	Outstanding Volume	Listing volume	Outstanding Volume
Manufacture	124	2,281,818,614	2,320,965,058	18%	18%
Construction	64	1,897,259,019	1,899,463,254	15%	15%
Wholesale and retail trade, accommodation, and food service activities	52	955,751,222	967,477,923	8%	8%
Transportation and storage	23	755,641,994	754,506,728	6%	6%
Mining and quarrying, oil, and gas	22	1,406,331,532	1,405,648,008	11%	11%
Finance	22	4,449,878,882	4,509,105,215	35%	35%
Information, communication, and other activities	18	102,754,862	101,902,109	1%	1%
Real estate activities	17	562,799,026	567,432,426	4%	4%
Professional, scientific, and technical activities; administrative and support service activities and education	12	99,888,627	100,042,078	1%	1%
Health care	9	103,299,283	104,496,191	1%	1%
Agriculture, forestry, and fishing	2	45,700,000	45,700,000	0%	0%
Total	365	12,661,123,061	12,776,738,990	100%	100%

Source: Hanoi Stock Exchange, 2019a.

In summary, there are the same number of economic sectors on both HOSE and HNX, which are 11 sectors in each stock market. The classification of the companies traded on HNX is dissimilar to the one on HOSE (Hanoi Stock Exchange, 2019a; Ho Chi Minh Stock Exchange, 2019b). Some companies listed on HNX run businesses in the agriculture, forestry, and fishery sector but there are no similar sectors in HOSE. The companies in the financial sector have great contribution to the total listing registration volume of HOSE and HNX.

2.4.3.2. Classifications of companies listed on HOSE and HNX based on size of companies

The Government issued Decree No. 39/2018/ND-CP on guidelines for law on support for small and medium-sized enterprises, which replaced Decree No.56/2009 / ND-CP dated 30 June 2009 (Nhu, 2018). It clearly defined criteria for classifying enterprises based on their sizes and stipulated support policies for small and medium-sized enterprises (Nhu, 2018). According to Article 6 of the Decree No.39/2018/ND-CP, classifications of enterprises could depend on number of employees obtaining social insurance and total annual revenue or total

capital of those enterprises. The criteria for micro enterprises, small enterprises, and medium enterprises are summarised in ***Table 2.8***:

Table 2.8: Criteria for micro enterprises, small enterprises, and medium enterprises

Sector		Agriculture, forestry, and fishery	Industry and construction	Trade and service
Micro enterprises	Number of employees participating in social insurance	10 persons or fewer	10 persons or fewer	10 persons or fewer
	Total annual revenue	VND 3 billion or less	VND 3 billion or less	VND 10 billion or less
	Total capital	VND 3 billion or less	VND 3 billion or less	VND 3 billion or less
Small enterprises	Number of employees participating in social insurance	100 persons or fewer	100 persons or fewer	50 persons or fewer
	Total annual revenue	VND 50 billion or less	VND 50 billion or less	VND 100 billion or less
	Total capital	VND 20 billion or less	VND 20 billion or less	VND 50 billion or less
Medium enterprises	Number of employees participating in social insurance	200 persons or fewer	200 persons or fewer	100 persons or fewer
	Total annual revenue	VND 200 billion or less	VND 200 billion or less	VND 300 billion or less
	Total capital	VND 100 billion or less	VND 100 billion or less	VND 100 billion or less

Source: The Government, 2018.

The number of employees having social insurance is not widely published and updated. In addition, for companies running business under a year without earning revenues, it is impossible to define their total annual revenues, and it is recommended to determine types of enterprises on the basis of their total capitals (The Government, 2018). For these reasons, the total capital is chosen to be key criteria for classifying types of enterprises to ensure consistency and numeric accuracy. According to Article 9 of the Decree No.39/2018/ND-CP, it is required to determine total capital in the balance sheet on the financial statement of the preceding year (The Government, 2018). If the enterprise has not been in operation for over a year, total capital in its balance sheet at the end of the nearest quarter will be considered (The Government, 2018).

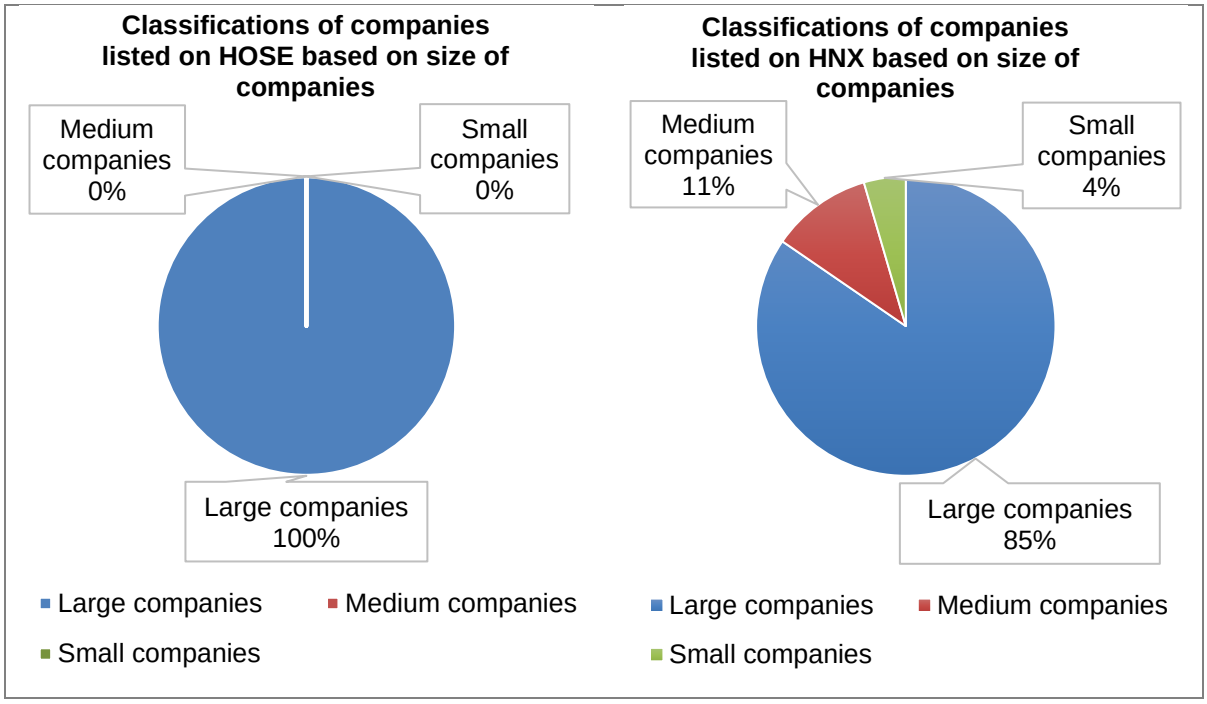

Figure 2.20: Classifications of listed companies based on sizes (2018)

Source: Compiled by author.

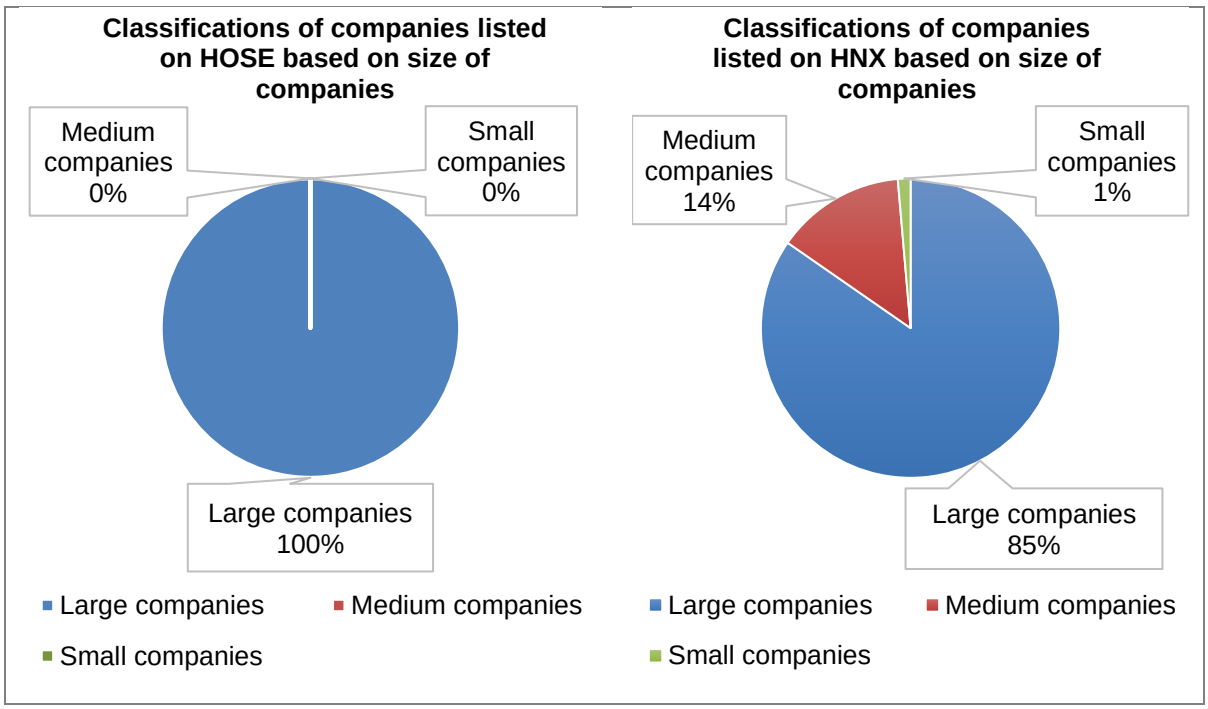

Figure 2.21: Classifications of listed companies based on sizes (2019)

Source: Compiled by author.

According to the mentioned criteria and guidelines for determining small, medium, and large enterprises, classifications of companies listed on HOSE and HNX based on sizes are manifested as in ***Figures 2.20*** and ***2.21***. In 2018 and 2019, 100% of companies listed on HOSE were large companies. Meanwhile, in 2018, there were 318 large companies

(accounted for 85%), 41 medium companies (accounted for 11%), and 17 small companies (accounted for 4%) on HNX. The number of listed companies on HNX reduced from 376 companies in 2018 to 365 companies in 2019. Among the 365 listed companies, 309 companies (accounted for 85%) were large, 51 companies (accounted for 14%) were medium, and 5 companies (accounted for 1%) are small. The number of medium companies went up, while the number of small companies decreased.

2.4.3.3. Classifications of companies listed on HOSE and HNX based on ownership

On 01 July 2015, updated versions of Law on Investment No. 67/2014/QH13 and Law on Enterprises No. 68/2014/QH13 of Vietnam came into effect and replaced the original legal documents passed on 2005. Some key changes on the legal documents have had significant effects on ownership and investment of companies in Vietnam.

Under Article 4 of Enterprise Law No. 60/2005/QH11, state-owned enterprises are made up of over 50 percent state investment (The National Assembly, 2005). It was updated in Article 4 of Law on Enterprises No. 68/2014/QH13 (The National Assembly, 2014). Accordingly, state-owned enterprises are redefined as the enterprises in which the State holds 100 percent of their charter capital (The National Assembly, 2014). Based on the current law, 100% of companies listed on HOSE and HNX are not state-owned companies ***(Figure 2.22)***. It implies that the listed companies are allowed to run as private and joint stock companies.

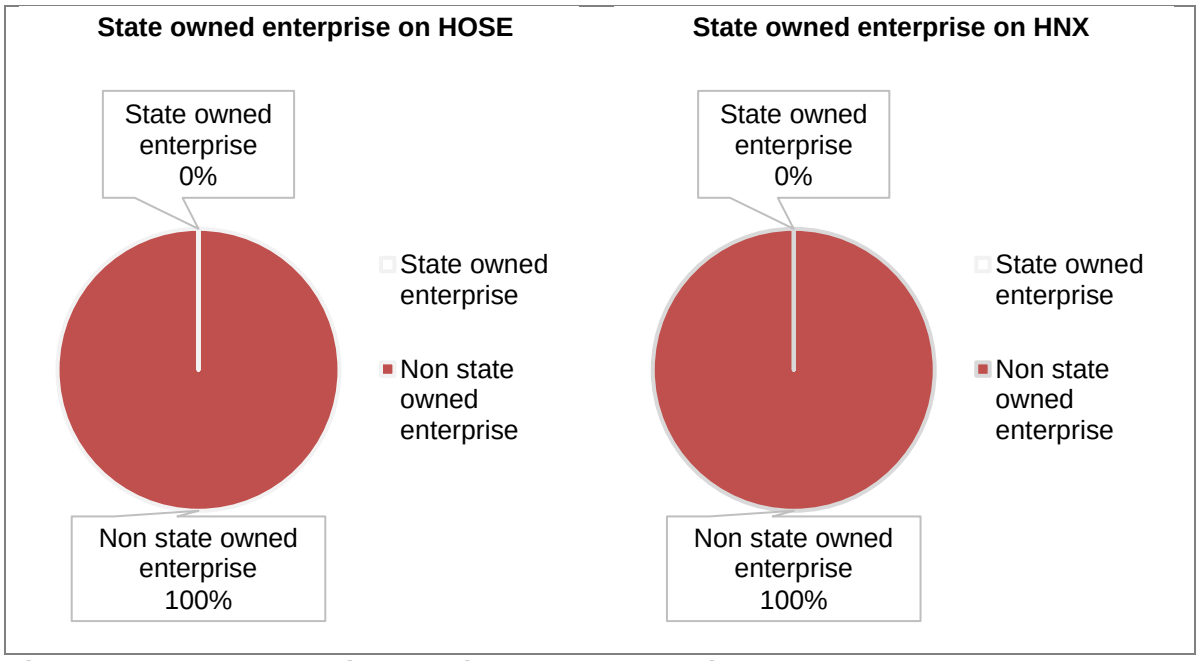

Figure 2.22: State-owned enterprises on HOSE and HNX

Source: Compiled by author.

However, under Article 141 and 144 of Law on Enterprises No. 68/2014/QH13, conditions for having the general meeting of shareholders and ratifying a resolution in the meeting are listed. It is stated that the general meeting of shareholders will be held when the number of attending shareholders represents at least 51% of the total number of votes. Further, resolutions will be passed if they are voted by the number of shareholders representing at least 65% of the total votes of the attending ones. It is the reason to concern whether the proportion of state shareholders in the listed companies is equal to or greater than 51%. According to the ***Figure 2.23***, there are 20% of listed companies on HOSE whose state stockholders own at least 51% of the outstanding shares and 23% of listed companies on HNX, respectively.

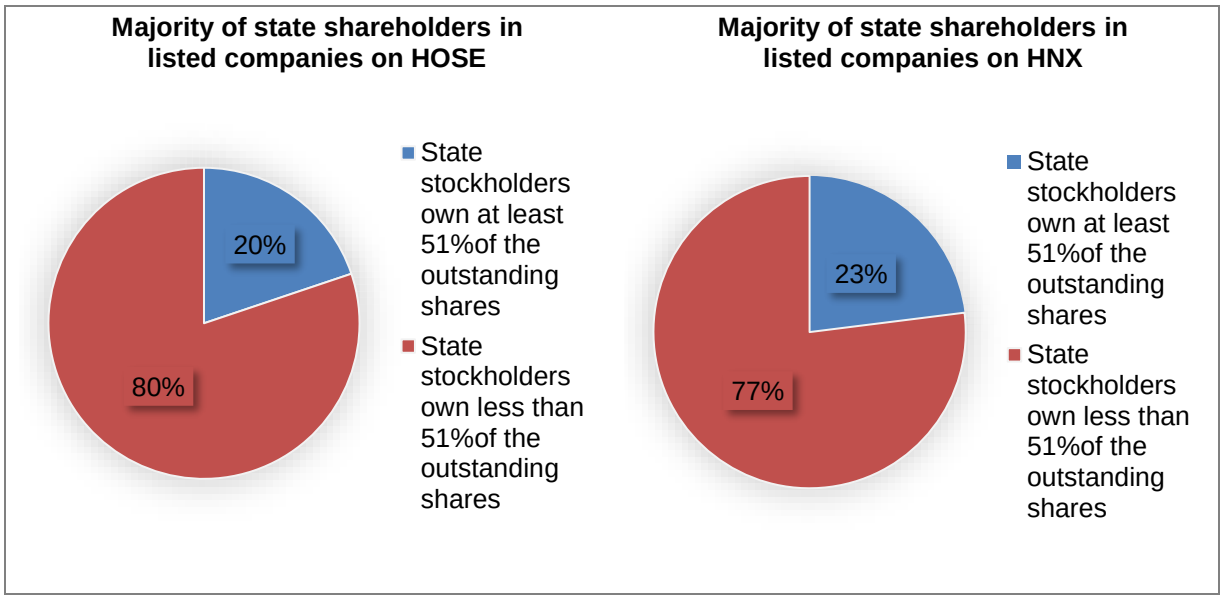

Figure 2.23: Majority of state shareholders in listed companies

Source: Compiled by author.

Further, according to financial trilemma, three main macroeconomic goals considered in regulating financial systems and policies include financial stability, national control over financial safeguard policies and freedom of international capital movement (Krugman, Obstfeld, & Melitz, 2018) ***(Figure 2.24)***. It is impossible for policy makers in an open economy to simultaneously seek all the three goals (Krugman, Obstfeld, & Melitz, 2018). Financial policies of Vietnam generally have several similarities to those of China (Linh, 2015). In particular, the countries conduct policies to control capital flows in order to pursue inflation targeting and financial stability (Linh, 2015). Nevertheless, controlling foreign investors in Vietnam is not as tight as controlling them in China (Linh, 2015). Because foreign individuals and organisations could invest in all shares listed in VND on HOSE and HNX (Linh, 2015).

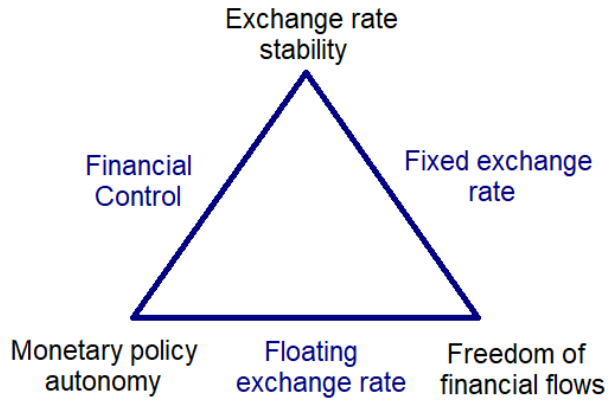

Figure 2.24: Financial trilemma

Source: Krugman, Obstfeld, and Melitz, 2018.

In addition, new guidance on foreign investment conditions regarding licensing procedures for investment by foreign investors are updated on Law on Investment No. 67/2014/QH13 and Decree No. 60/2015/NĐ-CP amending and supplementing some articles of Decree No.58/2012/ND-CP dated 20 July 2012 in implementing the securities laws to attract and stimulate foreign investment (Allen & Overy, 2014). In order to open up the Vietnamese economy, the number of prohibited sectors for foreign investors are decreased from fifty-one to six (Vietnam News, 2014). A new concept of a foreign invested economic organisation with a majority of foreign-owned capital are introduced in the current law (Oxford Business Group, 2015). Following Article 23.1 of the Law on Investment No. 67/2014/QH13, 51% threshold related to the total charter capital (as opposed to voting shares) encourages investment in a Vietnamese company of foreign investors (Allen & Overy, 2014). Accordingly, they are allowed to make investment in sectors restricted to foreign investors, while at the same time be able to control that company (Allen & Overy, 2014).

To improve efficiency of controlling, reporting standards for foreign shareholders are tightened in Law on Enterprises No. 68/2014/QH13 (Bui & Bui, 2015). Particularly, it is required for private joint stock companies to submit a list of foreign shareholders and their assets to the Business Registration Authority, and changes to the list must be reported to obtain approval from the Business Registration Authority (The National Assembly, 2014). It is also crucial to consider the impact of foreign shareholders in accordance with the law. In particular, “Article 50. Right of member” regulated “any [one] member or a group of members holding ten (10) per cent or more of the charter capital has rights to request that a meeting of the Members' Council be convened to deal with issues within its authority” (The National Assembly, 2014). It allows any foreign member or a group of foreign members holding at least 10% to request such meeting. Furthermore, according to “Article 59. Conditions and procedures for conducting meetings of Members’ Council”, a meeting of the Members’ Council will be carried

out if the attending members hold at least 65% of the charter capital (The National Assembly, 2014). Additionally, based on “Article 60. Resolutions of Members’ Council”, it is revealed that a resolution will be passed in a meeting if it is agreed by the number of votes representing at least 65% of the aggregate capital of the attendees (The National Assembly, 2014). It implies that the foreign shareholder groups or members could have a chance to affect resolutions and voting decisions if they hold at least 42.25% of the charter capital (The National Assembly, 2014).

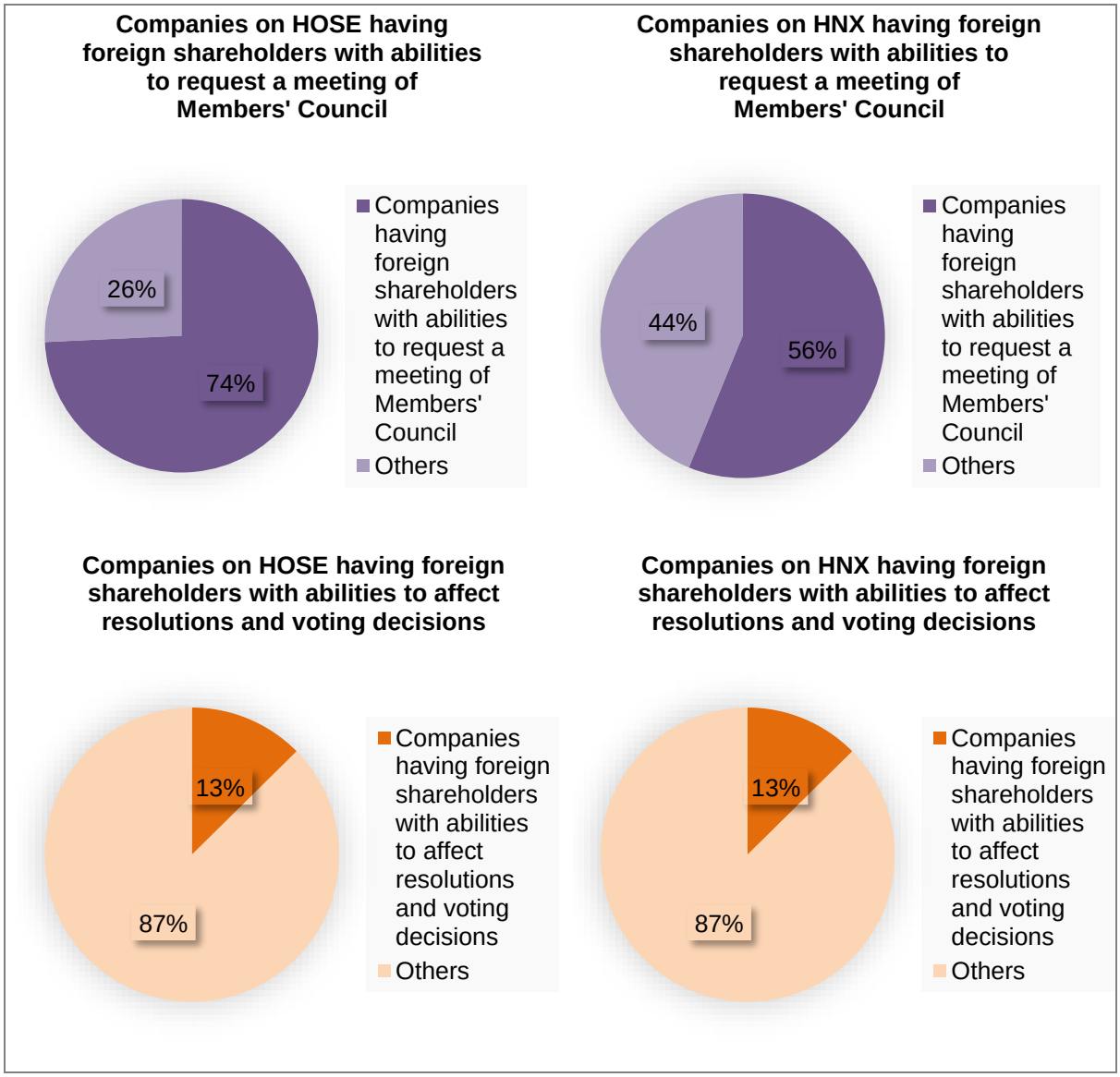

Figure 2.25: Effects of foreign shareholders

Source: Compiled by author.

Following the legal documents, it can be manifested from ***Figure 2.25*** that 74% of companies listed on HOSE have foreign shareholders with abilities to request a meeting of Members’ Council and 56% of companies listed on HNX, correspondingly. Moreover, 13% of companies listed on HOSE are related to foreign shareholders with abilities to have effects on

resolutions of Members' Council. Meanwhile, there are only 4% of companies listed on HNX related to foreign shareholders with abilities to have effects on resolutions of Members' Council. It indicates that more companies listed on HOSE could have abilities to be affected and controlled by foreign shareholders than those listed on HNX.

Behaviours of companies from different sectors are diversified because of some unique attributes, thus it is important to take into account the attributes from dissimilar sectors. It is necessary to randomly select some companies from different sectors in addition to market indices to ensure the reliability and the validity of testing the Vietnamese stock market efficiency.

2.5. Strategic decisions and activities related to restructuring the Vietnamese stock exchange markets

A profound lack of strict regulations and tight connection between the two stock exchanges as well as inadequacy of effective and efficient management have been revealed in the Vietnamese stock market (BBC, 2012). Around the period of global financial crisis, a huge number of severe illegal economic errors and frauds, especially in financing and investing activities, were detected with litigations and arrests in large banks and securities companies (BBC, 2012). It resulted in a significant weakening in trust and belief of investors and stakeholders. As a consequence, the resulting VN Index and HNX Index dropped significantly from 2010 to 2012 and hit the bottom.

Therefore, in order to re-establish a position of trust in investors and stakeholders, restructuring of the securities market has been the primary strategic project of the Government of Vietnam and the Ministry of Finance since 2012 (The Prime Minister, 2012b). Strategic objectives of the project include making the stock market become a critical channel of mobilising capital for the economy as well as positively supporting for the currency market in the process of restructuring the credit institutions towards 2020 (The Prime Minister, 2012b). Enhancement of the information disclosure and transparency on the stock exchange markets and reforming the two current stock exchanges is one of essential strategic activities (The Prime Minister, 2012a). The rationale behind is that it would lead to improvement of market stability and efficiency, sustainable development of the stock market, and enhancement of financial market and economy (Tuong & Huu, 2016; VnEconomy, 2016). Some initial crucial strategic activities have been implemented as follows:

The year of 2015 was a prerequisite year for the improvement of market stability and efficiency and restructuring of the stock market (Review of Finance, 2016). The Ministry of Finance issued two important circulars related to general guidance on information disclosure

and trading in the stock market for all participants in both HOSE and HNX, the two crucial platforms for trading listed stocks in Vietnam. The Circular No. 155/2015/TT-BTC dated 06 October 2015 of the Ministry of Finance guided the disclosure of information in the securities market. The Ministry of Finance legislated Circular No. 203/2015/TT-BTC dated 21 December 2015 on guiding securities transaction activities. Several new regulations in these circulars boosted liquidity and increased attractiveness of the two stock exchanges in the Vietnamese stock market. Ultimately, they would provide more standardised guidance for disclosing information and trading on the Vietnamese stock exchanges.

Reforming the two stock exchanges are strengthened and it would contribute to developing a centralised stock market and creating favourable conditions for market monitoring and development (State Securities Commission of Vietnam, 2017). There are two main phases of the consolidating roadmap. The first stage focuses on the establishment of a Vietnam Stock Exchange on the basis of consolidating the current stock exchanges in terms of organisational structure and finance but still maintaining the current operations of the stock exchanges and stock market (State Securities Commission of Vietnam, 2017; Tran, 2019). In the next phase, it is required to put the market information and technology system into operation for HNX and HOSE; thoroughly implement the market segmentation through reorganising the securities trading markets associated with the completion of the IT system; and build the unification of technology standards for the operations of the securities markets (State Securities Commission of Vietnam, 2017; Tran, 2019).

On 12 April 2016, HOSE and HNX signed a Memorandum of Understanding (MoU), one of the preparation steps for the merger to reform Vietnam Stock Exchange (VnEconomy, 2016). The initial reformation in the form of entering into alliances that were legally formalised through MoU could lead to cost reduction, liquidity improvement as well as enhancement and development of new products and services (Christiansen & Amico, 2009; Kohli, 2012).

On 24 October 2016, VNX AllShare index was officially operated (Nikkei Asian Review, 2016). It was the very first index connecting two current exchanges in Vietnam and the event was one of the milestones on the path of consolidating them into only one stock exchange in Vietnam (Nikkei Asian Review, 2016). This index includes 4 88 stocks selected from nearly 700 stocks listed on both exchanges. In particular, HOSE contributed 247 stocks, and HNX contributed 241 stocks (Bao Moi, 2016). VNX Allshare represents 92% of market capitalisation and nearly 94% of total trading value of Vietnam stock market (Bao Moi, 2016).

On 21 July 2017, VNX 50 Index was officially launched. It was based on the component basket of VNX AllShare, including 50 companies with leading market capitalisation and transaction value on HOSE and HNX (Thanh, 2017). Total market capitalisation of VNX50

reached 1,778 trillion VND, accounting for 70.94% of the market capitalisation on the two exchanges (Thanh, 2017).

According to Decision No. 1527/QD-BTC dated 03 August 2017 of the Minister of Finance, Nguyen Vu Quang Trung, Member of the Board of Directors and Deputy CEO of HNX, was appointed as Member of the Board of Directors and Acting CEO of the Board of Managers of HOSE (Duy T. , 2017).

On 10 August 2017, in order to strengthen the Vietnamese stock market by providing more instruments to hedge and manage risks in order to attract more investors, a derivatives market was launched, with technical preparations at an advanced stage already (Duy T. , 2017; MacCana, Vo, & Hoang, 2017).

On 07 January 2019, The Prime Minister approved the project on the establishment of Vietnamese Stock Exchange (Phuong, 2019). It would follow the model of parent-subsidiary company on the basis of re-arranging HNX and HOSE to unify the stock trading market, ensuring that the market operates effectively, fairly, openly and transparently (Phuong, 2019). The Vietnamese Stock Exchange would operate under the model of a state-owned limited liability company, and HNX and HOSE would be subsidiaries invested by the Vietnamese Stock Exchange, operating independently, and having legal status (Phuong, 2019). The Vietnamese Stock Exchange has a charter capital of VND 3,000 billion, which is transferred from the charter capital of HNX and HOSE (Phuong, 2019).

On 26 November 2019, the National Assembly of Vietnam adopted the new Law on Securities (Law on Securities No. 54/2019/QH14) to replace the Law on Securities in 2006. The Law on Securities No. 54 regulated activities in the field of securities and securities market, rights and obligations of organisations and individuals in the securities sector, securities market organisation, and State management on securities and securities market (National Assembly of the Socialist Republic of Vietnam, 2019). The major changes in this new regime included new conditions for public offerings, participation of foreign investors, procedures and permits for securities activities, establishment of one stock exchange and inaugural of Vietnam Securities Depository and Clearance Corporation. The objectives of this Laws are contributing to gradual change, restructuring and modernisation of the stock market, increasing information transparency in the market according to the international standards, and creating a foundation for the integration of the Vietnamese stock market with regional and global stock markets (National Assembly of the Socialist Republic of Vietnam, 2019). The Law on Securities No. 54/2019/QH14 came into effect from 01 January 2021.

On 16 November 2020, the Ministry of Finance issued Circular No. 96/2020/ TT-BTC guides information disclosure on the stock market, takes effect from 1 January 2021 and replaces Circular No. 155/2015/TT-BTC dated 6 October 2015 of the Ministry of Finance (State Securities Commission of Vietnam, 2021a). The method of supervising listed companies refers to two levels of supervision. The first level is the stock exchanges (HOSE and HNX), and the second level is the SSC. Several new regulations in the circular enhance transparency of information disclosure activities of listed companies and are in alignment with the development of the stock market (State Securities Commission of Vietnam, 2021a). In particular, one of the important changes in this Circular refers to strengthen the application of information technology by using electronic information disclosure system (State Securities Commission of Vietnam, 2021a). This content aims to enhance the information disclosure activities of listed companies to shareholders and investors in a timelier manner as well as supervise the listed companies more effectively. Furthermore, this Circular also removed the provisions on the extension of the information disclosure, and regulations on time limit and criteria for information disclosure of major shareholders, founding shareholders, internal shareholders, insiders and related persons of insiders are amended (State Securities Commission of Vietnam, 2021a). In other words, the companies are forced to timely and transparently disclose financial statements, annual reports, and relevant information in accordance with the regulations. Moreover, the company must disclose information about the annual meeting of the general meeting of shareholders at least 21 days before the date of the meeting, instead of 10 days before the date of the meeting according to the Circular No. 155 (State Securities Commission of Vietnam, 2021a). It means that shareholders have time to prepare and read documents to participate and make suggestions at the meeting more actively.

On 23 December 2020, the Prime Minister issued Decision No. 37/2020/QD-TTg to establish the Vietnamese Stock Exchange (State Securities Commission of Vietnam, 2020). Accordingly, VNX was headquartered in Hanoi, operating under the model of one-member limited liability company with 100% charter capital held by the State. VNX held 100% of charter capital on HNX and HOSE. The Decision took effect from 20 February 2021.

On 25 March 2021, Deputy Minister of Finance – Mr. Huynh Quang Hai issued the Decision on the appointment with a definite term for the positions of Chairman of the Board of Members and General Director of the Vietnamese Stock Exchange (Xuan, 2021). Mr. Nguyen Thanh Long holds the position of Chairman of the Members' Council of the Vietnam Stock Exchange and Mr. Pham Van Hoang holds the position of Member of the Board of Members and becomes General Director of the Vietnam Stock Exchange.

On 11 December 2021, The Vietnam Stock Exchange was officially put into operation (State Securities Commission of Vietnam, 2021b). The establishment of the VNX is a significant milestone of the securities industry stimulating process of restructuring securities market in Vietnam. This is a sustained effort to strengthen the regulation and operation of the market to ensure the efficient, transparent, and fair market operation so as to protect the legitimate rights and benefits of individuals and entities participating in the market. The VNX will take on and build upon the legacy, tradition, and achievements of HOSE and HNX (State Securities Commission of Vietnam, 2021b). Furthermore, it will update the governance, capacity, technology application, digitalisation making the securities market safe, sustainable, transparent, and fair to all participants contributing to the socio-economic development of this nation (State Securities Commission of Vietnam, 2021b).

Accordingly, in the future, HNX will be responsible for organising and operating the derivative securities market and bond trading market while HOSE will be in charge of organising and operating the stock trading market under the law. At the latest by the end of 2023, HOSE will receive all shares listed on HNX (VNBusiness, 2021). By June 2025, HOSE will receive shares of enterprises registered for trading on UPCOM. For HNX, before the deadline of 01 July 2023, this agency will continue to organise a trading market for listed and unlisted public shares on UPCOM at HNX until finishing the transfer of listed shares and registration for trading shares from HNX to HOSE (VNBusiness, 2021).

Subsequently, it is essential for economists, researchers, policymakers, managers, and investors to focus on researching effects of decisions related to the strategic restructuring of the Vietnamese stock exchange markets on improvement of the stock market efficiency in recent years. Additionally, it is important to critically investigate how market behaviours could impact the performance of listed companies in the strategically developing period.

2.6. Conclusion

The Vietnamese stock market obtains some unique characteristics of emerging and frontier stocks markets. Since the initial milestones of establishing the Vietnamese stock market, there has been a significant enhancement and development of this stock market. Restructuring of the securities market has been the primary strategic project of the Government of Vietnam and the Ministry of Finance since 2012 (The Prime Minister, 2012b). The recent regulatory changes aimed to re-establish a position of trust in investors and stakeholders as well as make an improvement in market liquidity and efficiency (Ho Chi Minh Stock Exchange, 2014; The Prime Minister, 2012b). Therefore, it is important to investigate the efficient form and the improvement of the Vietnamese stock market efficiency due to recent changes in this emerging stock market as well as evaluate the effects of market behaviours

on the performance of listed companies. Additionally, behaviours of companies from different sectors will be dissimilar due to some unique attributes, so it is essential to concern the attributes from different sectors by randomly selecting and testing some companies from different sectors in addition to the market indices to ensure the reliability and the accuracy in testing efficiency of the Vietnamese stock market.

CHAPTER 3: EFFICIENT MARKET HYPOTHESIS

3.1. Introduction

The financial market efficiency has played a crucial role in the development of global financial markets (Guermezi & Boussaada, 2016). Informational market efficiency is vital for open and transparent distribution of information in the market, and it is a key concept in the literature of financial management (Rehman et al., 2018). This chapter firstly focuses on analysing the importance of informational market efficiency in emerging and frontier markets. It includes its effects on performance and management of listed companies, linkages between stock market efficiency and size and sectors of listed companies, and its importance in the era of globalisation and international financial contagion. According to Malkiel & Fama (1970), it is based on the information reflected in the share price to classify the market efficiency into three major levels, including weak form, semi-strong form, and strong form. This chapter also summarises and discusses not only empirical studies on three forms of efficient market hypothesis in emerging and frontier markets, especially in Vietnam, but also recent studies related to impacts of restructuring stock exchange markets on stock market efficiency.

3.2. Importance of informational market efficiency of emerging and frontier markets

Financial markets boost economic growth and stimulate international integration of the emerging and frontier countries, and they are recognised as the fundamental basis of the modern global economy (Guermezi & Boussaada, 2016). Financial market efficiency has been among central concerns in finance and financial economics, and three main classifications of market efficiency include operational efficiency, allocative efficiency, and informational efficiency (Howells & Bain, 2008). A market in which transactions are conducted quickly and reliably at a minimum and fair competitive cost has operational efficiency (Al Ashikh, 2012). Allocative efficiency implies allocating funds in a way to achieve participants' most productive use and ultimate benefit (Al Ashikh, 2012). Informational efficiency means that stock prices are based on the best information available in the market, and the availability of information plays a key role in market efficiency. When prices are more informative, the market participants suffer less information asymmetry and they are more willing to put up capital, facilitate investment, and make right decisions (Edmans, Jayaraman, & Schneemeier, 2017).

Moreover, allocative efficiency requires both operational efficiency and informational efficiency to well allocate funds in capital markets to the most productive purposes and projects (Arnold, 2019). The informational efficiency has huge contributions to obtain the allocative efficiency of a market (Howells & Bain, 2008). It is because decisions related to

capital resources allocation respond to securities prices which are significantly influenced by efficient exploitation of available information in the market (Arshad et al., 2016). In addition, informational efficiency is important to obtain operational efficiency because operational costs and transaction costs are influenced by utilisation of the proper and relevant information in the markets (Degutis & Novickytė, 2014). As a result, it strongly supports market participants in obtaining the greatest return at a minimum cost, leading to the efficient allocation of the capital as well as stimulating the enhancement of the financial market and economic development (Howells & Bain, 2008). Therefore, most controversies and empirical studies on financial market efficiency focus on informational efficiency.

Regarding informational efficiency, Malkiel & Fama (1970, p. 383) stated that security prices "always fully reflect all relevant information" in an efficient market. It implies that share prices follow a random walk model, so it is impossible to basically predict changes in stock returns and gain a return greater than market return in the long term (Mishkin, 2016). Samuelson (1965), Mandelbrot (1966), and Malkiel & Fama (1970) considered investing in stocks in a well-functioning stock market as a "fair game" for all participants. Therefore, a comprehensive understanding of market efficiency plays a crucial role in developing strategies of investors and managers, boosting optimum resources allocation, and stimulating economic growth (Malhotra, Tandon, & Tandon, 2015). An environment of continuous changes in the economic and financial systems and markets relentlessly requires testing market efficiency empirically (Rehman et al., 2018).

3.2.1. Effects on performance and management of listed companies

Emerging stock markets have some specific characteristics, then it is required to study the efficiency of emerging stock markets to make the right decisions. A comprehensive overview of market efficiency is fundamental for the trading strategies of managers and analysts to obtain optimum research allocation and production efficiency (Ali et al., 2018). Feedbacks from the market are crucial and dominant in the decision-making process of the shareholder-orientated managers (Arnold, 2019). The shareholders' wealth maximisation is widely considered as a major objective of a business entity, and share prices and dividends are two of key financial factors in assessing market value of a company (Uwah & Asuquo, 2016). The wealth of shareholders is enhanced by dividend payment and capital gains from rising stock prices (Watson & Head, 2019). It is essential to build an efficient market to ensure correct valuation and pricing and the investment in a well-functioning stock market is regarded as a "fair game" for all participants (Samuelson, 1965; Mandelbrot, 1966; Malkiel & Fama, 1970).

Furthermore, stock price is defined as an expected rate of return required by investors for specific risk levels (Degutis & Novickytė, 2014). In an efficient market, the value of stocks reflects the fair value of the company, and the investors get access into all relevant information instantaneously, fully, and fairly (Rehman et al., 2018). In other words, the share prices in an efficient market accurately show perspectives of listed companies, so investors and managers obtain a thorough knowledge and understanding about business performance (Rejeb & Boughrara, 2013; Rehman et al., 2018). The market efficiency facilitates determining levels of risks and returns associated with their investments due to no undervalued or overvalued assets as well as positively supports managers to make right decisions and implement the best strategies to improve the actual and market value of their companies (Ali et al., 2018; Rejeb & Boughrara, 2013). The advantages that investors and companies could gain from an efficient market include specialised knowledge, low management fees or agency costs, lower trading costs, and a financing structure (Ang, Goetzmann, & Schaefer, 2011). Therefore, the accurate and appropriate valuation in a well-functioning market not only enhances the efficacy of several financial and managerial decisions but also achieves wealth-improving strategies of the companies (Arnold, 2019).

Norman (2011) discussed benefits of listed companies on Dar Es Salaam Stock Exchange in Tanzania. The study provided several opportunities and benefits from listing and trading on the stock exchange (Norman, 2011). Firstly, the companies could raise capital relatively cheaply from the public with minimum risk of losing their capital (Norman, 2011). Listing of shares enabled the companies to enhance the opportunities to venture into new investments and expansions by using alternative means of raising capital for such investments. The listing of shares facilitated economic growth and improved livelihood of the people. Secondly, the performance and efficiency of the companies were monitored by the market, hence the listed companies were likely to perform better and more efficiently to meet the expectations of the public (Norman, 2011). Thirdly, listing of securities facilitated share ownership changes or privatisation, so the business management and corporate governance would be changed (Norman, 2011). Fourthly, it was a marketing tool for the listed companies and the value of the companies was widely recognised by the mixtures of professionals, businessmen, firms' representatives, and the public (Norman, 2011). Fifthly, the listed companies were perceived to have the potentials of providing an attractive return to the investors as good performers, so they gained trust and confidence of the investors and attracted foreign portfolio investors (Norman, 2011).

Anhar (2015) studied all shares listed on the Indonesia Stock Exchange in June 2012 to identify the indicators that empirically support to evaluate company performance and

investment. The findings revealed that stock market could provide decisive information for investors, managers, and specialists (Anhar, 2015). In particular, the market participants used standard deviation of return, coefficient of variation, and coefficient beta of stock to measure investment risk (Anhar, 2015). Furthermore, price trend, latest return, average return, return trend, and relevant indicators gave information of expected returns for managers and investors (Anhar, 2015). The indicators related to the market prices and their trends were greatly useful and efficient to measure the company market value in the investors' expectation (Anhar, 2015).

Çal & Lambkin (2017) researched stock exchange brands as an enormous influence on perceptions and behaviours of investors. The study was carried out in Turkey and Ireland. The results indicated that the brand equity of a stock exchange dramatically affected the intention to invest (Çal & Lambkin, 2017). The stock exchanges acted as corporate brands and the highest impact derived from the brand loyalty (Çal & Lambkin, 2017). In this sense, listing on the stock exchange having prestigious brands with high familiarity, great loyalty of customers and high-customer satisfaction could support listed companies in gaining excellent reputation, successful marketing communications, and financial benefits (Çal & Lambkin, 2017).

This work of Long & Li (2010) empirically investigated the impact of stock market volatility on earnings management of 1024 selected listed firms in the Chinese stock market from 2007 to 2008. A reversing-U curve relationship between the stock market volatility and the earnings management was revealed. In other words, when the stock volatility rises, the level of earnings management would increase (Long & Li, 2010). When the stock volatility decreases, the level of earnings management would be higher (Long & Li, 2010). Thus, the stock market volatility had an extremely significant positive effect on earnings management (Long & Li, 2010).

Yang, Chou, & Yang (2020) evaluated effects of information transparency of listed companies on their enterprise value. This research analyses the data of 61 listed companies in the optoelectronic industry in Taiwan between 2003 and 2017 (Yang, Chou, & Yang, 2020). The empirical tests showed that the information transparency had an enormous influence on the values of listed companies (Yang, Chou, & Yang, 2020). Disclosing financial and non-financial information transparently could convert into advantages of the listed companies compared to their competitors (Yang, Chou, & Yang, 2020). The information transparency could help the companies to boost management efficiency as well as positively impact their corporate image (Yang, Chou, & Yang, 2020).

Conversely, if there is a lack of market efficiency, all available information will be not included in the share prices. Majumder (2012) evaluated daily closing prices for 74 MSCI industrial indices from the United States and Brazil, Russia, India, and China (BRIC) markets for 10 years. As a result, when a market was inefficient and sentiments were crucial for investors to make decisions, inaccurate valuation by applying any existing asset pricing model could cause a suboptimal risk–return relationship (Majumder, 2012). The investors and managers would be misled into building lowly efficient investing strategies, leading to inappropriate allocation of their funds (Majumder, 2012). Additionally, asymmetric information in the inefficient markets could lead to adverse selection and moral hazard problems (Casu, Girardone, & Molyneux, 2015). It would considerably distrust investors and stakeholders, reduce availability of resources, and discourage growth of the company (Arnold, 2019). Thus, it is vital to understand the efficiency of markets and use appropriate valuation in the markets because the market efficiency plays momentous roles in stimulating investment in stock markets (Arnold, 2019). Additionally, the inefficient market would provide unreliable information of risk and return to the fund managers and portfolio analysts, so it might result in some problems due to undervaluing or overvaluing projects (Ali et al., 2018). Malhotra, Tandon and Tandon (2015) supported that the managers found greater challenges to boost the shareholder wealth well and sustainably in an inefficient market with inaccurate pricing.

In summary, in an efficient market, all relevant information is fully captured and fairly reflected on the share prices, and the prices provide an accurate perspective of listed companies. Listing, trading, and complying with the regulations in the stock market could provide huge advantages and benefits to the listed companies. They refer to raising capital, enhancing the opportunities to venture into new investments and expansions, branding and marketing, and attracting trust and confidence of the domestic and foreign investors. Moreover, it leads to better decision-making process as well as more efficient business management and corporate governance.

3.2.2. Stock market efficiency and business size and sectors

Specific characteristics of the firm are factors impacting on the behaviours of expected stock returns (Shafana, Rimziya, & Jariya, 2013). The size of a firm gives a description of the business ability, and its economic sector shows the areas and the activities of an economy in which the company operates (Shafana, Rimziya, & Jariya, 2013). These mentioned characteristics of a firm could influence the stock price volatility of the listed company (Handayani et al., 2018). Thus, many studies have investigated the relationship between firm characteristic and stock returns.

Khodamipour, Golestani, & Khorrami (2014) analysed the relationship between the company size and company value. The information of 100 companies listed in Tehran stock exchange was illutrated from 2007 to 2011 (Khodamipour, Golestani, & Khorrami, 2014). The results of t-statistics manifested the existence of a significant and positive relationship between the firm size and book value to market value ratio (Khodamipour, Golestani, & Khorrami, 2014). On the other hand, the F-statistics findings showed no significant relationship between the firm size and stock return (Khodamipour, Golestani, & Khorrami, 2014).

Shafana, Rimziya, & Jariya (2013) determined the effect of firm size and book to market equity on stock returns in Sri Lanka context. Data of 12 companies listed on Colombo stock exchange was analysed between 2005 and 2010 (Shafana, Rimziya, & Jariya, 2013). The findings of the research indicated no significant relationship between the company size and average return in any significant manner (Shafana, Rimziya, & Jariya, 2013). Meanwhile, there was a negative relation between the book to market value and the stock return (Shafana, Rimziya, & Jariya, 2013).

Handayani et al. (2018) investigated determinants of the stock price volatility of manufacturing companies listed on the Indonesia Stock Exchange. Data of eight companies was obtained in the study period from 2011 to 2015 (Handayani et al., 2018). The result of panel regression analysis revealed that the volatility of stock price of the selected companies could be explained by 4.84% by return of equities, cash ratio, dividend payout ratio, debt to equity ratio, companies size, and sales growth (Handayani et al., 2018). Additionally, the company size had a positive effect on the volatility but the impact was not significant (Handayani et al., 2018).

On the contrary, some works disagreed with the output of the mentioned researches. In specific, Duy & Phuoc (2016) conducted an investigation on the relationship between firm size and stock returns of the service sector in HOSE. The work employed 160 observations of firms in service sector from 2009 to 2014 (Duy & Phuoc, 2016). The output of statistical tests manifested that smaller companies could offer the investors with better returns in both dividends and capital gain as smaller companies were exposed to greater risks (Duy & Phuoc, 2016).

Ul Haq & Rashid (2014) tested the existence of size effects on excess stock returns in Pakistan. The study sample included 50 companies listing KSE 100 index on Karachi stock exchange between 2007 and 2011 (Ul Haq & Rashid, 2014). The findings of the paper indicated a significant size effect on the stock returns. In other words, smaller firms had a higher average annual excess return than larger ones (Ul Haq & Rashid, 2014).

On the other hand, the papers of Mulyono, Suprapto, & Prihandoko (2018) and Dahoei & ParvizSaídi (2012) provided evidence of positive relationship between firm size and stock returns. Mulyono, Suprapto, & Prihandoko (2018) assessed the impact of firm performance on stock prices by investigating data of listed companies on Indonesia Stock Exchange. The data was related to return on assets, total asset turnover, and firm size over the period from 2009 and 2012 (Mulyono, Suprapto, & Prihandoko, 2018). The size measurements were achieved from a market capitalisation (Mulyono, Suprapto, & Prihandoko, 2018). As a result, the return on assets gave positive but insignificant impact to stock prices (Mulyono, Suprapto, & Prihandoko, 2018). Meanwhile, the total asset turnover and firm size positively and significantly influenced stock prices (Mulyono, Suprapto, & Prihandoko, 2018).

Dahoei & ParvizSaídi (2012) examined the relationship between company size and stock return. Non-financial companies listed on Tehran stock exchange and their industries indices were used from 20 April 2001 to 19 April 2011 (Dahoei & ParvizSaídi, 2012). The research findings provided that there was a prominent and positive relationship between company size and stock return (Dahoei & ParvizSaídi, 2012). In other words, when the company size went up, its stock return rose in accordance with high return rate of the company (Dahoei & ParvizSaídi, 2012).

Overall, there are a mix of findings regarding the relationship between the characteristics of company and stock price volatility or stock returns. Khodamipour, Golestani, & Khorrami (2014) and Shafana, Rimziya, & Jariya (2013) found a lack of significant firm size effects in their studies. Additionally, the research of Handayani et al. (2018) on manufacturing companies listed in the Indonesian stock market provided consistent findings with them. Meanwhile, Duy & Phuoc (2016) revealed a negative and significant relationship between firm size and stock returns when evaluating the service companies listed on the HOSE. The study of Ul Haq & Rashid (2014) in Pakistan provided harmonious conclusions. In contrast, the work of Mulyono, Suprapto, & Prihandoko (2018) in Indonesia and the research related to non-financial companies listed on Tehran stock exchange of Dahoei & ParvizSaídi (2012) offered evidence of positive and prominent relationship between the firm size and the stock prices. Therefore, works in dissimilar sectors could yield different points of view. It is suggested to employ the listed companies with different sizes in various sectors in the examination of this research.

3.2.3. The era of globalisation and international financial contagion

Thanks to the continuing presence of foreign investors, the advent of technological development and the removal of cross-border capital flow restrictions in most countries, there

has been a rise in globalisation of financial markets (Vo & Ellis, 2018). Additionally, emerging stock markets have played a major role in helping foreign investors gain benefits of portfolio diversification (Vo & Ellis, 2018). Various empirical studies have evaluated stock market integration and contagion among countries around the world.

In specific, Elfakhani, Arayssi, & Smahta (2008) gathered a sample of Arab, the United States and emerging stock markets between 1997 and 2002 to conduct cointegration study among them. The statistical tests were carried out on 65 monthly returns for 13 indexes over the five years (Elfakhani, Arayssi, & Smahta, 2008). The results showed individual cointegrations between Tunisia and Jordan and between Kuwait and Jordan, Tunisia, and Saudi Arabia (Elfakhani, Arayssi, & Smahta, 2008). Besides that, the general market index of the United States was cointegrated with Jordan, Kuwait, and Morocco (Elfakhani, Arayssi, & Smahta, 2008). However, there was no cointegration among the market indices of emerging countries and any of the Arab market indices (Elfakhani, Arayssi, & Smahta, 2008).

Al Nasser & Hajilee (2016) researched stock market integration among emerging markets (Brazil, China, Mexico, Russia, and Turkey) and developed markets (Germany, the United Kingdom, and the United States). The statistical tests were deployed on monthly data of the selected markets between 2001 and 2014 (Al Nasser & Hajilee, 2016). The findings manifested the existence of short-run coefficients for stock market returns in the emerging and developed countries (Al Nasser & Hajilee, 2016).

The work of Kim, Kim, & Lee (2015) focused on spillover effects of the financial crisis in the United States on the financial markets in emerging Asian countries. The existence of financial contagion was found around the collapse of Lehman Brothers in September 2008 (Kim, Kim, & Lee, 2015). In addition, Balli, Balli, Louis, & Vo (2015) appraised spillover effects of the United States, the developed portion of Euro area, and Japan on a sample of 39 emerging markets. They also recognised the transmission of volatility across the markets (Balli et al., 2015).

Additionally, Vithessonthi & Kumarasinghe (2016) carried out a study on the impact of financial development as well as international trade integration on stock market integration. A panel sample of 15 developed and emerging countries in Asia from 1985 to 2013 was collected and analysed (Vithessonthi & Kumarasinghe, 2016). The output of this research indicated that financial development of a nation had a significant influence on its stock market integration with the global stock market (Vithessonthi & Kumarasinghe, 2016).

Moreover, Rejeb & Boughrara (2013) investigated the effects of financial liberalisation on the level of informational efficiency in emerging stock markets. A treatment-effects model with time varying parameters was used on monthly data of 13 emerging economies from 1986 to 2008 (Rejeb & Boughrara, 2013). As a result, there was an improvement of efficiency in the emerging markets, and financial liberalisation contributed to develop the level of efficiency and lessen the probability of financial crises (Rejeb & Boughrara, 2013). In an efficient market, the perspectives of the listed company were accurately reflected on the stock prices, hence the informational efficiency could promote the allocative efficiency of the market as well as stimulate economic growth (Rejeb & Boughrara, 2013).

Vo & Ellis (2018) studied the interdependence between the Vietnamese stock market and other advanced markets (Hong Kong, Japan, and the United States) from the beginning of January 2000 to the ending of June 2015. The research found that these linkages were stronger during and after the global financial crisis in 2008 (Vo & Ellis, 2018). The growth of the emerging stock markets' roles strengthened international financial integration and highlighted the stock return linkage and volatility transmission among stock markets worldwide (Vo & Ellis, 2018).

Therefore, the gradual and considerable increase in interconnectedness among financial systems on the globe would be explained by financial liberalisation, growth of globalisation and diversification of investments in the securities market, and the constantly upward trend of international trade flows (Rejeb & Boughrara, 2013; Thakor, 2015). Furthermore, advances in information technology, especially the internet and digital transformation, hugely supports the investors to get access to other markets easier and make investments all over the world without any huge barriers and difficulties (Balli et al., 2015). Additionally, introduction and growth of free-trade areas, custom unions, joint markets, and regional economic unions have a significant contribution to trends of co-movement among several economies (Elfakhani, Arayssi, & Smahta, 2008). The increase in financial interconnectedness and globalisation could improve the degree of informational efficiency but stimulate financial contagions of risks and crisis between emerging markets and developed markets (Thakor, 2015). Due to the mentioned unique characteristics of emerging and frontier stocks markets, it is essential to study the informational efficiency of emerging and developing markets (Barry, Peavy III, & Rodriguez, 1998). In recent years, Vietnam has been regarded as one of the most dynamic frontier and emerging stock markets in Asia (Pham, Nguyen, & Vo, 2018). It is important for researchers, analysts, policymakers, and managers to hold a comprehensive view about the efficiency of the Vietnamese emerging markets to build efficient strategies in order to boost the market efficiency as well as improve business performance.

3.3. Efficient market hypothesis in emerging and frontier markets

Fama (1965) initially investigated the concept of “efficient market”. An “efficient” market for securities is a market in which stock prices instantaneously and fully convey the available information and the arrival of new information (Fama, 1995). Thus, actual prices in the efficient market are considered as good estimates of intrinsic value of a company and tools to understand the prospects of the company (Fama, 1965). According to Malkiel & Fama (1970), it is based on the information reflected in the share price to classify the market efficiency into three major levels, including weak form, semi-strong form, and strong form ***(Figure 3.1)***. All empirical studies on the efficient market hypothesis have focused on appraising whether stocks "fully reflect" specific subsets of available information (Malkiel & Fama, 1970).

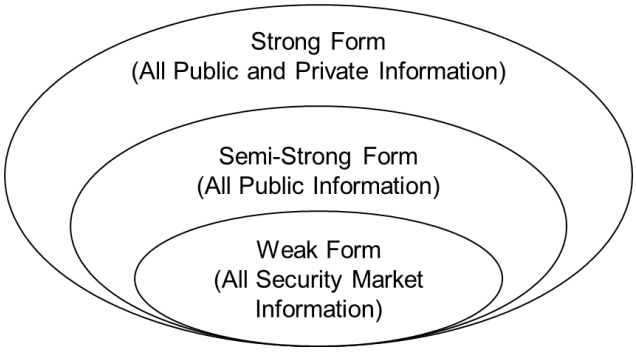

Figure 3.1: Efficient market hypothesis
Source: Naseer and Tariq, 2015.

3.3.1. Weak form efficiency

Weak form efficiency refers to a level of market efficiency at which all information incorporated in the history of past prices and return sequences are contained in the current share prices (Howells & Bain, 2008). If the market has a weak form efficiency, it would be impossible for investors to obtain abnormal excess return over a sustainable period of time from trading strategies and technical analysis on the basis of historical price movement and returns (Degutis & Novickytė, 2014; Nalın & Güler, 2015). Because all relevant and fundamental information has been fully exploited and reflected in the past price changes (Mobarek & Fiorante, 2014). Information subset of interest in weak form test is historical data and information of past prices (or returns) (Malkiel & Fama, 1970). In other words, tests for the weak form focus on investigating whether there is no existence of correlation between stock prices or returns in successive periods of time (Howells & Bain, 2008). This weak form is usually associated with random walk hypothesis, implying that the current stock price moves randomly and unpredictably without depending on price changes in the past (Malkiel & Fama, 1970). Thus, random walk model is a fundamental tool to appraise this weak level of efficiency

(Malkiel & Fama, 1970). There have been a variety of works investigating weak form efficiency by using various tests on dissimilar data set from several countries in periods of time and giving different conclusions.

3.3.1.1. India

The Indian stock market is one of the dynamic Asian emerging stock markets with two key stock exchanges – Bombay Stock Exchange and National Stock Exchange (Dsouza & Mallikarjunappa, 2015). The paper of Palamalai & Kalaivani (2015) studied this market efficiency by investigating the daily closing prices of 23 sectoral indices of these two stock exchange markets, BSE SENSEX and CNX NIFTY for nearly 5 years (Palamalai & Kalaivani, 2015). Autocorrelation test, augmented Dickey-Fuller (ADF) test, runs test, and variance ratio test were applied (Palamalai & Kalaivani, 2015). The findings suggested a lack of random walk process in the case of all sectoral indices along with the CNX NIFTY and BSE SENSEX (Palamalai & Kalaivani, 2015). Thus, there was an absence of weak form efficiency in this market (Palamalai & Kalaivani, 2015).

Further, Dsouza & Mallikarjunappa (2015) examined the random walk model in this stock market by testing the daily closing prices of companies listed in Bombay Stock Exchange. The data was obtained between 01 January 1991 and 31 December 2012 (Dsouza & Mallikarjunappa, 2015). In the study, runs test, unit root test, autocorrelation test and the generalised autoregressive conditional heteroskedasticity (GARCH) model were used to appraise the existence of weak form efficiency in this market (Dsouza & Mallikarjunappa, 2015). The empirical results indicated that the observed price series did not follow the random walk behaviour, and it was possible to predict the downward or upward trend in the security prices (Dsouza & Mallikarjunappa, 2015). In other words, the Indian stock market was not efficient in the tested period (Dsouza & Mallikarjunappa, 2015).

The paper of Siddiqui & Narula (2013) appraised market efficiency and anomalies in the Indian stock market through evidence of S&P CNX Nifty. The data included 2995 observations, which were the daily returns of S&P CNX Nifty from 01 January 2000 to 31 December 2011 (Siddiqui & Narula, 2013). GARCH (1,1) model was deployed to explore the existence of weekend effect, monthly effect, and holiday effect in the stock market (Siddiqui & Narula, 2013). The great GARCH value revealed persistency in returns with the volatility clustering on Fridays and Novembers (Siddiqui & Narula, 2013). It implied that the prices did not move randomly, and it was possible to predict future prices based on the estimated error value of last day (Siddiqui & Narula, 2013). Therefore, the market was weak form inefficient (Siddiqui & Narula, 2013).

3.3.1.2. China

The Chinese stock market is an Asian emerging one with two official stock exchanges, and it has experienced important reforms during the past twenty years (Li & Zhang, 2011; Lin, Fei, & Wang, 2011). Thus, there have been various studies on the Chinese stock market efficiency and its evolution of market efficiency thanks to these reforms (Lin, Fei, & Wang, 2011).

Seddighi & Nian (2004) implemented research on market efficiency of the Chinese stock market. The daily closing prices of the Shanghai Stock Exchange index and eight shares listed in this stock exchange were from 04 January 2000 to 31 December 2000 (Seddighi & Nian, 2004). Firstly, Durbin–Watson test, Durbin 'h' test, and Lagrange Multiplier test were deployed to examine hypothesis of autocorrelation (Seddighi & Nian, 2004). Secondly, Dickey–Fuller tests were used for appraising the presence of unit root (Seddighi & Nian, 2004). Thirdly, auto regressive conditional heteroskedasticity model (ARCH) test and a GARCH (1, 1) model were conducted to appraise assumptions and hypothesis involved with the residuals (Seddighi & Nian, 2004). As a result, the share prices of the Chinese stock market did not follow martingale process of a random walk as required by market efficiency (Seddighi & Nian, 2004).

Zhang & Xindan (2008) examined the martingale hypothesis in the Chinese stock market by testing four indices. They were the Shanghai A Index, Shanghai B Index, Shenzhen A Index, and Shenzhen B Index (Zhang & Xindan, 2008). Variance ratio tests as well as nonparametric variance ratio tests based on ranks and signs were deployed in the work (Zhang & Xindan, 2008). The null hypothesis of martingale difference behaviour was completely rejected, so the Chinese stock market was inefficient (Zhang & Xindan, 2008). However, under the heteroscedasticity, this stock market became more efficient in the latter sub-period (Zhang & Xindan, 2008).

Charles & Darné (2009a) evaluated the weak form efficiency of the Chinese stock market. They tested daily closing prices of stock indices for these two major stock exchanges for both A and B shares (Charles & Darné, 2009a). The time span covered from 03 January and 24 February 1992 to 06 July 2007 for the Shanghai market and from 05 October 1992 to 06 July 2007 for the Shenzhen market (Charles & Darné, 2009a). A variety of multiple variance ratio tests were used (Charles & Darné, 2009a). The findings suggested that Class B shares strongly rejected the random walk hypothesis, so this stock market was inefficient (Charles & Darné, 2009a). Additionally, Class A shares were empirically more efficient than Class B ones, intimating that liquidity, market capitalisation, and a lack of asymmetric information considerably contributed into the weak form efficiency (Charles & Darné, 2009a).

Li & Zhang (2011) carried out an investigation on the evolution of market efficiency of the Shanghai stock market thanks to split share structure reform in 2005 (Li & Zhang, 2011). In particular, the study examined closing data of four major indices and the data sample was from 04 January 2003 to 17 December 2007 (Li & Zhang, 2011). The share structure reform started on 18 May 2005, so it was the chosen as break point to split up whole sample into two subgroups (Li & Zhang, 2011). The first subgroup included 568 observations in total and the other subgroup consisted of 632 observations (Li & Zhang, 2011). The statistics results of the descriptive statistics and ARCH test revealed that the Shanghai and Shenzhen stock markets were not efficient before this fundamental reform (Li & Zhang, 2011). Nevertheless, they achieved weak form efficiency post the reform at a significance level of 5% (Li & Zhang, 2011). Thus, the split share structure reform crucially contributed into the improvement of this market efficiency (Li & Zhang, 2011).

3.3.1.3. Asian emerging countries

Asia remained the fastest-growing major region of the world, contributing more than two-thirds to the global growth in 2019 (International Monetary Fund, 2019b). Beside financial interconnection and globalisation, the gradual development and rising importance of emerging stock markets have been considered amongst the most conspicuous features of international financial development over the current decades (Guidi & Gupta, 2013; Thakor, 2015). Considering that the economic development of the Asian emerging markets has hugely relied on foreign direct investment, a lack of market efficiency could cause disincentive to invest in the emerging stock markets and delay the overall process of Asian market growth (Guidi & Gupta, 2013). It would be crucial for domestic and international investors, researchers, and policy makers to research the informational efficiency of Asian emerging stock markets (Guidi & Gupta, 2013).

Araújo Lima & Tabak (2004) conducted a test related to the random walk hypothesis for China, Hong Kong, and Singapore. The study collected daily returns for the market capitalisation indices of the Shanghai and the Shenzhen stock exchanges, Hang Seng index, and the Straits Time index were analysed. The data focused on the period of June 1992 to December 2006 (Araújo Lima & Tabak, 2004). The evidence from the tests supported that Class A shares for the Chinese stock exchange markets and the Hong Kong stock markets met the requirements of the weak form efficiency (Araújo Lima & Tabak, 2004). Nevertheless, Class B shares for the Chinese stock exchanges and Singapore did not obey the random walk hypothesis (Araújo Lima & Tabak, 2004). It indicated that liquidity and market capitalisation would considerably influence weak form efficiency tests (Araújo Lima & Tabak, 2004).

Jeyanthi (2010) assessed weak form market efficiency in Asian emerging markets, including China, India, Indonesia, Korea, Malaysia, and Taiwan, by statistically testing their market indices (Jeyanthi, 2010). The daily price indices were acquired from 01 April 1998 to 31 March 2009, and traditional tests (such as, Kolmogorov Smirnov Goodness of Fit (K-S), runs test, autocorrelation test and Ljung-Box test) as well as dynamic time series models (such as Dicky-Fuller and ADF tests) were deployed to appraise weak form efficiency (Jeyanthi, 2010). Among them, only the unit root hypothesis provided sufficient evidence that stock prices of Asian emerging markets followed random walk model (Jeyanthi, 2010). In other words, the unit root test (non-stationarity) supported that the Asian emerging markets were weak form efficient (Jeyanthi, 2010).

Lim & Luo (2012) researched weak form efficiency of 14 Asian stock markets (Lim & Luo, 2012). This article conducted the generalised spectral martingale test proposed by Escanciano and Velasco to examine their daily market indices over the sample period of 31 December 1991 to 31 December 2007 (Lim & Luo, 2012). The results provided existence of serial dependence in return series, implying the potential of return predictability and the market inefficiency (Lim & Luo, 2012).

Raquib & Alom (2015) focused on the market efficiency of Dhaka Stock Exchange, an emerging financial market. The sample collected and illustrated a total of 2694 daily observations of daily price indices of the DSE General Index during the sample period from 2001 to 2013 (Raquib & Alom, 2015). The evidence from the autocorrelation function tests revealed a positive correlation on Dhaka Stock Exchange returns in the research period and lack of the random walk in this case, hence the Dhaka Stock Exchange did not hold weak form of market efficiency (Raquib & Alom, 2015).

Rehman et al. (2018) researched the efficiency of equity market in Bangladesh, India, and Pakistan in the South Asian region. The research analysed daily index data of CSE All Share Index of Bangladesh, S&P BSE 500 Index of India, and KSE 100 Index of Pakistan from 30 June 2005 to 30 June 2017 (Rehman et al., 2018). ADF test, Phillip Perron (PP) test, Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, and runs test were deployed to illustrate the efficient market hypothesis (Rehman et al., 2018). The empirical findings provided sufficient evidence that these markets did not follow random walk model and it was possible to predict the stock returns for the three emerging markets (Rehman et al., 2018). Therefore, the markets were weak form inefficient (Rehman et al., 2018).

Malhotra, Tandon, & Tandon (2015) examined the weak form efficiency of 10 selected stock exchanges in Asia-Pacific markets. The closing prices of all indices for daily, weekly,

and monthly returns covered the period from 1997 to 2012 (Malhotra, Tandon, & Tandon, 2015). Descriptive statistics (Jarque-Bera statistics), parametric serial correlation test (Ljung-Box statistics), unit root test (ADF), and multiple variance ratio test were carried out to test this level of market efficiency (Malhotra, Tandon, & Tandon, 2015). The output of autocorrelation and unit root test showed that the mentioned stock indices did not exhibit weak form in daily and weekly returns (Malhotra, Tandon, & Tandon, 2015). Moreover, the results of multiple variance ratio test rejected the existence of weak form efficiency in all indices (Malhotra, Tandon, & Tandon, 2015).

3.3.1.4. Brazil – Russia – India – China

Although Brazil and Russia are not Asian emerging countries, BRIC have been considered as leading emerging economies in the regions and in the world (Nalın & Güler, 2015). Thus, a variety of research have focused on testing market efficiency of these mentioned emerging markets.

Camelia (2012) researched informational efficiency in four European emerging countries (Romania, Hungary, Czech Republic, and Estonia) and BRIC emerging economies. The market value-weighted equity indices were collected to appraise hypothesis in the paper (Camelia, 2012). There were totally 2500 observations for each country, and the data lasted from October 2002 to October 2012 (Camelia, 2012). There were two key sections to test the market efficiency. To appraise the normality hypothesis of logarithmic distributed instantaneous returns of stock indices, graphical analysis, Jarque-Bera test, and QQ-plot test were deployed (Camelia, 2012). Moreover, unit root tests (ADF test, PP test, autocorrelation coefficients, and Ljung-Box test), runs test, and variance ratio test were used for stationary tests (Camelia, 2012). As a result, the existence of linear dependences for the return series was empirically found, and there was not a normal distribution in several markets (Camelia, 2012). It implied a lack of random walk behaviour in these emerging stock markets (Camelia, 2012).

Mobarek & Fiorante (2014) examined the presence of weak form efficiency in the equity markets of BRIC by testing daily closing prices of indices (Mobarek & Fiorante, 2014). In this research, data in the equity markets of Japan, the United Kingdom, and the United States were used as a benchmark to compare findings and efficiency (Mobarek & Fiorante, 2014). The sample spanned between September 1995 and March 2010 (Mobarek & Fiorante, 2014). With the belief that the market efficiency could be influenced by changes of structure and market environment, the data was divided into three subgroups for further investigation (Mobarek & Fiorante, 2014). The serial correlation tests, the runs test, and the variance ratio

tests were applied to appraise the random walk hypothesis (Mobarek & Fiorante, 2014). The results from these tests demonstrated that the markets were inefficient during the earlier sub-periods due to significant positive autocorrelation in returns (Mobarek & Fiorante, 2014). In the last sub-period, these BRIC markets were weak form efficient (Mobarek & Fiorante, 2014). It indicated a relative improvement in market efficiency of these four transition markets (Mobarek & Fiorante, 2014).

The study of Sanyal, Gahan, & Gupta (2014) tested whether stock markets of 10 emerging economics followed the random walk hypothesis ***(Table 3.1)***. Closing data for the market indices were obtained, and there were totally 55426 observations for the ten countries (Sanyal, Gahan, & Gupta, 2014). In the paper, descriptive statistics and test of normality were applied to examine the normality of the return series across exchanges (Sanyal, Gahan, & Gupta, 2014). Furthermore, runs test, unit root test, auto correlation, and variance ratio tests were deployed to test the market efficiency (Sanyal, Gahan, & Gupta, 2014). The findings suggested that Hong Kong stock market was weak form efficient because it followed the random walk model under both parametric and non-parametric tests (Sanyal, Gahan, & Gupta, 2014). Meanwhile, there was a lack of random walk behaviour in all the other emerging markets (Sanyal, Gahan, & Gupta, 2014).

Table 3.1: Data and sample of stock markets in ten emerging countries

Country	Stock Exchange	Market Index	Period of study	Number of observations	Data type
India	Bombay Stock Exchange	BSE Sensex	01.07.1997 - 07.01.2014	4087	Closing level data
China	Shanghai Stock Exchange	SSEC	19.12.1990 - 07.01.2014	5908	Closing level data
Indonesia	Indonesia Stock Exchange (Bursa Efek Indonesia)	JKSE	01.07.1997 - 07.01.2014	4013	Closing level data
Sri Lanka	Colombo Stock Exchange	All share price index	02.01.1985 - 30.09.2013	6868	Closing level data
Pakistan	Karachi Stock Exchange	KSE 100	02.07.1997 - 07.01.2014	4029	Closing level data
Russia	Moscow Exchange	RTS Index	01.09.1995 - 07.01.2014	4666	Closing level data
Brazil	Brazil Stock Exchange (IBOVESPA)	IBOVESPA	27.04.1993 - 07.01.2014	5122	Closing level data
Turkey	BORSA Istanbul	BIST 30	04.01.1988 - 07.01.2014	8470	Closing level data
Mexico	Mexican Stock Exchange (Bolsa Mexicana de Valores)	IPC	08.11.1991 - 07.01.2014	5542	Closing level data
Hong Kong	Hong Kong Stock Exchange	Hang Seng Index	31.12.1986 - 07.01.2014	6721	Closing level data

Source: Sanyal, Gahan, & Gupta, 2014.

Tiwari & Kyophilavong (2014) evaluated the random walk hypothesis in BRIC and South Africa. The monthly average stock indices of the studied stock markets were taken from January 2000 to December 2010 (Tiwari & Kyophilavong, 2014). Unit root tests and wavelet-based unit root tests were used in the paper (Tiwari & Kyophilavong, 2014). The findings indicated that there was a presence of random movement in the stock market in the Russian Federation but not in these other stock markets during the period, implying that this stock market was the only one obtaining weak form efficiency (Tiwari & Kyophilavong, 2014).

The work of Nalın & Güler (2015) investigated the existence of the weak form efficiency in BRIC and Turkey. Stock market indices for these five countries are used for analysis (Nalın & Güler, 2015). The monthly data were collected in the period from July 1997 to December 2013, and the data consisted of around 198 monthly values of every index (Nalın & Güler, 2015). Autocorrelation analysis, unit root tests, Johansen cointegration, and Granger causality test were applied to determine whether the markets follow random walk theory or not (Nalın & Güler, 2015). The empirical findings revealed that the selected markets obeyed random walk model and were weak form efficient (Nalın & Güler, 2015).

3.3.1.5. Summary

In summary, there have been inconsistent findings regarding the existence of weak efficient form in the emerging stock markets ***(Table 3.2)***. Different statistical methods could result in dissimilar findings for stock markets. Furthermore, variance ratio tests are widely used in several empirical research (Palamalai & Kalaivani, 2015; Zhang & Xindan, 2008; Charles & Darné, 2009a; Lima & Tabak, 2004; Malhotra, Tandon, & Tandon, 2015; Camelia, 2012; Mobarek & Fiorante, 2014; Sanyal, Gahan, & Gupta, 2014). Additionally, stock market efficiency could be enhanced thanks to strategic decisions (Li & Zhang, 2011; Mobarek & Fiorante, 2014). Therefore, the markets have dissimilar evidence by applying different tests, so it is crucial to find out whether the Vietnamese stock market would follow the random walk model and meet the requirements of weak efficient form by using various tests.

Table 3.2: Empirical studies on weak form efficiency in emerging countries

No	Study	Year of publication	Markets under study	Data collection	Time frame	Company/ Market indexes	Methods	Findings
1	Srinivasan Palamalai & M Kalaivani	2015	India	Daily closing prices of 23 sectoral indices of the Indian stock market along with the BSE SENSEX and CNX NIFTY	From 2009 to 2014	Daily closing prices of 23 sectoral indices, BSE SENSEX and CNX NIFTY	Autocorrelation test, ADF test, runs test, and variance ratio test	Do not follow weak form of efficiency
2	Janet Jyothi Dsouza & T. Mallikarjunappa	2015	India	Daily data of Bombay Stock Exchange (BSE)-200 index-based companies	From 01 January 1991 to 31 December 2012	Daily data of BSE-200 index-based companies	Runs test, ADF test, PP test, autocorrelation test, and GARCH (1, 1) model	Do not follow weak form of efficiency
3	Taufeeque Ahmad Siddiqui & Isha Narula	2013	India	Daily returns of S&P CNX Nifty including 2995 observations	From 01 January 2000 to 31 December 2011	Daily returns of S&P CNX Nifty	GARCH (1,1) model	Do not follow weak form of efficiency
4	H. R. Seddighi & W. Nian	2004	China	Daily data of eight shares listed in the Shanghai Stock Exchange are examined	From 04 January 2000 to 31 December 2000	Daily closing prices	Durbin–Watson test, Durbin 'h' test, Lagrange Multiplier test, Dickey–Fuller tests, ARCH test, and GARCH (1,1) model	Do not follow weak form of efficiency
5	Bing Zhang & Li Xindan	2008	China	Total 3379 observations of Shanghai Index and total 3206 observations of Shenzhen Index	From 1992 to 2006	Daily prices of the composite indices	Rank test, sign test, and variance ratio test	Do not follow weak form of efficiency and improve the Chinese stock market efficiency in the last sub-period

No	Study	Year of publication	Markets under study	Data collection	Time frame	Company/ Market indexes	Methods	Findings
6	Amelie Charles & Olivier Darné	2009	China	Daily closing price stock indices for the Chinese stock exchanges in Shanghai and Shenzhen for A and B shares	From 1992 to 2007	Daily closing prices of the stock indices	Multiple variance ratio tests	Do not follow weak form of efficiency
7	Xindan Li & Bing Zhang	2011	China	Totally 568 observations for the first sub-period and 632 observations for the second sub-period	2 January 2003 to 18 December 2007	Daily prices of the composite indices	Descriptive statistics and ARCH test	Do not follow weak form of efficiency before the reform, and follow weak form of efficiency after the reform
8	Eduardo Jose Araújo Lima & Benjamin Miranda Tabak	2004	China, Hong Kong, and Singapore	The market indices of these markets	From June 1992 to December 2000	Daily stock prices and the market indices	Variance ratio test	Do not follow weak form of efficiency
9	B J Queensly Jeyanthi	2010	China, India, Indonesia, Korea, Malaysia, and Taiwan	The daily price of market indices in six Asian emerging markets	From 01 April 1998 to 31 March 2009	Daily prices of the market indices	Traditional tests (such as, K-S, runs test, autocorrelation test, and Ljung-Box test) and dynamic time series models (such as Dicky-Fuller and ADF tests)	K-S test, runs tests, autocorrelation test and Ljung-Box test: Do not follow weak form efficiency. Unit root test: Follow weak form efficiency

No	Study	Year of publication	Markets under study	Data collection	Time frame	Company/ Market indexes	Methods	Findings
10	Kian-Ping Lima & Weiwei Luo	2012	Bangladesh, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, and Thailand	Their market indices at daily frequency	From 31 December 1991 to 31 December 2007	Daily prices of the market indices	Generalised spectral martingale test proposed by Escanciano and Velasco	Do not follow weak form of efficiency
11	Muhammad Raquib & Khairul Alom	2015	Bangladesh	Total 2694 daily observations of daily price indices of DSE General Index (DGEN)	From 2001 to 2013	Daily prices of the market indices	Autocorrelation function tests	Do not follow weak form of efficiency
12	Seema Rehman, Imran Umer Chhapra, Muhammad Kashif, & Raja Rehan	2018	Bangladesh, India, and Pakistan	Daily prices of stock market indices	The time series data covered the period from 30 June 2005 to 30 June 2017	Daily prices of the market indices	ADF test, PP test, KPSS test, and runs test	Do not follow weak form of efficiency
13	Nidhi Malhotra, Kamini Tandon, & Deepak Tandon	2015	Australia, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Singapore, and Taiwan	Daily, weekly, and monthly closing values of 10 Asia-Pacific countries	The time series data covered the period from 1997 to 2012	Daily, weekly, and monthly closing prices of the market indices	Descriptive statistics (Jarque-Bera statistics), parametric serial correlation test (Ljung-Box statistics), unit root test (ADF), and multiple variance ratio test	Do not follow weak form of efficiency

No	Study	Year of publication	Markets under study	Data collection	Time frame	Company/ Market indexes	Methods	Findings
14	Oprean Camelia	2012	Romania, Hungary, Czech Republic, Estonia, Brazil, Russia, India, and China	Around 2500 daily values of every market index	From October 2002 to October 2012	Daily prices of the market value-weighted equity indices	Graphical analysis, Jarque-Bera test, QQ-plot test, unit root tests (ADF test, PP test, autocorrelation coefficients, and Ljung-Box test), runs test, and variance ratio test	Do not follow weak form of efficiency
15	Asma Mobarek & Angelo Fiorante	2014	Brazil, Russia, India, and China	Daily closing prices of all indices	From September 1995 to March 2010	Closing price of the market indices	Serial correlation tests, runs test, and variance ratio tests	Do not follow weak form of efficiency
16	Pradipta Kumar Sanyal, Padma Gahan, & Smarajit Sen Gupta	2014	Brazil, China, India, Indonesia, Hong Kong, Mexico, Pakistan, Russia, Sri Lanka, and Turkey	Totally 55426 observations for the ten countries	Flexible start date to 01.2014 (mainly)	Closing data of the market indices	Descriptive statistics and test of normality, runs test, unit root test, auto correlation, and variance ratio tests	Do not follow weak form of efficiency
17	Aviral Kumar Tiwari & Phouphet Kyophilavong	2014	Brazil, Russia, India, China, and South Africa	Monthly average stock indices of the five stock markets	From January 2000 to December 2010	Monthly average stock indices	Unit root test and wavelet-based unit root tests	Brazil, India, China, and South Africa: Do not follow weak form of efficiency. Russia: Follow weak form of efficiency
18	Halime Temel Nalın & Sevinç Güler	2015	Brazil, Russia, India, China, and Turkey	Totally 198 observations for each country	From July 1997 to December 2013	Monthly data of the market indices	Autocorrelation analysis, unit root test, Johansen cointegration, and Granger causality test	Follow weak form of efficiency

Source: Compiled by author.

3.3.2. Semi-strong form efficiency

When there are findings of comprehensive tests supporting the existence of weak efficient form, efforts will be made to carry out semi-strong form tests (Malkiel & Fama, 1970). Semi-strong form of market efficiency expands the concern of efficiency slightly further, and the focal points in this level seek to whether the current share prices fully replicate all publicly available information, which refers to not only all historical information but also all other publicly available information (Mallikarjunappa & Dsouza, 2014). When the price adjusts promptly and accurately to such information, there is no opportunity to gain abnormal returns (ARs) in semi-strong efficient markets (Mallikarjunappa & Dsouza, 2014). Tests of semi-strong form efficiency concern the adjustment of stock prices to one or many types of information generating events (Malkiel & Fama, 1970). Event studies are regarded as a good methodology to examine the existence of semi-strong efficient form (Ray, 2011). Some events related to announcement regarding merger and acquisition, earnings, stock splits, dividends, new issues, and other economic or political issues are commonly researched (Naseer & Tariq, 2015). It is crucial for domestic and international investors, researchers, and policy makers to test whether the efficiency of Asian emerging stock markets is semi-strong form or not (Guidi & Gupta, 2013). Several studies on emerging stock markets, especially Asian ones, have been conducted.

Kong & Taghavi (2006) examined the effects of annual earnings announcement on the Chinese stock markets. The data set included 698 listed companies in Shanghai and 526 listed companies in Shenzhen in 2000 and 2001 (Kong & Taghavi, 2006). The time window around each annual event disclosure was from day -10 to day +10 (Kong & Taghavi, 2006). The study deployed event analysis with M-EGARCH model, and the findings revealed that a greater than expected earnings announcement caused an increase in the conditional mean of stock returns on days prior to the news announcement and a decline afterwards (Kong & Taghavi, 2006). Additionally, higher absolute values of reported earnings led to a fall in conditional volatility of the changes prior to the news announcement and a rise afterwards (Kong & Taghavi, 2006). Thus, the stock exchange markets did not obtain the semi-strong form efficiency.

Chen, Liu, & Huang (2009) undertook an event study related to the impact of cash dividend changes on stock prices. They focused on a sample of all A-share firms listed on the Chinese stock exchange markets with cash dividend announcements between 2000 and 2004 (Chen, Liu, & Huang, 2009). The ending data set comprised 460 firms with increasing cash dividend announcements and 422 firms with decreasing cash dividend announcements

(Chen, Liu, & Huang, 2009). The study investigated the period of 141 daily return observations around an event, from day -120 to day +20 (Chen, Liu, & Huang, 2009). According to findings from parametric t-test, the AR reached a significantly positive of 0.23 percent on the publication day for the cash dividend on the upward trend (Chen, Liu, & Huang, 2009). The ARs of the eight days post announcement were positive, and four of them were statistically significant (Chen, Liu, & Huang, 2009). Therefore, high-dividend yield shares had higher positive ARs, suggesting that the Chinese stock market was not semi-strong form efficient (Chen, Liu, & Huang, 2009).

Zuguang & Ahmed (2010) appraised the effect of dividend announcement on stock price of companies listed on Shanghai Stock Exchange from January 2005 to December 2009. They investigated 218 dividend announcement dates related to the stocks listed in SSE 180 index and their daily closing stock prices (Zuguang & Ahmed, 2010). The study analysed data in the period from day –125 to day +5 to research around each event (Zuguang & Ahmed, 2010). The research deployed parametric t-test to determine the statistically significant ARs over the event window period (Zuguang & Ahmed, 2010). When the dividend increase decisions were announced, the investors promptly reacted and gained ARs (Zuguang & Ahmed, 2010). The effect of significantly large dividend increase on the value of AR was significantly greater than the impact of general dividend increase (Zuguang & Ahmed, 2010). Therefore, Shanghai Stock Exchange was semi-strong form inefficient (Zuguang & Ahmed, 2010).

The work of Beltratti, Bortolottib, & Caccavaio (2016) executed an event study to analyse how the spit-share reform affected the Chinese stock market efficiency. The research focused on a sample of 1210 companies on Shanghai and Shenzhen stock markets from March 2004 to February 2007 (Beltratti, Bortolotti, & Caccavaio, 2016). The time window around each annual event disclosure was from day -10 to day +9 (Beltratti, Bortolotti, & Caccavaio, 2016). The abnormal prices went up by 2.20% in the ten days prior to the first suspension and most significantly in the three days prior to each announcement (Beltratti, Bortolotti, & Caccavaio, 2016). It was consistent with information leakage, and this was evidence for inefficiency in semi-strong level (Beltratti, Bortolotti, & Caccavaio, 2016).

In an efficient market, stock prices and trading volume changes should immediately reflect the announcement or publication (Chen & Kutan, 2016). Chen & Kutan (2016) researched the effects of information transmission through rumours in the stock market of Taiwan. The data set comprised the closing prices of the market index and rumoured firms listed on the stock market of Taiwan (Chen & Kutan, 2016). It covered the period from 01 January 2000 to 31 December 2012 with 161 daily observations from day -141 days to day

+20 surrounding 329 rumour events (Chen & Kutan, 2016). The researchers utilised EGARCH (1,1) process to evaluate the effects of rumours on the stock returns (Chen & Kutan, 2016). As a result, investors accessing a positive rumour about a stock tended to purchase the stock, while negative rumours had more dramatic and longer effects on stock returns than positive rumours did (Chen & Kutan, 2016). It implied that they could take advantages to earn ARs from rumours, indicating evidence for inefficient market in semi-strong form (Chen & Kutan, 2016).

Dua, Puri, & Mittal (2010) examined the semi-strong form efficiency in the Indian stock market by illustrating influences from buy-back of shares on the market. The authors studied a sample of 56 events of 48 companies listed on National Stock Exchange from 01 January 2004 to 31 December 2009 (Dua, Puri, & Mittal, 2010). The work employed data from day -15 to day +15 around the event (Dua, Puri, & Mittal, 2010). The statistical findings from parametric t-test manifested inconsiderable responses before or on the announcement date as well as statistically insignificant ARs around the announcement date. Thus, the stock market had semi-strong efficient form (Dua, Puri, & Mittal, 2010).

Ray (2011) also conducted research to test this efficient form in the Indian stock market, and the events related to bonus issues and stock splits from 1996 to 2008 were considered (Ray, 2011). There were 521 and 351 companies which went for bonus issues and stock splits, respectively during the study period (Ray, 2011). The investigation window of (-30, +30) was applied for all the events to appraise the ARs and the change in liquidity (Ray, 2011). To research the stationarity of data series, unit root tests including ADF and PP tests were carried out (Ray, 2011). The findings revealed that the stock split return was statistically significant at 5% level on the announcement date in this market, but statistically insignificant in the case of bonus issues (Ray, 2011). Therefore, the investors could make ARs around the stock split announcements only and the Indian stock market was not semi-strong efficient (Ray, 2011).

Sehgal & Bijoy (2015) performed an examination about stock price reactions to earnings announcement for the Indian stock market. They collected daily stock price data of 469 companies listed on Bombay Stock Exchange (Sehgal & Bijoy, 2015). The sample period was between December 2002 and December 2011 (Sehgal & Bijoy, 2015). The investigation window lasted from 120 days before the event to 20 days after the event (Sehgal & Bijoy, 2015). Significant ARs were recorded for 32 out of 37 quarters in the pre-event period and 35 out of 37 quarters in the post-event period (Sehgal & Bijoy, 2015). Furthermore, considerable continuous pattern in ARs for 26 out of 37 quarters was observed (Sehgal & Bijoy, 2015). It intimated that the investors could anticipate the information about earnings announcement to

gain financial benefits (Sehgal & Bijoy, 2015). Thus, there was insufficient evidence to support the semi-strong efficient form of the Indian stock market (Sehgal & Bijoy, 2015).

Hussin, Ahmed, & Ying (2010) implemented an investigation regarding the semi-strong form efficiency on the Malaysian stock exchange by studying market reaction to dividend and earnings announcements. A data sample was collected from 01 January 2006 to 30 November 2006 (Hussin, Ahmed, & Ying, 2010). The study window included 21 days between day -10 to day +10 (Hussin, Ahmed, & Ying, 2010). Lilliefors test and Shapiro-Wilks test were used to evaluate normality, and Mann – Whitney U was deployed to do rank test (Hussin, Ahmed, & Ying, 2010). The statistical evidence intimated that increasing dividend announcements resulted in favourable AR while decreasing dividend announcements led to unfavourable AR, so the stock prices in this market were adjusted in an efficient manner to reflect dividend and earnings announcement (Hussin, Ahmed, & Ying, 2010). As a result, this market had semi-strong form efficiency (Hussin, Ahmed, & Ying, 2010).

The paper of Mann & Babbar (2017) examined the stock price reaction around new product announcement by conducting event study. The study illustrated a data sample of 383 new product announcements during 11 years from 2003 to 2013 for companies listed on BSE 500 index of the Indian stock market (Mann & Babbar, 2017). The authors studied from 210 days prior to 10 days after the event day to evaluate the impact of the event (Mann & Babbar, 2017). Independent sample t-test was used to determine any difference in ARs between before and after announcement days (Mann & Babbar, 2017). The statistical results revealed that the ARs were observed on the event day and the new product announcements had substantial effects on the stock prices (Mann & Babbar, 2017). It implied that the stock market firmly had semi-strong form efficiency (Mann & Babbar, 2017).

Evelyn & Basana (2018) appraised the impact of 2008 and 2016 United States Presidential Election on Indonesia stock market. They collected daily closing prices of 240 companies' shares in nine sectors to conduct parametric t-test (Evelyn & Basana, 2018). During the elections as well as 2009 and 2017 inauguration day, there were ARs in the Indonesian stock market (Evelyn & Basana, 2018). The research analysed from 5 days before the event day to 5 days after the event day (Evelyn & Basana, 2018). The t-statistic test manifested that over 50% average cumulative abnormal returns in most of the events was statistically significant but there were insignificant ARs between pre and post the event (Evelyn & Basana, 2018). It implied semi-strong efficient form of Indonesian stock market (Evelyn & Basana, 2018).

The paper of Alhashel (2016) deployed an event study methodology to evaluate the effects of rights offering announcements on the market efficiency of Kuwait Stock Exchange. The author applied p-value test to analyse a sample of 69 rights offering and capital increase announcements in this stock exchange from 2004 to 2013, and the investigation period lasted from day -34 to day +25 (Alhashel, 2016). The results revealed that prices incorporated new information promptly, which were considered as evidence of the semi-strong efficiency of Kuwait Stock Exchange (Alhashel, 2016).

In general, there are dissimilar findings for various stock markets which use different types of events and apply diversified methods ***(Table 3.3)***. Dua, Puri & Mittal (2010), Mann & Babbar (2017), Hussin, Ahmed, & Ying (2010), Evelyn & Basana (2018), and Alhashel (2016) found that selected stock markets followed semi-strong form of efficiency. On the other hand, Kong & Taghavi (2006), Chen, Liu & Huang (2009), Zuguang & Ahmed (2010), Beltratti, Bortolottib, & Caccavaio (2016), Ray (2011), and Sehgal & Bijoy (2015) supported that the researched Asian emerging stock markets did not follow semi-strong form of efficiency. Thus, it is vital to examine the semi-strong efficient form of the Vietnamese stock market when it meets the requirements of the weak form. Furthermore, most of the research deployed event studies and 6 in 12 empirical research used parametric t-test to examine the semi-strong form efficiency (Chen, Liu & Huang, 2009, Zuguang & Ahmed, 2010; Dua, Puri & Mittal, 2010; Sehgal & Bijoy, 2015; Mann & Babbar, 2017; Evelyn & Basana, 2018).

Table 3.3: Empirical studies on semi-strong form efficiency in emerging countries

No.	Study	Year of publication	Markets under study	Data collection	Time frame	Company/Market indexes	Event	Methods	Findings
1	Shuhong Kong & Majid Taghavi	2006	China	3,672 observations on the earnings and losses announcement days and 23,680 observations on daily stock price returns in the period around the announcement day	2000 and 2001	Closing prices of stocks	Annual earnings announcement	Event study with M-EGARCH model	Do not follow semi-strong form of efficiency
2	Dar-Hsin Chen, Hsiang-Hsi Liu, & Cheng-Ting Huang	2009	China	460 firms with increasing cash dividend announcements and 422 firms with decreasing cash dividend announcements	Between 2000 and 2004	Daily closing price of stocks	Cash dividend changes	Event study with parametric t-test	Do not follow semi-strong form of efficiency
3	Hu Zuguang & Minhaz Uddin Ahmed	2010	Shanghai Stock Exchange	218 dividend announcement dates from the stocks listed in SSE 180 index	From January 2005 to December 2009	Daily closing price of stocks and daily SSE 180 index values	Dividend announcement	Event study with parametric t-test	Do not follow semi-strong form of efficiency
4	Andrea Beltratti, Bernardo Bortolottib, & Marianna Caccavaio	2016	China	1210 companies on Shanghai and Shenzhen stock markets	From March 2004 to February 2007	Closing prices of listed companies	Spit-share reform	Event study with Campbell, Lo & MacKinlay (1997)	Do not follow semi-strong form of efficiency

No.	Study	Year of publication	Markets under study	Data collection	Time frame	Company/Market indexes	Event	Methods	Findings
5	Chun-Da Chen & Ali M. Kutan	2016	Taiwan	Taiwan's stock market closing price index and the closing prices of rumoured firms listed on the stock market of Taiwan	01 January 2000 to 31 December 2012	Market indexes and closing prices of listed companies	Information transmission through rumours	Event study with EGARCH (1,1)	Do not follow semi-strong form of efficiency
6	Vibha Dua, Himanshu Puri, & R.K. Mittal	2010	India	56 events of 48 companies listed on National Stock Exchange	From 01 January 2004 through 31 December 2009	Daily prices of stocks	Buy-back of shares	Event study with parametric t-test	Follow semi-strong form of efficiency
7	Koustubh Kanti Ray	2011	India	521 and 351 companies which went for bonus issues and stock splits, respectively during the study period	From 1996 to 2008	Daily adjusted share price data of the selected companies	Bonus issues and stock splits	Event study with Unit root test (ADF and PP tests)	Do not follow semi-strong form of efficiency
8	Sanjay Sehgal & Kumar Bijoy	2015	India	469 companies listed on Bombay Stock Exchange	From December 2002 to December 2011	Daily share price	Earnings announcement	Event study with parametric t-test	Do not follow semi-strong form of efficiency
9	Baharuddin M Hussin, Abdullahi D Ahmed, & Teoh C Ying	2010	Malaysia	120 listed companies announcing the final dividends in their fourth financial quarter were collected	From 01 January 2006 to 30 November 2006	Stock prices of each company and KLSE composite index prices	Dividend and earnings announcements	Normality tests (Lilliefors test and Shapiro-Wilks test) and Rank test	Follow semi-strong form of efficiency

No.	Study	Year of publication	Markets under study	Data collection	Time frame	Company/Market indexes	Event	Methods	Findings
10	Bikram Jit Singh Mann & Sonia Babbar	2017	India	383 new product announcements for 11 years	From 2003 to 2013	Daily share price	New product announcements	Event study with parametric t-test	Follow semi-strong form of efficiency
11	Evelyn Evelyn & Sautma Ronni Basana	2018	Indonesia	240 companies' share in nine sectors	Around 2008 and 2016 presidential election in the United States	Closing prices of listed companies	2008 and 2016 United States Presidential Election	Event study with parametric t-test	Follow semi-strong form of efficiency
12	Bader S. Alhashel	2016	Kuwait Stock Exchange	69 firms with rights offering and capital increase announcements in the Kuwait Stock Exchange	From 2004 to 2013	Closing prices of listed companies	Right offering announcements	Event study with p-value test	Follow semi-strong form of efficiency

Source: Compiled by author.

3.3.3. Strong form efficiency

The extreme level of market efficiency is strong efficient form (Mandal & Rao, 2010). In this level, it is assumed that all the pertinent information, either publicly available or privately held, will be incorporated into stock prices (Malkiel & Fama, 1970). It means that there is no opportunity to earn ARs in a long period of time by using insider trading information (Howells & Bain, 2008). In the strong efficient market, no individual has sustainably greater abnormal profits than others, and no fund managers are enabled to consistently beat the market from insider dealing (Malkiel & Fama, 1970). Strong form tests focus on whether any individuals or groups have monopolistic access to any information affecting stock prices (Malkiel & Fama, 1970). Corporate insiders and specialists are the groups whose monopolistic access to information has been popularly identified, and the insider trading conveys new information to the market (Malkiel & Fama, 1970). To test for strong form efficiency, indirect methods, referring to appraising how the corporate insiders, professional investors, and specialists gain benefits from monopolistic access to some information, are primarily used (McLaney, 2014). These tests include evaluation of the performance of professionally managed portfolios based on insider information (Fapetu & Adesina, 2013). Various studies are implemented on the strong form efficiency of the foreign exchange markets and stock markets in developed economies, but empirical works in developing stock market have been limited (Sheefeni, 2015). There are inconsistent findings when testing the presence of the strong efficient form in the emerging stock markets.

Cheng, Davidson III, & Leung (2011) stated that analysis of insider trading would convey insights into the strong efficient form of market by investigating dividend signals in Hong Kong stock market. The sample data contained stock price and financial statement data relevant to 653 simultaneous earnings and dividend announcements with 3329 insider trading events from 1993 to 2003 (Cheng, Davidson III, & Leung, 2011). Event studies were conducted to appraise the abnormal stock price reaction to insider trades (Cheng, Davidson III, & Leung, 2011). The result showed that the market reacted more to the insider trades with a decreasing dividend announcement than an increasing one (Cheng, Davidson III, & Leung, 2011). Additionally, insider trades contained more information asymmetry, and insider return had a positive and significant correlation with dividends (Cheng, Davidson III, & Leung, 2011). Thus, there was a lack of evidence to support that Hong Kong stock market was strong form efficient.

Qiu, He, & Xiao (2018) appraised the source of return predictability by insider dealing in the Chinese stock market. The data set included information on the end date, trading volume, and direction of the transactions with 59,671 observations from 2005 to 2016 (Qiu, He, & Xiao,

2018). The findings from the event study showed that the information contained in the insiders' transactions was about operating earnings, and they opportunistically traded in anticipation of earnings management (Qiu, He, & Xiao, 2018). Further, there was evidence supporting that insider trading delivered significant value-relevant information about earnings to the stock market (Qiu, He, & Xiao, 2018). Therefore, corporate insiders and specialists could take advantage of this information (Qiu, He, & Xiao, 2018).

Chauhan, Kumar, & Chaturvedula (2016) conducted research on information asymmetry and insider trades in the Indian stock market. The sample data covered 7689 purchases and 6387 sales announcements of insider trading, and 795 firms involved in insider trading from January 2007 to October 2012 (Chauhan, Kumar, & Chaturvedula, 2016). The statistical evidence manifested that information production depended on the degree of information asymmetry between insiders and outsiders (Chauhan, Kumar, & Chaturvedula, 2016). Moreover, insider trades occurring prior to an earnings announcement could make a tremendous impact on stock prices (Chauhan, Kumar, & Chaturvedula, 2016).

The paper of Sheefeni (2015) examined the strong efficient form of the capital market in Namibia by appraising ARCH and GARCH modelling techniques. The sample data consisted of monthly market capitalisation on the Namibian stock exchange, all share index, and value of transaction from January 1997 to December 2012 (Sheefeni, 2015). The findings indicated that the Namibian capital market had weak form efficiency but not strong form efficiency (Sheefeni, 2015). Therefore, investors could not predict and outperform the market on the basis of historical data (Sheefeni, 2015).

Furthermore, Oke & Azeez (2012) implemented a test of the strong-form efficiency of the Nigerian capital market. The data set included annual market capitalisation on the Nigerian stock exchange, government development stock, annual all share index, and the value of transaction between 1986 and 2010 (Oke & Azeez, 2012). The ARCH and GARCH models were employed to examine strong form efficiency (Oke & Azeez, 2012). The findings showed that the stock market was weak form efficient but not strong form efficient, and the current market prices of securities reflected only the past information (Oke & Azeez, 2012).

On the other hand, Gupta, Anand, & Singh (2008) investigated the strong-form efficiency in the case study of the Indian stock market. In this research, 294 stocks were chosen from CNXMIDCAP200, CNX 100, and CNXMIDCAP, and their stock prices at the beginning and end of the financial year were collected from 2003 to 2007 (Gupta, Anand, & Singh, 2008). The t- test was used to evaluate the significance (Gupta, Anand, & Singh, 2008). The findings indicated that mutual fund managers obtaining sophisticated analytical tools, superior

information, and insider information were unable to have outstanding performance as compared to randomly selected portfolios of index stocks (Gupta, Anand, & Singh, 2008). It was concluded that this market was strong form efficient (Gupta, Anand, & Singh, 2008).

Fapetu & Adesina (2013) empirically investigated the strong form of efficiency in the case study of the Nigerian stock market. They tested whether the market index was beaten by professionally managed funds or not (Fapetu & Adesina, 2013). The authors used "market model" for estimating residuals with parametric t-test to examine the average monthly returns data of five banks out of 28 selected companies from August 2007 to January 2011 (Fapetu & Adesina, 2013). The empirical analysis showed that the AR of the professionally managed portfolio was statistically insignificant at 5% significance level (Fapetu & Adesina, 2013). Therefore, the Nigerian Stock Market was efficient in the strong form (Fapetu & Adesina, 2013).

Based on the mentioned literature on the strong form efficiency, there are mixed findings of strong form efficiency ***(Table 3.4)***. In specific, the papers of Cheng, Davidson III, & Leung (2011), Qiu, He and Xiao (2018), Chauhan, Kumar, & Chaturvedula (2016), Sheefeni (2015), and Oke & Azeez (2012) using event study or ARCH and GARCH concluded that the chosen markets did not follow strong form efficiency. On the contrary, the works of Gupta, Anand, & Singh (2008) and Fapetu & Adesina (2013) applying t-test manifested that the Indian and Nigerian stock markets were strong form efficient. Investigating market efficiency is usually appraising all three forms or mix of two forms or any one of them (Mallikarjunappa & Dsouza, 2013). If the Vietnamese stock market meets the requirements of semi-strong form efficiency, it will be essential to find out whether the market would have strong efficient form or not.

Table 3.4: Empirical studies on strong form efficiency in emerging countries

No.	Study	Year of publication	Markets under study	Data collection	Time frame	Company/Market indexes	Methods	Findings
1	Louis T.W. Cheng, Wallace N. Davidson III, & T.Y. Leung	2011	Hong Kong	653 simultaneous earnings and dividend announcements with 3329 insider trading events	From 1993 to 2003	Stock price data and financial statement data	Event study	Do not follow strong form of efficiency
2	Ying Qiu, Hua Hec, & Gang Xiao	2018	China	Information on the end date, trading volume and direction of the transactions with 59,671 observations	From 2005 to 2016	Stock price data, trading volume and direction of the transactions	Event study	Do not follow strong form of efficiency
3	Yogesh Chauhana, K. Kiran Kumarb, & Chakrapani Chaturvedulac	2016	India	7689 purchases and 6387 sales announcements of insider trading and 795 firms involved in insider trading	From January 2007 to October 2012	Stock price data and insider trading announcements	Event study	Do not follow strong form of efficiency
4	Johannes Peyavali Sheefeni Sheefeni	2015	Namibia	Monthly market capitalisation on the Namibian stock exchange, all share index, and the value of transaction	From January 1997 to December 2012	Market data and transaction information	ARCH and GARCH	Do not follow strong form of efficiency
5	Micheal Ojo Oke & B. A. Aseer	2012	Nigeria	Annual market capitalisation on the Nigerian stock exchange, government development stock, annual all share index and the value of transaction	From 1986 to 2010	Market data and transaction information	ARCH and GARCH	Do not follow strong form of efficiency
6	Deepak Gupta, Arti Anand, & Rohini Singh	2008	India	Stock prices of 294 stocks at the beginning and end of the financial year	From 2003 to 2007	Stock price data	t-test	Follow strong form of efficiency
7	Oladapo Fapetu & Joseph Ayowole Adesina	2013	Nigeria	Average monthly returns data of five banks out of 28 companies	From August 2007 to January 2011	Stock price data	t-test	Follow strong form of efficiency

Source: Compiled by author.

In summary, the above literature on examining different levels of the efficient market hypothesis provides mixed findings in three forms of market efficiency. The use of dissimilar data collection in different studied markets and the application of various methodological approaches draw diversified conclusions. Therefore, it is essential to discover the efficient forms of the Vietnamese stock market and explore the benefits of listed companies from listing, trading, and complying with the current regulations in this Asian emerging market.

3.4. Recent studies related to impacts of restructuring stock exchange markets on stock market efficiency.

In recent decades, there has been an upward trend of consolidating financial entities in the financial landscape in several developed and developing countries following the trend towards demutualisation (Azzam, 2010). The demutualisation is known as a process of transforming exchanges from non-profit and member-owned organisations into profit and investor-owned business organisations (Azzam, 2010). Stock exchanges in the emerging markets were mainly built in the form of state-owned structure, and their conversion into listed corporations has been increasingly boosted up (OECD, 2016). During this era of transformation, there have been a great number of mergers and acquisitions in the stock exchange industry (OECD, 2016). Consolidation in developed stock markets mainly aims at utilising excess capacity, while consolidation in developing markets is a strategy of strengthening the financial industry on the whole to overcome instability (Teplova & Rodina, 2016). The mergers and acquisitions refer to considered as the presentation of consolidation of exchanges, and the market efficiency is influenced by characteristics of the consolidation, level of national development, size, geographical diversification, and industrial diversification (Charles, Darné, Kim, & Redor, 2016).

Charles et al. (2016) studied the effects of stock exchange mergers on the informational efficiency. Generalised spectral shape test was used for testing the impact of 31 mergers on the market efficiency of 37 stock exchanges from 1997 to 2011, and this study utilised daily closing prices of the stock exchange market indices (Charles et al., 2016) ***(Appendix 3.1)***. To illustrate the impacts of consolidation across the time, different lengths of sub-periods were examined to investigate the periods of efficiency and then comparatively analyse the efficiency before and after stock exchange mergers (Charles et al., 2016). The results reflected a massive improvement in the market efficiency after a merger in most cases and the beneficial impact was more reflected in the short term than in the long term (Charles et al., 2016). The effects on the efficiency depend on merger characteristics of stock exchanges (Charles et al., 2016).

On 20 March 2000, it was publicly announced that the exchanges of Amsterdam, Brussels, and Paris planned to consolidate (Nielsson, 2009). In September 2000, these mentioned exchanges formally merged into Euronext, considered as the first pan-European exchange (Nielsson, 2009). In 2002, the Lisbon exchange also consolidated into the Euronext. The study of Nielsson (2009) empirically researched the impact of the Euronext stock exchange consolidation on listed companies and stock liquidity. The main data set included monthly observations of 1,506 listed firms on Euronext between September 1996 and September 2006 (Nielsson, 2009). A fixed effects regression with dummy variables were deployed to test the impacts of the Euronext stock exchange merger on stock liquidity (Nielsson, 2009). In addition, a seemingly unrelated regression was used to examine its competitive effects (Nielsson, 2009). The findings revealed an overall decrease in volatility and the Euronext merger predominantly boosted trading activities in large firms and firms with foreign sales (Nielsson, 2009). There was an insignificant improvement in stock liquidity of small and medium-sized firms or purely domestic companies (Nielsson, 2009). Further, the consolidation enhanced the competitive stand of Euronext in global financial markets (Nielsson, 2009).

Meanwhile, Ben Slimane (2012) examined the Euronext stock exchange merger and its effects on market volatility and associated risks. Different from the above study, two events related to the consolidation, including the day on which the trading platforms were harmonised and the day on which the clearing systems were integrated, were considered (Ben Slimane, 2012). The paper gathered daily data on stock returns for the main stock indices for Lisbon (PSI20), Amsterdam (AEX25), and Brussels (Bel20), and data of DAX, FTSE, and DJ indices were used in the control sample (Ben Slimane, 2012). The database covered from January 1999 to December 2005 (Ben Slimane, 2012). The paper employed a standard GARCH (1, 1) model to assess the volatility of stock markets in Lisbon, Amsterdam, and Brussels (Ben Slimane, 2012). There was no obvious evidence that the harmonisation of the trading platforms and the integration of the clearing systems would greatly impact the volatility of the merged markets (Ben Slimane, 2012). Thus, the empirical results showed that the Euronext consolidation did not have any significant effects on the market risk (Ben Slimane, 2012).

On 19 December 2011, Moscow Interbank Currency Exchange and the Russian Trading System consolidated into a single trading platform named the Moscow Exchange (Teplova & Rodina, 2016). The merger aimed to reinforce state control over the Russian financial market upon the financial crisis of 2008 – 2009 (Teplova & Rodina, 2016). An investigation related to the roles of this strategic consolidation in boosting market liquidity in the case study of Russia was conducted by Teplova & Rodina (2016). It used daily closing prices of 169 stocks from

September 2011 to September 2012 (Teplova & Rodina, 2016). The K-S and the Wilcoxon tests were used to compare market-wide liquidity before and after the exchange acquisition (Teplova & Rodina, 2016). As their conclusion, consolidating financial entities, especially domestic exchanges, could support to organise a multifunctional trading platform with high product diversification, reduce transaction costs and risks, and advance the exchange to the position of a global player (Teplova & Rodina, 2016).

Additionally, Hellström, Liu, & Sjögren (2018) examined whether the consolidation of Nordic and Baltic stock trading platform impacted on weak-form informational efficiency. The sample comprised stock prices of 236 Swedish, 111 Finnish, 153 Danish, and 51 Baltic stocks, and the data was collected from 04 January 2000 to 31 December 2007 (Hellström, Liu, & Sjögren, 2018). This study deployed a time-varying measure of return predictability for individual stocks in a panel dataset to evaluate the effects of this stock market merger (Hellström, Liu, & Sjögren, 2018). The findings pointed to a positive effect of the stock market consolidation on the informational efficiency and turnover for an average firm, but the merger impacts were asymmetrically distributed over firms (Hellström, Liu, & Sjögren, 2018).

The findings are consistent with output of a case study of Indonesia Stock Exchange merger. In specific, the Surabaya Stock Exchange and the Jakarta Stock Exchange were merged into the Indonesia Stock Exchange, and the merger was initiated on 27 December 2005 and officially implemented on 01 December 2007 (Yang & Pangastuti, 2016; Kholisoh, 2017). A study of Yang & Pangastuti (2016) examined the impact of the merger on improvement of market liquidity by applying the ordinary least squares method. Daily data for the market indices and listed company prices was used (Yang & Pangastuti, 2016). The sample included 1,304 observations from 30 November 2002 to 29 November 2007 and 1,522 observations from 30 November 2007 to 29 November 2012 (Yang & Pangastuti, 2016). As a result, the merger events led to an improvement in trading volume and market liquidity, and the growth of number of listed companies and market capitalisation could boost the market efficiency based on economies of scale (Yang & Pangastuti, 2016). Moreover, a greater market efficiency and liquidity for the local stock exchange is also found (Yang & Pangastuti, 2016).

On the other hand, Kholisoh (2017) also studied the impact of Indonesia Stock Exchange merger on volatility and liquidity especially on the level of the firms' stock. The work focused on the period of two months before and after 01 December 2007, when the consolidation was conducted (Kholisoh, 2017). It collected over 350,000 intraday transactions data of 45 liquid stocks to illustrate statistically (Kholisoh, 2017). The parametric paired t-test

was deployed to examine whether there were any significant changes in the variables from pre and post merging into the Indonesia Stock Exchange or not (Kholisoh, 2017). The empirical findings manifested an enhancement of average frequency of trading after the merger as compared to the period before the merger, but it was not significant (Kholisoh, 2017). It implied insignificant impacts of merger on the market liquidity as well as the volatility on the average in the stock market (Kholisoh, 2017).

Overall, diversified studies provide different findings regarding to the impacts of stock exchange merge on the market efficiency ***(Table 3.5)***. In particular, Charles et al. (2016), Nielsson (2009), Teplova & Rodina (2016), Yang & Pangastuti (2016) and Hellström, Liu, & Sjögren (2018) stated that consolidation enhanced the informational efficiency, the market liquidity, and the competitive stand of the researched markets as well as benefited the listed firms. Nevertheless, Ben Slimane (2012) and Kholisoh (2017) found no significant effect of the merger on the volatility and market risks. Thus, it is expected that the Vietnamese stock market efficiency has been developed thanks to strategic changes in the stock exchange markets.

Table 3.5: Empirical studies on effects of restructuring stock exchanges in emerging countries

No.	Study	Year of publication	Markets under study	Data collection	Time frame	Company/ Market indexes	Methods	Findings
1	Amélie Charles, Olivier Darné, Jae H. Kim, & Etienne Redor	2016	37 stock exchanges	31 mergers on the level of efficiency of 37 stock exchanges	From 1997 to 2011	Daily closing spot prices of market indices	Generalised spectral shape test	The market efficiency was improved, and it was influenced by characteristics of the merger, level of national development, size, geographical diversification, and industrial diversification.
2	Ulf Nielsson	2009	Amsterdam, Brussels, Lisbon, and Paris	Monthly observation of 1,506 listed firms on Euronext	From September 1996 to September 2006	Monthly prices of all listed firms	Fixed effects regression with dummy variables and seemingly unrelated regression	The merger led to a decrease in volatility, boosted trading activity in big firms and firms with foreign sales, and enhanced the competitive stand of Euronext in global financial markets.
3	Faten Ben Slimane	2012	Lisbon, Amsterdam, and Brussels	Daily data on stock returns for Lisbon (PSI20), Amsterdam (AEX25) and Brussels (Bel20)	From January 1999 to December 2005	Daily prices of market indices	GARCH (1, 1)	The consolidation did not have significant effects on the market risk.
4	Tamara V. Teplova & Victoria A. Rodina	2016	Moscow Exchange	Daily closing prices of 169 stocks	From September 2011 to September 2012	Daily prices of listed stocks	The K-S and the Wilcoxon tests	Consolidating financial entities, especially domestic exchanges, could support to organise a multifunctional trading platform with high product diversification, lower transaction costs and risks, and advance the position of the stock exchange in the global market.
5	Jörgen Hellström, Yuna Liu, & Tomas Sjögren	2018	Nordic and Baltic stock exchange	Stock prices of 236 Swedish, 111 Finnish, 153 Danish, and 51 Baltic stocks	From 04 January 2000 to 31 December 2007	Daily prices of listed stocks	Sign test and muliple variance ratio test	There was a positive effect of the stock market consolidation on the informational efficiency and turnover for an average firm.

No.	Study	Year of publication	Markets under study	Data collection	Time frame	Company/ Market indexes	Methods	Findings
6	Ann Shawing Yang & Airin Pangastuti	2016	Indonesia	1,304 observations in pre-merger period and 1,522 observations in post-merger period	From 30th November 2002 to 29th November 2012	Daily prices of market indices and listed stocks	Ordinary least squares analysis	The merger events led to an improvement in trading volume and market liquidity. The growth of number of listed companies and market capitalisation could boost the market efficiency based on economies of scale.
7	Luluk Kholisoh	2017	Indonesia	Over 350,000 intraday transactions data of 45 liquid stocks	Two months before and after 1st December 2007	Intraday transaction s data of 45 liquid stocks	Parametric paired t-test	There were not significant impacts of the merger on the market liquidity and volatility on the average.

Source: Compiled by author.

3.5. Previous studies related to the Vietnamese stock market efficiency

There has been a considerable growth in the demand for investment funds in Vietnam and a significant development of the Vietnamese stock market in terms of market capitalisation and liquidity (Gupta, Yang, & Basu, 2014; Vo & Truong, 2017). The new listings of firms and the attraction of foreign investors also accelerate the stock market development (Vo & Truong, 2017). It is crucial to examine whether stock prices in the market reflect the performance of the companies or their true economic value to make good financial decisions (Gupta, Yang, & Basu, 2014). There have been various studies appraising the market efficiency of the Vietnamese stock market at different levels of efficient market hypothesis.

In particular, Dong Loc, Lanjouw, & Lensink (2010) exploited weekly price series of VN Index and the five oldest stocks on the stock exchange. To examine the weak form of the market efficiency, autocorrelation tests, nonparametric runs tests, and variance ratio tests were implemented (Dong Loc, Lanjouw, & Lensink, 2010). The results obtained from the autocorrelation tests, runs tests, and variance ratio tests failed to support the random walk hypothesis for the market index, and all chosen individual stocks, so the Vietnamese stock market was inefficient in the weak form (Dong Loc, Lanjouw, & Lensink, 2010).

Guidi & Gupta (2013) investigated market efficiency in six Association of South East Asian Nations (ASEAN) stock markets, including Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam. This study collected the daily prices for stock market indices from 04 January 2000 to 29 April 2011 (Guidi & Gupta, 2013). It rejected the efficient market hypothesis for the stock markets of Indonesia, Malaysia, Philippines, and Vietnam (Guidi & Gupta, 2013). On the other hand, share markets of Singapore and Thailand were weak form efficient (Guidi & Gupta, 2013). Moreover, the evidence supported that these markets did not follow the same trend, implying that it was impossible to predict prices in one market based on information in another market (Guidi & Gupta, 2013).

The findings agreed with the empirical study of Do, Le, & Nguyen (2015). The research of Do, Le, & Nguyen (2015) aimed to examine whether the Vietnamese stock market, one of the emerging markets, was weak form efficient or not. It collected daily and weekly return of VN Index in HOSE and HNX Index in HNX from 2000 to 2013 (Do, Le, & Nguyen, 2015). To test the weak form of efficient market hypothesis, two statistical techniques namely the Portmanteau test and nonparametric runs test were deployed (Do, Le, & Nguyen, 2015). The results from the Portmanteau test manifested statistically significant positive autocorrelation coefficients of the stock returns in the Vietnamese stock exchange markets (Do, Le, & Nguyen, 2015). Furthermore, the runs test indicated the existence of positive correlations in the data

(Do, Le, & Nguyen, 2015). Therefore, there was a lack of random walk features, so the Vietnamese stock market was weak form inefficient (Do, Le, & Nguyen, 2015).

Shaik & Maheswaran (2017) investigated the stock market efficiency of eight nations of ASEAN. The daily closing prices data of market indices in Cambodia, Indonesia, Lao, Malaysia, Philippines, Singapore, Thailand, and Vietnam were used to examine. The study period was chosen differently based on markets and VN Index in the Vietnamese stock market from 2000 to 2016 (Shaik & Maheswaran, 2017). The work used unit root test, variance ratio test, spectral shape test, and average exponential test to evaluate the random walk hypothesis in these mentioned markets (Shaik & Maheswaran, 2017). The unit root test and Wright (2000) rank and sign-based test rejected the random walk hypothesis in all the selected ASEAN markets (Shaik & Maheswaran, 2017). The other variance ratio tests, the spectral shape test, and the average exponential test found that the stock markets in Indonesia, Philippines, Thailand, and Vietnam were inefficient (Shaik & Maheswaran, 2017). Therefore, the findings from all tests indicated that the Vietnamese stock market was not weak form efficient.

More attention and investment were devoted to the emerging Vietnamese stock market and investors tried to find opportunities to gain ARs in the market, so a study of Luu, Pham, & Pham (2016) examined seasonality effects on the Vietnamese stock exchange. To illustrate the seasonality effects, the data of HOSE composite index – VN Index was gathered from 03 January 2006 to 31 December 2014 with a total of 2242 observations and the t-test was used (Luu, Pham, & Pham, 2016). The statistical analysis showed an existence of seasonal anomalies, indicating opportunities for arbitragers to achieve abnormal profits based on analysing and forecasting in the Vietnamese stock market (Luu, Pham, & Pham, 2016). In other words, the Vietnamese stock market was not fully efficient yet (Luu, Pham, & Pham, 2016). The finding of this study was supported by the results of appraising whether momentum exists of Vo & Truong (2017). It was recommended that investors build investment strategy and a portfolio based on previous 6 months and hold for 9 months to generate a favourable profit (Vo & Truong, 2017).

Nghia & Blokhina (2020) made an assessment about the efficiency of Vietnamese stock market in the period from 2015 to 2018. The authors tested the weak form levels of Vietnamese stock market efficiency by conducting statistical tests on the VN Index from the beginning of January 2015 to the end of April 2018 (Nghia & Blokhina, 2020). The findings showed that the stock market was not weak form efficient. According to the research, a main root referred that the enterprises had not performed their obligation of information disclosure properly and fully, and the quality of published information was inferior (Nghia & Blokhina, 2020). Therefore, it led to a low level of information transparency (Nghia & Blokhina, 2020).

Moreover, Phan & Zhou (2014) studied whether the Vietnamese stock market was efficient by examining random walk hypothesis. The data set included weekly prices of VN Index and daily prices of the five oldest shares listed on the Vietnamese stock market. The research covered from 28 July 2000 (the day of first trading session) to 28 July 2013 (Phan & Zhou, 2014). Three statistical techniques consisting of autocorrelation test, variance ratio test, and runs test were adopted to explore the weak form of the efficient market hypothesis (Phan & Zhou, 2014). Runs tests, autocorrelation test, and Lo & MacKinlay's variance ratio test pointed out that random walk hypothesis was rejected for the full sample and the first two cycles of the stock market (Phan & Zhou, 2014). This research indicated that there was a gradual development of its market efficiency over more than ten operating years although the Vietnamese stock market was weak form inefficient (Phan & Zhou, 2014). The results from autocorrelation test and variance ratio test under the assumption of homoscedastic or heteroscedasticity increments provided enough evidence to accept random walk hypothesis for the third cycle (Phan & Zhou, 2014). In other words, it could be weak form efficient in the period from 24 February 2009 to 28 July 2013 (Phan & Zhou, 2014).

Furthermore, the outcome was consistent with the results obtained from the study of Gupta, Yang, & Basu (2014). The researchers investigated the existence of weak form efficiency in the Vietnamese stock market. This investigation collected data on the basis of daily, weekly, monthly and quarterly index returns in HOSE from 2000 to 2012 (Gupta, Anand, & Singh, 2008). To appraise the effects of the global financial crisis on the Vietnamese stock market efficiency, data was divided into pre-crisis period, crisis period, and post crisis period (Gupta, Yang, & Basu, 2014). This study performed ADF test, PP tests, and KPSS tests to evaluate the weak form efficiency (Gupta, Yang, & Basu, 2014). The results obtained from the different tests in the pre-crisis and during crisis were mixed, and it was dominantly found that the stock market was inefficient in the pre-crisis and during crisis periods (Gupta, Yang, & Basu, 2014). However, the Vietnamese stock market was weak form efficient after the crisis (Gupta, Yang, & Basu, 2014). It implied an improvement in its market efficiency and the Vietnamese market was progressing towards weak form efficiency (Gupta, Yang, & Basu, 2014).

Tran & Mai (2015) considered the Vietnamese stock market as an interesting laboratory to assess the effects of dividend announcements on share prices. The data set included closing prices and adjusted closing prices of 233 companies listed on HOSE with totally 979 dividend announcements between 2008 and 2014 (Tran & Mai, 2015). ARs and abnormal trading behaviours were evaluated by event study method (Tran & Mai, 2015). There were three groups of dividend announcements in the study – dividend increases, dividend

decreases, and no change (Tran & Mai, 2015). The event window was from day -5 to day +5, and the estimation window was from day -125 to day -6 (Tran & Mai, 2015). Parametric student t-test and non-parametric Wilcoxon signed-rank test were deployed (Tran & Mai, 2015). As a result, the mean and median values of AR from day -2 to day -1 in the dividend increase cluster were significantly positive (Tran & Mai, 2015). Moreover, abnormal trading volume was significantly different from zero from day 0 to day +5 in these three groups (Tran & Mai, 2015). It provided strong statistical evidence of information leakage or insider trading before the announcement date (Tran & Mai, 2015). Therefore, the market was not semi-strong efficient due to the information leakage before the announcement day and the low transparency level of the stock market (Tran & Mai, 2015).

The empirical research of Tran, Nguyen, & Pham (2016) appraised semi-strong form efficiency in the Vietnamese stock market by analysing market reaction to dividend and earnings announcements. It involved 247 listed companies on HOSE from 2014 to 2015 (Tran, Nguyen, & Pham, 2016). The daily stock price of each firm and VN Index were used for 21 days around the publishing day from HOSE database from day -10 to day +10, and the data consisted of announcements of dividends and quarterly earnings of the companies (Tran, Nguyen, & Pham, 2016). Event study methodology with parametric t-test was adopted to examine the semi-strong form efficiency (Tran, Nguyen, & Pham, 2016). It was pointed out that there was insignificant reaction on the announcement day and in few days around it (Tran, Nguyen, & Pham, 2016). Additionally, there were significant ARs within 20 trading days surrounding the date of dividend and earnings announcements (Tran, Nguyen, & Pham, 2016). It revealed that stock prices did not promptly and adequately reflect the new information, and these announcements had significant impact on the stock price in the event window of 20 days (Tran, Nguyen, & Pham, 2016). In other words, the evidence did not support the appearance of semi-strong form in the Vietnamese stock market (Tran, Nguyen, & Pham, 2016).

Furthermore, there has been an upward trend of attention from regulatory agencies, investors, and academics to insider trading, particularly in countries with weak regulatory structures in recent years (Nguyen, Tran, & Zeckhauser, 2017). Nguyen, Tran, & Zeckhauser (2017) evaluated 718 split events in the Vietnamese emerging stock market in the period of January 2007 and May 2011. A panel data set on stock prices with 426,931 daily observations was used for all firms listed on HOSE and HNX (Nguyen, Tran, & Zeckhauser, 2017). Moreover, daily data on VN Index and HNX Index, two key market indices in Vietnam, were also analysed (Nguyen, Tran, & Zeckhauser, 2017). Standard event study methodology with parametric t-test and non-parametric Wilcoxon test was deployed to appraise hypotheses in

the study (Nguyen, Tran, & Zeckhauser, 2017). Both t-test and Wilcoxon test provided that the average cumulative market-adjusted return was statistically significant in the event window of (-30, +30) of the split announcements (Nguyen, Tran, & Zeckhauser, 2017). Stocks split of vulnerable firms caused significant excess short-term returns, and the ARs were remarkably high before the split announcements (Nguyen, Tran, & Zeckhauser, 2017). The ARs were regarded as evidence for insider trading (Nguyen, Tran, & Zeckhauser, 2017).

Subsequently, there have been inconsistent findings from examining the Vietnamese stock market efficiency. Dong Loc, Lanjouw, & Lensink (2010), Guidi & Gupta (2013), Do, Le, & Nguyen (2015), Shaik & Maheswaran (2017), Luu, Pham, & Pham (2016), and Nghia & Blokhina (2020) concluded that the Vietnamese stock market was inefficient in weak form hypothesis. On the other hand, Phan & Zhou (2014) and Gupta, Yang, & Basu (2014) consented that there was an improvement in its market efficiency, and the Vietnamese market had weak form efficiency post the global financial crisis. Tran & Mai (2015) and Tran, Nguyen, & Pham (2016) supported that the Vietnamese stock market did not fully achieve the semi-strong form efficiency. The work of Nguyen, Tran, & Zeckhauser (2017) also indicated the ARs around the announcements, which was considered as evidence for insider trading. The investigations in the different periods using the dissimilar statistical tests gave the diversified conclusions ***(Table 3.6)***. These existing studies examine the market efficiency by only evaluating the market level and mainly using the quantitative methods. However, it would be pointless without appraising its empirical implications in the listed companies as there is a crucial linkage between the market efficiency and the performance of the companies (Anhar, 2015; Ang, Goetzmann, & Schaefer, 2011; Rejeb & Boughrara, 2013; Uwah & Asuquo, 2016). Thus, it is crucial to research impacts of the market behaviours on the business performance of listed companies, including both newly listed companies and existing companies, in the developing period. Furthermore, there is insufficient research assessing the effects of recent regulatory changes in the Vietnamese stock market on the market efficiency. Additionally, most of these studies on the Vietnamese stock market efficiency analyse only the market indices or the five oldest listed companies. These mentioned gaps are addressed in this work.

Table 3.6: Empirical studies on the Vietnamese stock market efficiency

No.	Study	Year of publication	Markets under study	Data collection	Time frame	Company/ Market indexes	Methods	Findings
1	Truong Dong Loc, Ger Lanjouw & Robert Lensink	2010	Vietnam	Weekly price series of VN Index and the five oldest stocks	From 2000 to 2004	Data of market index and individual stocks	Autocorrelation tests, runs tests and variance ratio tests	Do not follow weak form of efficiency
2	Francesco Guidi & Rakesh Gupta	2013	Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam	Daily prices for six stock market indices	Data period lasted from 04 January 2000 to 29 April 2011	Data of market indices	Unit root tests (ADF test and KPSS test); Variance ratio tests (Mutiple variance ratio test and Wright test); Runs test and Johansen and Juselius cointegration test	Do not follow weak form of efficiency (Vietnam)
3	Thi Thanh Nhan Do, Tuan Bach Le, & Thanh Trung Nguyen	2015	Vietnam	Daily and weekly return of VN Index and HNX Index	From 2000 to 2013	Data of market indices	Portmanteau test and runs test	Do not follow weak form of efficiency
4	Muneer Shaik & S. Maheswaran	2017	Cambodia, Indonesia, Lao, Malaysia, Philippines, Singapore, Thailand, and Vietnam	The daily closing prices data of market indices in 8 ASEAN stock markets	Flexible based on markets and VN Index (2000 - 2016)	Data of market indices	Unit root test, variance ratio test, spectral shape test and average exponential test	Do not follow weak form of efficiency (Vietnam)
5	Chung Tien Luu, Cuong Hung Pham, & Long Pham	2016	Vietnam	2242 observations of VN Index	From 2006 to 2014	Data of market index	t-test	Do not follow weak form of efficiency

No.	Study	Year of publication	Markets under study	Data collection	Time frame	Company/ Market indexes	Methods	Findings
6	Pham T. Nghia. & Tatiana K. Blokhina	2020	Vietnam	Daily return of VN Index	From January 2015 to April 2018	Data of market index	Unit root test	Do not follow weak form of efficiency
7	Khoa Cuong Phan & Jian Zhou	2014	Vietnam	Weekly prices of VN Index and daily prices of the five oldest listed shares	From 2000 to 2013	Data of market index and individual stocks	Autocorrelation test, variance ratio test, and runs test	Follow weak form of efficiency in only the third cycle
8	Rakesh Gupta, Junhao Yang, & Parikshit K. Basu	2014	Vietnam	Daily, weekly, monthly, and quarterly index returns from HOSE	From 2000 to 2012	Data of market index	ADF test, PP tests, and KPSS tests	Follow weak form of efficiency after the crisis
9	Quoc Trung Tran & Y Dat Mai	2015	Vietnam	979 dividend announcements issued by 233 companies listed on HOSE	From 2008 to 2014	Data of stock prices	Event study with t-test and Wilcoxon signed-rank test	Do not follow semi-strong form of efficiency
10	Thi Xuan Anh Tran, Thanh Phuong Nguyen, & Tien Manh Pham	2016	Vietnam	Daily stock price of 247 listed companies on HOSE and VN Index related to dividend and earnings announcements	From 2014 to 2015	Data of market index and individual stocks	Event study with t-test	Do not follow semi-strong form of efficiency
11	Vinh Nguyen, Anh Tran, & Richard Zeckhauser	2017	Vietnam	Data set on stock prices, VN Index and HNX Index with 426,931 daily observations around 718 split events	From 2007 to 2011	Data of market indices and individual stocks	Event study with t-test and Wilcoxon signed-rank test	Existence of insider trading

Source: Compiled by author.

3.6. Conclusion

The enhancement in financial interconnectedness and globalisation could develop informational efficiency but boost financial contagions of risks and crisis between emerging markets and developed markets. Due to the unique characteristics of emerging and frontier stocks markets, it is significant to investigate the informational efficiency of these emerging and developing markets (Barry, Peavy III, & Rodriguez, 1998). In recent years, Vietnam has been recognised as one of the most dynamic frontier and emerging stock markets in Asia (Pham, Nguyen, & Vo, 2018). It is crucial for researchers, analysts, policy makers, managers, and investors to gain a comprehensive view about the efficiency of the Vietnamese emerging market due to the regulatory changes in the market. In an efficient market, stock prices provide reliable indicators for managers to have managerial efficacy as well as make right investment decisions (Ali et al., 2018).

Based on the above literature on testing different levels of the efficient market hypothesis, mixed findings in three forms of market efficiency are found. Using dissimilar data collection in various studied markets and applying different methodological approaches drew diversified conclusions. Furthermore, several studies have supported that the strategic changes of stock exchange markets have beneficial effects on the market efficiency. Therefore, it is essential to discover the efficient forms of the Vietnamese stock market and the impacts of the market behaviours on the business performance. It is also expected that the Vietnamese stock market efficiency will be enhanced thanks to the mentioned restructuring of the stock exchange markets in Vietnam.

From the literature review, there are three gaps listed as below:

- The current empirical studies on efficient market hypothesis related to the Vietnamese stock market only evaluate the market efficiency by mainly using quantitative methods (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran, Nguyen, & Pham, 2016). It indicates that the works provide understanding by looking at the market only. However, it would be pointless without appraising its empirical implications in the listed companies because there is a crucial linkage between the market efficiency and companies' performance, and share price is one of key financial factors in assessing and determining market value of a company (Uwah & Asuquo, 2016). Anhar (2015), Ang, Goetzmann, & Schaefer (2011), Rejeb & Boughrara (2013), and Rehman et al. (2018) consented that the stock market could positively support managers and investors to make right decisions and implement the best strategies. In an efficient market, the stock price provides reliable signals of

stock prices and listed companies (Arnold, 2019). Additionally, the stock market volatility has essentially positive effects on earnings management (Long & Li, 2010). On the contrary, when a market is inefficient and sentiments are crucial in making decisions, inaccurate valuation by applying any existing asset pricing model could cause undervaluing or overvaluing problems (Ali et al., 2018, Majumder, 2012). This research makes original contributions to the literature by providing a theoretical framework to examine the efficient forms of the stock market as well as evaluate its impacts and implications on the business performance. This study contributes to knowledge of the linkages between financial market efficiency and business performance of listed companies in emerging markets by conducting the investigation at the level of market and looking at the reflection of market participants simultaneously. In doing the research, it bridges the existing gap in the literature on market efficiency and its potential benefits to listed companies in stock exchange markets. This study uses various sources of data, including quantitative data, qualitative data, and documentary data, to judge the context as well as combines quantitative and qualitative methods to analyse and appraise the market efficiency in the case study of Vietnam.

- Furthermore, there are insufficient evidence researching the impact of the current policies and regulations in the emerging stock markets on the market efficiency (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran, Nguyen, & Pham, 2016). Moreover, restructuring of the securities market has been the primary strategic project in Vietnam since 2012 (The Prime Minister, 2012b). Reforming the two current stock exchanges has been one of the essential strategic activities, and various regulatory changes have been made to not only enhance the market stability and efficiency but also facilitate its sustainable development in recent years (The Prime Minister, 2012b). Therefore, this research contributes to the literature by examining the current market efficiency and its improvement due to recent policies and regulations in the emerging stock exchange market by providing a detailed investigation of the case study of Vietnam as an example.
- Additionally, most of the existing studies in the Vietnamese stock market efficiency conduct tests based on only market indices or the five oldest listed shares (Dong Loc, Lanjouw, & Lensink, 2010; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017). Nonetheless, market indices in emerging countries are not the criterion fully and accurately reflecting characteristics of all stocks listed and traded in the emerging market, so employing only the market indices could cause distorted outcomes. In addition, companies with dissimilar firm sizes from different sectors have

diverse behaviours and obtain various impacts of listing, trading, and complying with the current regulations in the stock market due to some unique attributes and characteristics (Dahoei & ParvizSaídi 2012; Duy & Phuoc, 2016; Handayani et al., 2018; Mulyono, Suprapto, & Prihandoko, 2018; Ul Haq & Rashid, 2014). Thus, this research employs different sizes of the listed companies in various sectors in the examination in addition to the market indices to ensure the reliability and the validity of testing efficiency of the Vietnamese stock market.

The gaps found in the literature reviewed above have informed the formulation of this thesis research question and objectives, and these mentioned gaps are filled in this research.

CHAPTER 4: RESEARCH METHODOLOGY

4.1. Introduction

Based on the previous chapters, it is essential not only to discover the efficient forms of the Vietnamese stock market and its impacts on listed companies, but also to examine whether there is the development of this market efficiency due to the restructuring project. The Vietnamese stock market efficiency is expected to be enhanced thanks to the mentioned changes in the Vietnamese stock exchange markets. There are three main gaps exerted from the literature review of this research. Firstly, the current empirical studies on efficient market hypothesis related to the emerging stock markets appraised the market efficiency by only investigating the market and mainly using quantitative methods (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran, Nguyen, & Pham, 2016). Secondly, there is insufficient research examining the market efficiency and its improvement due to recent regulatory changes in the emerging stock markets (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran, Nguyen, & Pham, 2016). Thirdly, the existing studies related to the Vietnamese stock market efficiency examine only the market indices or the five oldest listed shares to provide an understanding of the market efficiency (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017).

This work will fulfil the above-mentioned gaps, and this research offers two general contributions that could be applied in not only Vietnam but also other countries and one specific contribution that focuses on the case study of Vietnam. Firstly, this research makes original contributions to the literature by providing a theoretical framework to simultaneously examine the efficient forms of the stock market as well as evaluate its impacts and implications on the business performance. Secondly, it contributes to the literature by examining the current market efficiency and its improvement due to recent policies and regulations in the emerging stock exchange markets by taking the case study of Vietnam as an example. Thirdly, this study considers different sizes of the listed companies in various sectors in addition to the market indices to ensure the reliability and the validity of testing the Vietnamese stock market efficiency.

To deal with the research question and objectives, this research analyses and combines qualitative and quantitative data with support from documentary data. Firstly, the research focuses on statistically testing historical price data supported by documentary data to approach the first research objective. To meet the requirement of the second research

objective, it involves the analysis and evaluation of quantitative data in support of qualitative data. The qualitative data collection and analysis in this study is conducted based on the findings from statistically appraising the market efficiency of the Vietnamese stock market. Furthermore, while the qualitative data analysis strives for the third research objective, the qualitative data analysis is supported by documentary data in order to firmly meet the requirement of the last research objective. In this study, the influences that listed companies would obtain from the Vietnamese stock market are regarded as time valuation of a company, enhancement of funds, business management or corporate expansion. As multiple sources of data and mixed methods are employed to seek the research question and objectives, the alignment of philosophy and methodology with the research purposes is ensured. In this present study, building and organising research methodology is based on the research question and objectives. This chapter designs and interprets the research methodology, and it includes research philosophy, research approach, methodological choice and design, and data collection and analysis.

4.2. Research philosophy

Research philosophy refers to the development of knowledge and the nature of that knowledge, and it relates to major assumptions about the way in which the researcher views the world (Saunders, Lewis, & Thornhill, 2019). A philosophical worldview is regarded as a basic set of beliefs, a general viewpoint about the world, and the nature of research that orients researchers in research decisions and actions (Creswell & Creswell, 2018). The author briefly reviews some potential philosophical stances in business and management, and then justifies and chooses the best to obtain the research requirements and objectives from my viewpoint as a researcher.

It is vital to understand the philosophical approach underlying given research in order to conduct the research appropriately in alignment with the purpose and focus of the research, and each research project has particular ontological, epistemological, and axiological stances. Ontological assumptions concern the nature of reality, and it shapes the way the researchers view and study the research objects (Saunders, Lewis, & Thornhill, 2019). The ontology could determine the way the researcher see the world of business and management and relevant issues, and then the directions the research project could take (Saunders & Lewis, 2018). Epistemology is regarded as knowledge, to what constitutes acceptable knowledge in a field of study, and epistemological assumptions determine what contributions to knowledge the researcher could be made as a result of the research (Saunders, Lewis, & Thornhill, 2019). It studies the nature, scope, limits, and validity of human knowledge. Axiology is a branch of

philosophy that studies the importance of values and ethics within the research process, which incorporates the way the researchers deal with their own values as well as those of their research participants (Saunders & Lewis, 2018). The research philosophies could be differentiated in terms of where their assumptions fall on the objectivism – subjectivism continua. Objectivism refers to the assumptions of the natural sciences and it argues that social entities in reality are external to social actors, whereas subjectivism is regarded as a research position that social phenomena are created from the perceptions and consequent actions of social actors (Saunders, Lewis, & Thornhill, 2019).

Three key types of philosophies used in finance and management include positivism, interpretivism, and pragmatism (Creswell & Creswell, 2018). Positivism is regarded as a philosophical stance of the natural science, and it is gained through observation and by highly structured methods to facilitate replication and produce law-like generalisations (Saunders, Lewis, & Thornhill, 2019). This philosophical stance incorporates unambiguous and accurate knowledge (Saunders, Lewis, & Thornhill, 2019). Epistemologically, the emphasis is placed on the strictly scientific empiricist method designed to investigate the observable and measurable data and facts uninfluenced by human interpretation, and positivists consider causal explanation and prediction as contribution (Creswell & Creswell, 2018; Saunders, Lewis, & Thornhill, 2019). The positivist researchers attempt to maintain an objective, neutral, detached, and independent stance from what is researched in order to avoid influencing the research findings (Saunders, Lewis, & Thornhill, 2019). This approach is used in data-driven studies, and the subsequent research findings are considered objective and generalisable (Schinckus, 2015). Thanks to data collection and analysis based on evidence and statistical probability, logicality, and reliability of highly structured methods are considered as advantages of positivist research (Saunders, Lewis, & Thornhill, 2019). However, it is impossible to employ this approach to implement studies involving human intention, attitudes, thoughts, and unobservable entities due to a major focus on sense experience and lack of explicit evidence (Hammersley, 2013). Meanwhile, interpretivism is a subjectivist philosophy, which advocates the importance of understanding differences between humans as social actors (Saunders, Lewis, & Thornhill, 2019). This philosophy emphasises investigating social world of business and management based on understanding of phenomena and interactions, and interpretivism prefer humanistic qualitative methods (Easterby-Smith, Thorpe, Jackson, & Jaspersen, 2018). For the interpretivists, the reality is socially constructed through culture and language, and there are multiple meanings, interpretations, and realities (Saunders, Lewis, & Thornhill, 2019). Epistemologically, they focus on narratives, stories, perceptions, and interpretations as well as consider new understandings and worldviews as contributions (Saunders, Lewis, & Thornhill, 2019). Interpretivist research has high validity because primary

data offers trustworthy, honest, and in-depth information, and interpretive researchers are part of what is researched (Easterby-Smith et al., 2018). However, due to the heavily influenced data by personal viewpoints and values, it is impossible to make a law-like generalisation based on the primary data generated in interpretive studies (Saunders, Lewis, & Thornhill, 2019). Moving to the next one, pragmatism is defined as a research philosophy in which the most important determinants of the research philosophy are the research question and objectives (Saunders, Lewis, & Thornhill, 2019). For pragmatic researchers, the reality is considered as the practical consequences of ideas, and the emphasis is placed on the flux of processes, experiences, and practices (Saunders, Lewis, & Thornhill, 2019). The pragmatists focus on investigating and solving problems in practice as well as informing future practice as the contribution, so they concern the practical meaning of knowledge in specific contexts epistemologically and this philosophy incorporates value-driven research axiologically (Saunders, Lewis, & Thornhill, 2019). The pragmatic researcher could embrace various research strategies, and the choice of them is driven by the specific nature of their research problems and the needs of the research project (Greenfield & Greener, 2016). This philosophy allows working within both positivist and interpretivist positions as well as employ both quantitative and qualitative methodologies with the goal of obtaining the best possible research outcomes (Greenfield & Greener, 2016). The use of mixed methods ensures that the advantages of both the highly structured methods and the primary data collection are integrated and enhanced while their disadvantages offset each other (Yoshikawa, Weisner, Kalil, & Way, 2008). As there are different types of philosophical stances employed in the academic world, the selection of a possible philosophy strives to meet the research requirements.

This research focuses on testing the efficiency of the Vietnamese stock market and its improvements and discovering how the listed companies would be impacted in the current stock market, which makes the research a real-world practice-oriented study. The methodology of research is essentially determined by the research question and objectives. Evaluation of this market efficiency requires a positivist and a quantitative approach, whereas exploration of the impacts of market behaviours on the listed companies and the way to improve efficiency needs interviews and a qualitative approach. The study focuses on the research question and objectives to choose and apply several methods, different world views, and various types of data collection and analysis to best meet the research requirements. This research investigates a mixture of qualitative, quantitative, and documentary data to deal with the research question and the research objectives. It integrates both objective and subjective approaches as well as employs mixed methods combining quantitative and qualitative methods to meet the research requirements. This study looks at the evidence of the market

level and the market participants' levels to provide comprehensive outcomes. Hence, mixed method methodology, which is used in this study, is consistent with a pragmatism philosophy. The pragmatist ontology, epistemology, and axiology allow the researcher to address the research question and objectives, adopt a wide range of research methods as well as emphasise practical solutions and outcomes related to this emerging stock market efficiency.

4.3. Research approach

The research approach, which refers to a plan to undertake research with the intersection of philosophical worldview, research designs and specific methods, is selected by the nature of the research problem or addressed issue (Creswell & Creswell, 2018). Two main classifications of research approach are deduction and induction, whose characteristics will be briefly summarised. The deductive reasoning method is known as a method used to appraise general theories by testing hypotheses with specific data on a specific case (Ketokivi & Mantere, 2010). It refers to a highly structured methodology to facilitate replication to ensure reliability and operationalised concepts as well as the principle of reductionism to measure facts, understand problems better, and reach logical conclusions (Saunders, Lewis, & Thornhill, 2019). On the contrary, the inductive reasoning method starts by collecting data and having specific observations to obtain theoretical explanation and general conclusions (Sekaran & Bougie, 2013). The strength of an inductive approach is the process of investigation of problems based on understanding how humans interpreted their social world (Saunders, Lewis, & Thornhill, 2019).

The study depends on the research questions and objectives to choose a suitable research approach and this research combines quantitative, qualitative, and documentary data to meet the research requirements. To meet the first two research objectives, theories of efficient market hypothesis are applied to build adequate premises and statistically appraise the hypotheses on the Vietnamese stock market efficiency. It aims to examine whether the Vietnamese stock market follows a random walk model. The quantitative methods are mainly employed to collect the secondary data of daily prices of the market indices and the listed companies to examine the existence of relationships in the daily stock prices. If the market is weak form efficient, the tests for semi-strong efficient form will be undertaken. On the basis of findings from the statistical examination, this research determines the efficient level of the market and investigates the development of the market efficiency by comparing with the relevant literature.

To fulfil the second research objective, the statistical findings are reconfirmed by the opinions of the managers of the listed companies, the representatives of the stock exchanges,

and experienced and professional experts in the market regarding the current market efficiency and its improvements due to recent policies and regulations in the stock market. After that, the research continues to accomplish the two next research objectives. They are in regard to the pros and cons of listing, trading, and complying with the current regulations as well as the effects of market behaviours on the company performance in the current environment and development of the stock market. Thanks to the findings from the statistical tests, this study obtains a general view of the Vietnamese stock market efficiency and its improvements to build the potential interview questions to explore the market efficiency further. Moreover, it also depends on the statistical tests to identify potential interviewees. The interviews are conducted with the managers of the randomly chosen companies, the managers of the stock exchanges, and the experienced and professional experts participating in HOSE and HNX to gain new feedback, comments, and explanatory discussion. The qualitative findings are properly checked by supporting evidence from illustrating documentary information, including financial statements, annual reports, and sustainable development reports of the companies.

In summary, the research refers to appraising hypotheses by analysing collected historical stock price data, conducting interviews with the managers and the other market participants, and analysing relevant documentary sources of information. Thus, deduction and induction are mixed to obtain the relevant research requirements, which is called abduction.

4.4. Methodological choice and design

Research design is defined as a general framework for data collection and analysis to address research questions and obtain research objectives in order to provide a reasonable explanation for decisions on data sources, data collecting methods, and analysis techniques (Saunders, Lewis, & Thornhill, 2019). This session demonstrates some potential methodological choices and designs and then justifies how to make decisions to meet the research question and research objectives.

4.4.1. Justification for mixed methods choice

Three major types of methodological choices to gather information refer qualitative, quantitative, and mixed methods (Saunders, Lewis, & Thornhill, 2019). The terms quantitative and qualitative involves classifications of data as well as the way to acquire, process, illustrate, and report these types of data. These methodological choices will be discussed in the following part.

Qualitative research refers to researching social context, lived experiences, and human perceptions (Griensven, Moore, & Hall, 2014). Qualitative methods collect and evaluate non-numeric representations of the world, including words, texts, narratives, dialogues, interviews, pictures, and observations. The qualitative research methodology is deployed when there is an existing need to investigate the problem thoroughly, and it is often used to answer the open-ended research question (Rutberg & Bouikidis, 2018). Qualitative research flexibly gets access to new findings based on data collected and provides a comprehensive perspective on the issues or the contexts. It involves non-numeric data and social constructing topics, which contributes to flexibility and effectiveness in acquiring further understanding of the nature of the problems with a holistic approach (Easterby- Smith et al., 2018). However, it is difficult to quantify the raw materials with non-numeric data for analysing findings (Easterby-Smith et al., 2018). Thus, qualitative methodological choices are dominantly employed in research with an interpretive and inductive approach (Creswell & Creswell, 2018).

In contrast, quantitative methods deal with numeric data, so quantitative research depends on the generations and manipulation of numbers by conducting statistical analysis (Griensven, Moore, & Hall, 2014). The quantitative research is carried out in a more structured environment in which it is allowed to determine relationships between variables and outcomes (Rutberg & Bouikidis, 2018). It focuses on building and appraising a hypothesis which describes the anticipated relationship or expected outcome from the research questions and objectives (Rutberg & Bouikidis, 2018). The relationships between variables are measured numerically and illustrated statistically and graphically (McCusker & Gunaydin, 2015). The advantages of quantitative research refer to not only its ability to draw logical and reliable conclusions based on findings of testing hypotheses and theories but also the independence of the researchers from what they research (Easterby- Smith et al., 2018; Saunders, Lewis, & Thornhill, 2019). However, it is quite difficult to use the methods to investigate human emotions and perceptions with unstructured data (Easterby-Smith et al., 2018). Therefore, quantitative methodological choices are mainly used in research following positivism philosophical worldview and a deductive approach with highly structured data collection (Creswell & Creswell, 2018).

In terms of the next method, mixed methods research is defined as an approach to the research question by blending quantitative and qualitative methods (Creswell & Creswell, 2018). It is characterised by a pragmatic attitude in which the research questions and objectives are given high priority in empirical studies (Saunders, Lewis, & Thornhill, 2019). In this type of research method, both quantitative and qualitative data are collected, integrated, and combined to reach the research questions (Lund, 2012). Compare with the other single

methodological choices, mixed methods provide better tools to deal with complex research questions than quantitative or qualitative methods separately (Griensven, Moore, & Hall, 2014). The use of a mixed method approach ensures that the advantages of qualitative and quantitative methods are integrated and enhanced while their disadvantages offset each other (Yoshikawa et al., 2008). While the quantitative elements contribute to statistical analysis and generalisability, qualitative strands demonstrate meaning, context, and depth of the research issues (Griensven, Moore, & Hall, 2014). Thus, the combination of different perspectives given by qualitative and quantitative methods produces a more sufficient and comprehensive understanding of the subject under study (Lund, 2012). Further, the mixed methods approach enables pragmatic researchers to have flexibility in choosing techniques to address a range of research requirements (Onwuegbuzie & Leech, 2005).

This research focuses on the research questions and objectives to select the most adequate research approach from the above investigation. To answer the research question, this study applies mixed methods blending quantitative and qualitative methods to figure out the answers. The initial research objectives refer to the statistical examination of the efficient form of the Vietnamese stock market. Because the research time horizon is related to the past, the acquisition of primary data of share price to conduct the statistical tests is an impossible mission. Therefore, it is better to analyse quantitative data by using secondary data collection. In particular, the premises are set up on the basis of the efficient market hypothesis to carry out an investigation about the market efficiency and its improvements in recent years. The daily closing stock prices of the market indices and some companies listed in the Vietnamese stock market are inputted to statistically appraise the hypotheses in this stock market efficiency to investigate the existence of relationships in the daily stock prices and to provide findings of the stock market efficiency.

The second research objective focuses on critical assessment of the development of the Vietnamese stock market efficiency as a result of recent policies and regulations related to the stock market. It is initially anchored in the results from the statistical tests of the efficient market hypothesis to evaluate whether there are any improvements in the market efficiency of the Vietnamese stock market or not. The quantitative results give a general view of the market efficiency and its development, and they are rechecked and supported by conducting semi-structured interviews. The in-depth interviews are organised with several managers of the selected listed companies, the leaders of stock exchanges, and the experienced and professional experts in the Vietnamese stock market to entirely satisfy the second research objective. It is noticeable that the quantitative data collection and analysis are the foundation

for building the interview questions, choosing the potential interviewees, and conducting the interviews.

The two last questions focus on the opportunities and challenges of the listed companies and the impacts of market behaviours on the company performances in the current policies and regulations. Thanks to the understanding of the Vietnamese stock market efficiency and its improvements due to the current regulations in the stock market, the findings from the quantitative tests serve as the basement to build the interview contents related to the two mentioned research objectives. The in-depth interviews with the manager, the leaders, and the experienced and professional experts strive for obtaining their perspectives and explanatory discussion regarding the advantages and challenges from listing, trading, and conforming to the current regulations as well as the impacts of market behaviours on business performances. Further, the gathered information is rechecked and assured by illustrating annual financial reports, sustainable development reports, and other sources of documentary data.

As the use of either quantitative or qualitative approach is not enough adequate to address and solve the complexity, it is essential to combine the quantitative and qualitative methods, known as mixed methods, to implement the research. Therefore, this study uses both numeric and non-numeric data to investigate the research questions, and it merges the quantitative, qualitative, and documentary data. It can be presented as ***Table 4.1***:

Table 4.1: Research question and methodological choices

<table>
<tr><td>Research Objectives</td><td colspan="2">(1) Evaluate and determine the efficient form of the Vietnamese stock market by testing historical data.
(2) Examine the current market efficiency and its improvements due to recent policies and regulations related to the stock market.
(3) Examine advantages and challenges to listed companies due to listing, trading, and complying with the current policies and regulations in the stock market considered by listed companies and stakeholders.
(4) Evaluate impacts of market behaviours on the business performance of listed companies.</td></tr>
<tr><td rowspan="3">Methodological choices</td><td>Focuses on testing relationships between numeric variables</td><td>Involves with both numeric and non-numeric data</td></tr>
<tr><td colspan="2">Requires obtaining comprehensive view by:
• Building efficient market hypotheses on the Vietnamese stock market and statistically appraising quantitative data to accept or reject the hypotheses.
• Achieving information and opinions from managers of listed companies and other market participants.</td></tr>
<tr><td colspan="2">→ MIXED METHODS RESEARCH DESIGN</td></tr>
</table>

Source: Author.

4.4.2. Decisions on design of mixed methods.

Mixed method design provides researchers diversified data collection and analysis to achieve a more comprehensive picture of a phenomenon (Acar & Ucus, 2017). The next step is to make decisions on the designs of the mixed method to apply in the study. There are three core mixed methods strategies in designing research for researchers to choose, which contain convergent design, explanatory sequential design, and exploratory sequential design (Creswell & Creswell, 2018).

Firstly, these above listed types of mixed methods are briefly summarised. Convergent mixed methods design is a mode of mixed methods design in which qualitative and quantitative perspectives are acquired in parallel, evaluated separately, and then merged to address a broader conclusion (Usher, Ford, Li, & Weidner, 2018). In a convergent parallel design, researchers equally and concurrently weigh the two elements and independently conduct the qualitative and quantitative data collection and analysis during the study process (Demir & Pismek, 2018). The qualitative findings and the quantitative statistical outcomes are directly compared to interpret the overall conclusions (Acar & Ucus, 2017).

Exploratory sequential mixed methods are used when it is unobvious to know the most significant concepts for the investigation, and there is a lack of adequate techniques to measure and apply an intended concept (Nikpour, Tirgar, Ebadi, Ghaffari, Firouzbakht, & Hajiahmadi, 2018). Implementation of qualitative methods is followed by the use of quantitative methods in the study (Nikpour, et al., 2018; Özen & Turan, 2017). The aim of the exploratory method is to employ the qualitative data collection and analysis to address a specific phenomenon or issue and then develop the quantitative instruments to examine (Özen & Turan, 2017).

Explanatory sequential mixed methods design is the reverse sequential from the exploratory sequential design (Creswell & Creswell, 2018). In the explanatory sequential approach, the quantitative data is collected and illustrated initially before it is further explained and enhanced by conducting qualitative collection and analysis (Bakla, 2018). The quantitative findings support building qualitative research questions and identifying potential participants in qualitative procedures (Creswell & Creswell, 2018). The qualitative element is established on the basis of the quantitative results to savvy the quantitative findings required to have additional explanations from participants (Saei, Rahmani, Ebadi, & Khankeh, 2017). Then, the results from both quantitative and qualitative phases are integrated to interpret and explain the research problem (Gündoğdu, Aygün, Ilkım, & Tüfekçi, 2018). While the statistical results

of quantitative methods generate a general overview of the research problems, the qualitative methods explore the problem further by exploring human perspectives (Saei et al., 2017).

The research appraises the Vietnamese stock market efficiency and its improvements before discovering and evaluating its impacts on listed companies in the current policies and regulations. The study not only follows the pragmatic trend that builds concurrent recognition and cooperation among quantitative, qualitative, and documentary data, but also provides a detailed examination on a case study of an emerging economy – Vietnam. This research has explanatory sequential mixed methods. It implies that the study is characterised by the collection and analysis of qualitative data in the second phase on the basis of the initial results from the quantitative data analysis in the first phase (Creswell & Creswell, 2018). Weight is mainly given to the quantitative data, and the mixing of data are applied when the qualitative data collection in the second phase is informed by the initial quantitative results (Creswell & Creswell, 2018).

This research contributes to the literature by providing a theoretical framework to simultaneously investigate the market efficiency in recent years and evaluate its impacts on the business performance. This research follows the sequential explanatory mixed methods design, and it comprises two steps ***(Figure 4.1)***. Particularly, the starting point is setting and statistically appraising hypotheses on the efficiency of the Vietnamese stock market to determine the market efficient form and discover the improvement of market efficiency by testing historical stock prices. The data sample includes closing prices of VN Index, HNX Index, and 22 listed stocks in the Vietnamese stock market. The statistical analysis provides a general overview of the Vietnamese stock market efficiency and its improvements in the current years. After that, the quantitative findings are rechecked by qualitative data collection and analysis in support of documentary data. It is based on the statistical analysis to identify the potential interviewees, build the in-depth interview questions, and undertake the interviews with the managers of the listed companies and other experts in the market. The second phase has two key points, which include: firstly, achieving the opinions of the market participants regarding the Vietnamese stock market efficiency and its development to recheck and reassure the quantitative findings; and secondly, examining the pros and cons of the listed companies from listing, trading, and complying with the current policies and regulations in the market as well as intensively analysing the effects of market behaviours on the listed companies. Following that, the quantitative and qualitative findings are reassured and rechecked by investigating documentary information from annual reports, sustainable development reports and relevant public documents related to the chosen listed companies.

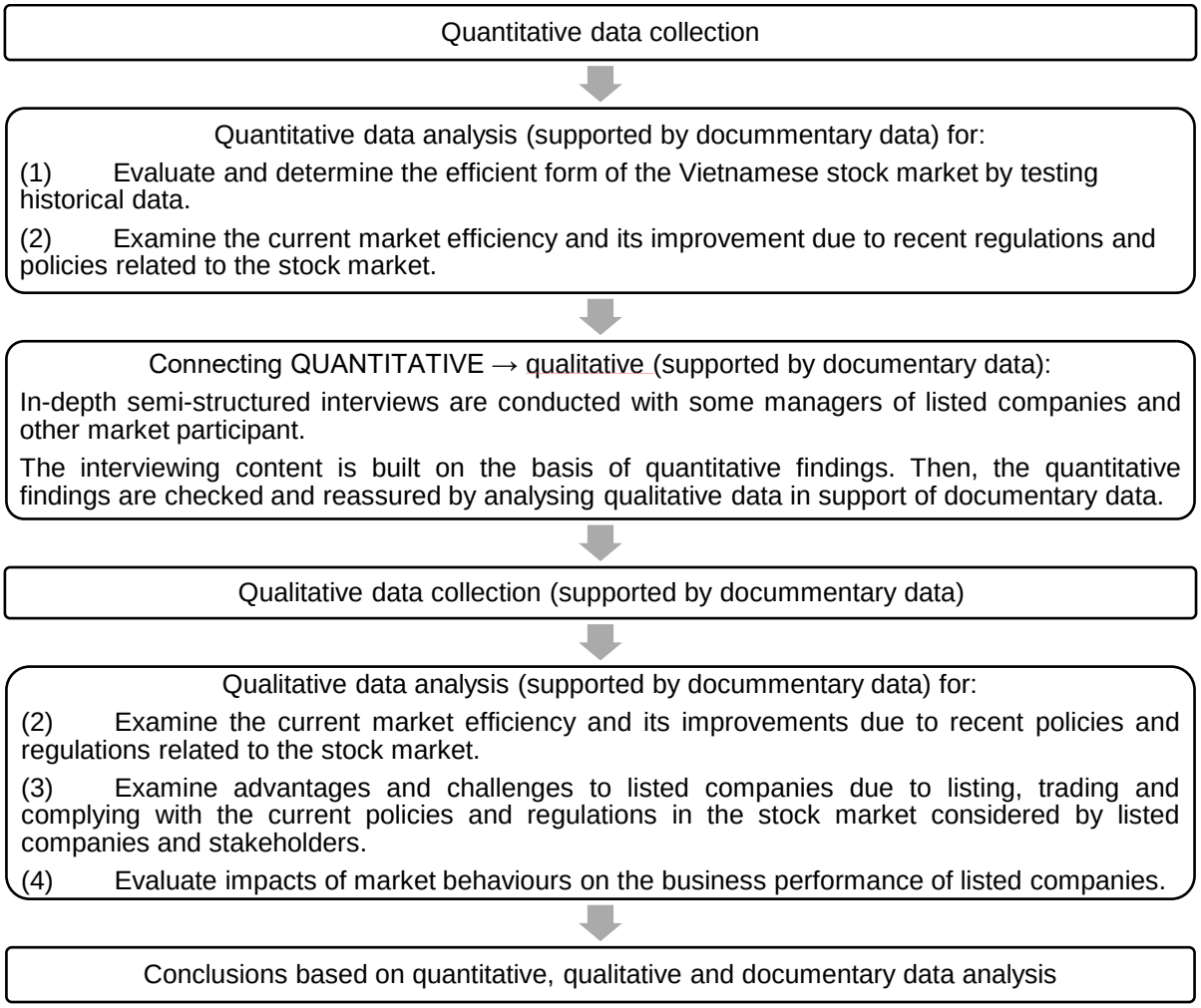

Figure 4.1: Visual process of the explanatory mixed methods design of the study
Source: Author.

This research has the sequential explanatory mixed methods design because it gives more rigorous measurements of associations while explicitly valuing the information from verbal text evidence. The sequence of the data collection in the study starts with quantitative data to qualitative data and documentary data (QUANTITATIVE → qualitative in support of documentary) (Harrison et al., 2017).

4.5. Data collection and sampling

The contributions from this research are providing a theoretical framework of investigating the level of market and the market participants to give a comprehensive understanding of the nature of the linkages between financial market efficiency and business performance in emerging markets. This research also contributes to the literature by evaluating the responses of Vietnamese stock market efficiency to recent policies and regulation in the stock exchange markets. Thus, in addition to statistically testing market

efficiency, it is important to investigate the market efficiency and evaluate the effects of market efficiency and its behaviours on the listed companies from the perspectives of the market participants. The benefits of the listed companies in this study are regarded as time valuation of a company, increase of funds or business management and development. The research is designed as a sequential explanatory mixed methods approach valuing both objective and subjective perspectives and both primary and secondary data. This research combines the quantitative and qualitative methods to analyse and appraise the market efficiency in the case study of Vietnam. It employs various sources of data, including quantitative data, qualitative data, and documentary data, to judge the context, whose weight is on the quantitative strand. Furthermore, different sizes of companies from the various sectors are advised to be randomly chosen in addition to the market indices to increase the reliability and the accuracy in testing the Vietnamese stock market efficiency. Therefore, in this study, data collection and sampling are totally based on the research questions and the literature review to firmly meet the research requirements and fulfil the existing gaps in the literature.

The research executes two steps. In particular, the study starts with setting and statistically examining hypotheses to determine the efficient form of the Vietnamese stock market and investigate the development of the market efficiency in recent time by testing historical stock prices. Data sample includes closing stock prices of VN Index, HNX Index, and some companies listed on the Vietnamese stock market. If the market is efficient, all stock prices in the market will instantaneously and unbiasedly adjust to the arrivals of relevant available information. According to Malkiel & Fama (1970), the efficient market hypothesis focused on the way new information was captured and adjusted the stock prices, and three major levels included weak form, semi-strong form, and strong form. The tests of the efficient market hypothesis usually involve historical stock prices and assess the historical market and stock performance. In addition to statistically testing market efficiency, it is important to investigate the market efficiency and its improvement due to the current regulations from the perspectives of the market participants as well as evaluate the benefits that listed companies would obtain from the Vietnamese stock market. The quantitative data collection and analysis of the first phase serve as a basis for identifying potential interviewees and building up the interview guide and questions to conduct interviews with the managers and the experts in the markets in the following phase.

Data collection and sampling are totally based on the research question and the literature review to meet the research requirements and close the existing gaps in the current literature. The study collects a panel data set including both time-series and cross-sectional dimensions. The choice of data sampling depends on the research question and the research

objectives. This work deploys stratified random sampling. The stratified random sampling is a modification of random sampling (Saunders, Lewis, & Thornhill, 2019). It is a probability sampling procedure in which the target population is classified into two or more relevant and significant strata based on one or several attributes (Saunders, Lewis, & Thornhill, 2019).

To investigate the Vietnamese stock market efficiency, data from both HOSE and HNX is gathered. In particular, this study uses observations on the daily prices of the selected firms' stocks from both HOSE and HNX as well as the two main market indexes that are representative indices of companies listed on HOSE and HNX in Vietnam over time. In addition, one of the research objectives aims to study how the performance of listed companies could be affected by the market behaviours. In other words, it is necessary to discover relevant data of both newly listed and existing companies. Further, behaviours of companies with different sizes from various sectors are diversified due to some unique attributes, so it is crucial to consider the attributes from various sectors. In other words, it is significant to choose some companies from the different sectors in addition to the market indices to strengthen the reliability and the validity of testing the Vietnamese stock market efficiency. It implies that the chosen sample is more representative of the research target population, and the strata are represented proportionally within the sample.

4.5.1. Time-series choices

There are two key market indexes in Vietnam. VN Index is known as a composite market capitalisation-weighted price index and it expresses the price change of all common stocks listed on Ho Chi Minh Stock Exchange (Ho Chi Minh Stock Exchange, 2016). The index is used to compare the current market value with the market value on the date of 28 July 2000 – the first trading session of the market, and it has a base value of 100 (Ho Chi Minh Stock Exchange, 2016). Historically, VN Index reached a peak of 1211.34 in April 2018 ***(Figure 4.2)***.

Figure 4.2: VN Index from July 2000 to April 2019

Source: https://tradingeconomics.com/vietnam/stock-market

HNX Index is a capitalisation-weighted price index that represents the price fluctuation of stocks traded on Hanoi Stock Exchange, and it has a base value of 100 as of 14 July 2005 (Hanoi Stock Exchange, 2018a). On 31 March 2019, it was recorded that there were 376 companies listed on HOSE while 379 stocks were listed on the HNX (State Securities Commission Of Vietnam, 2019). Therefore, the researcher will collect historical data of VN Index, HNX Index, and some selected companies.

On 12 April 2016, HOSE and HNX signed a MoU (VnEconomy, 2016). It was one of the preparations for the merger to reform the Vietnam Stock Exchange. The initial reformation was in the form of entering into alliances legally formalised through MoU (VnEconomy, 2016). It could lead to cost reduction, liquidity improvement, and development of new products and services (Kohli, 2012). On 07 January 2019, The Prime Minister granted approval on the project on the establishment of the Vietnamese Stock Exchange (Phuong, 2019). It would follow the model of a parent-subsidiary company on the basis of re-arranging HNX and HOSE to unify the stock trading market, ensuring that the market operates effectively, fairly, openly, and transparently (Phuong, 2019).

The changes in the period between 2016 and 2019 made considerable contributions to improving the stability and efficiency of this emerging stock market. One of the major focal points in this research refers to researching the responses of the Vietnamese stock market efficiency to recent policies and regulations in the stock exchange markets. It is expected that the strategic decisions and the regulatory changes in this stock market would have positive effects on the performance of listed companies. In addition, the closing price is the last price of a security at the end of a trading day in a financial market, and it is used to evaluate the market sentiment for a particular stock price over a trading period by comparing it to the prices on previous days (Arnold, 2019). Therefore, it is essential to examine the efficiency of the Vietnamese stock market by collecting and statistically analysing the daily closing stock prices belonging to the mentioned period. To offset the disadvantages of secondary data, data sources should be current and up-to-date information. In specific, this research obtains historical daily closing prices of VN Index, HNX Index, and some randomly selected companies in the period from January 2018 to January 2019 to implement statistical tests for weak form and semi-strong form to examine the Vietnamese market efficiency and its improvement in recent time. From 02 January 2018 to 07 January 2019, there were totally 5957 observations.

4.5.2. Cross-sectional choices

In this research, the choice of data collection and sampling depends on the research question and the research objectives. It is important to randomly choose some companies which could represent specific characteristics and features of the companies listed in the stock market in addition to the market indices to perform the tests of the efficient market hypothesis. Additionally, selecting potential interviewees and building structure and content of interviews in the following step are carried out based on the foundation of the statistical results by testing historical closing prices, so the chosen listed companies should contribute a good basis for performing the qualitative analysis. Thus, it is essential to have a sample size that would not only ensure the reliability and validity of testing the efficient form of this market but also enable the researcher to conduct interviews and perform qualitative data analysis, and this study performs stratified random sampling. It implies that the chosen sample is more representative of the research target population and the strata are represented proportionally within the sample (Saunders, Lewis, & Thornhill, 2019).

There are four criteria to be taken into account when selecting listed companies. Firstly, it is necessary to gather data from both HOSE and HNX to investigate the Vietnamese stock market efficiency. This research uses observations on the daily prices of selected firms' stocks from both HOSE and HNX as well as the two market indices. Secondly, the behaviours of companies from different sectors differ from one another due to some unique attributes, thus it is vital to consider the attributes from several sectors (Duy & Phuoc, 2016; Handayani et al., 2018). Therefore, some companies are selected from various sectors in addition to the market indices to strengthen the reliability and the accuracy in testing the efficiency of the Vietnamese stock market. Thirdly, one of the research objectives aims to study how the company performance could be affected by the market behaviours, so it is necessary to discover relevant data of both newly listed and existing companies. Fourthly, Dahoei & ParvizSaídi (2012), Ul Haq & Rashid (2014), and Duy & Phuoc (2016) provided statistical evidence of the existing relationship between the firm size and the stock prices or returns, so it is important to choose companies with different sizes. Thus, listed companies are chosen by the use of stratified random sampling according to these four criteria. It ensures that the market indices and the chosen listed companies' stocks not only are good representatives to statistically test the efficient form of the Vietnamese stock market but also provide a firm foundation for undertaking the interviews and conducting the qualitative data analysis.

According to Chapter 2 The Vietnamese stock market, there are some different features between HOSE and HNX ***(Figure 4.3)***. Firstly, HoSTC – the precursor of HOSE – was officially

traded on 28 July 2000 (Ho Chi Minh Stock Exchange, 2016). Meanwhile, HaSTC – the precursor of HNX – was officially inaugurated on 08 March 2005 (Hanoi Stock Exchange, 2018b). It means that HOSE has a longer and stronger foundation of establishment and development than HNX. Moreover, HOSE was established in Ho Chi Minh city – an economic centre of Vietnam and a southern city, whereas HNX was established in Hanoi city – the capital of Vietnam, a political centre of Vietnam and a northern city. The market capitalisation of HOSE in 2019 was nearly seventeen times greater than that of HNX, and the listed value of HOSE in 2019 was almost seven times more than that of HNX (Hanoi Stock Exchange, 2020; Ho Chi Minh Stock Exchange, 2020). Additionally, there are the same number of economic sectors on both HOSE and HNX, which are 11 sectors in each stock market based on the unique and different characteristics of companies (Hanoi Stock Exchange, 2019a; Ho Chi Minh Stock Exchange, 2016). However, the classifications of the companies in these stock exchanges are dissimilar. There is an agriculture, forestry, and fishing sector in HNX, while there is no such similar sector in HOSE. Last but not least, all companies listed on HOSE are large companies, whereas there are large, medium, and small companies listed on HNX. Furthermore, price limits on HOSE are currently +/- 7%, while price limits on HNX are +/- 10%. The differences applied on HOSE and HNX might have different impacts on trading activities on these stock exchanges.

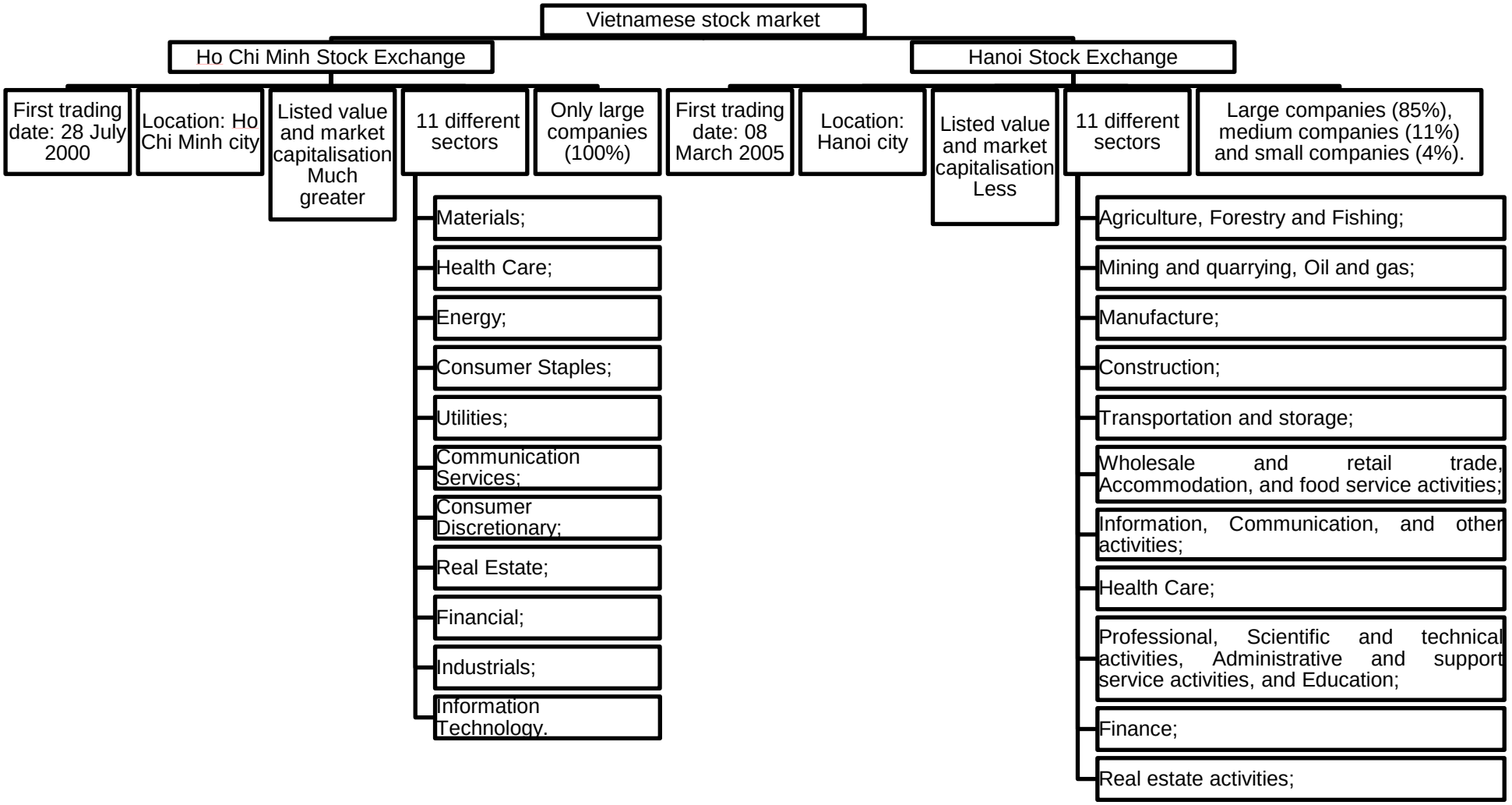

Figure 4.3: Differences between HOSE and HNX

Source: Compiled by author.

The different features would lead to different behaviours of companies and stock prices. The quantitative data collection takes into account these differences to ensure that chosen market indices and companies are good representatives to test the market efficient form of the Vietnamese stock market. As of the end of 2019, it was recorded that there were 373 stocks listed on the HOSE while 365 companies were listed on the HNX (State Securities Commission Of Vietnam, 2019). It means that the proportions of listed companies on the HOSE and the HNX are approximately equal and nearly a half of the total listed companies ***(Figure 4.4)***. Therefore, in this research sample, one half of the total selected companies are listed on HOSE, and the other companies are listed on HNX.

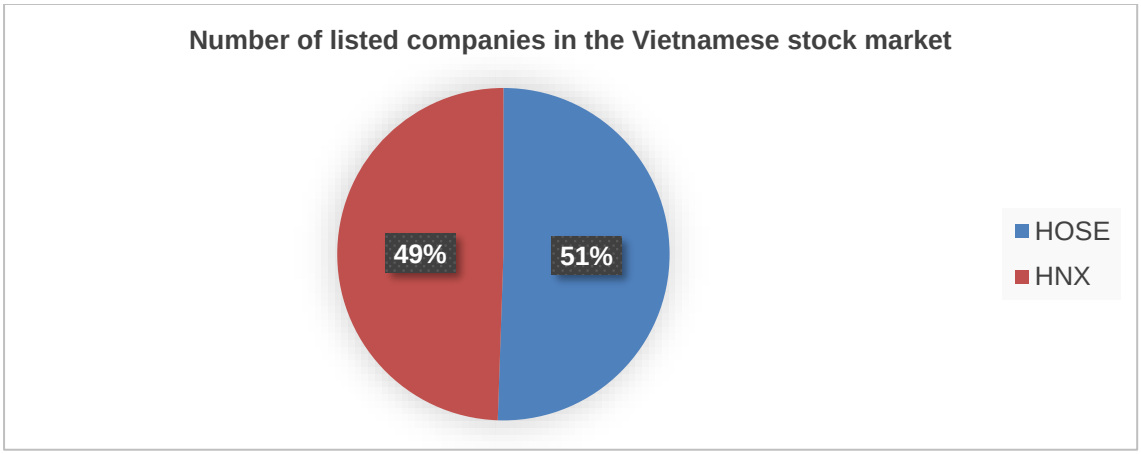

Figure 4.4: Number of listed companies in the Vietnamese stock market

Source: Compiled by author.

Secondly, behaviours of companies from various sectors are different due to some unique attributes. The works of Handayani et al. (2018) and Duy & Phuoc (2016) showed that implementing tests on companies in different sectors could result in dissimilar output. Thus, it is necessary to choose some companies from various sectors in addition to the market indices to strengthen the reliability and the validity of testing the Vietnamese stock market efficiency. In each stock exchange, one company is chosen from each industry. There are totally 11 different industries on HOSE and 11 different industries on HNX. Thus, 11 companies from the different industries are selected from companies listed on HOSE. Similarly, 11 companies from the dissimilar industries are selected from companies listed on HNX. In total, the study collects data of 22 company stocks and 2 market indices from HOSE and HNX.

Thirdly, as presented in Chapter 2, between 2015 and 2019, the market capitalisation of HOSE and HNX rose from VND 1,298,533 billion to VND 3,471,652 billion. Furthermore, 106 stocks were newly listed on HOSE between 2015 and 2019 ***(Appendix 4.2)***. HNX also had 76 newly listed companies in the same period ***(Appendix 4.3)***. Thus, it is vital to discover

relevant data of both newly listed and existing companies. Among the selected companies, 50% of them were newly listed on the stock exchanges in the period between 2015 and 2018, and the rest 50% of them were the existing companies. Additionally, on 12 April 2016, HOSE and HNX signed a MoU (VnEconomy, 2016). On 07 January 2019, The Prime Minister approved the project on the establishment of Vietnamese Stock Exchange (Kohli, 2012). From 12 April 2016 to 07 January 2019, there were 78 companies newly listed on the HOSE which accounted for approximately 70% of the total newly listed companies in this period. At the same time, there were 35 companies newly listed on the HNX which made up 30% ***(Figure 4.5)***. Therefore, in terms of the 11 newly listed companies, this research selects 7 companies newly listed on the HOSE and 4 companies newly listed on the HNX. In terms of the 11 existing listed companies, the study chooses 4 companies listed on HOSE and 7 companies listed on the HNX.

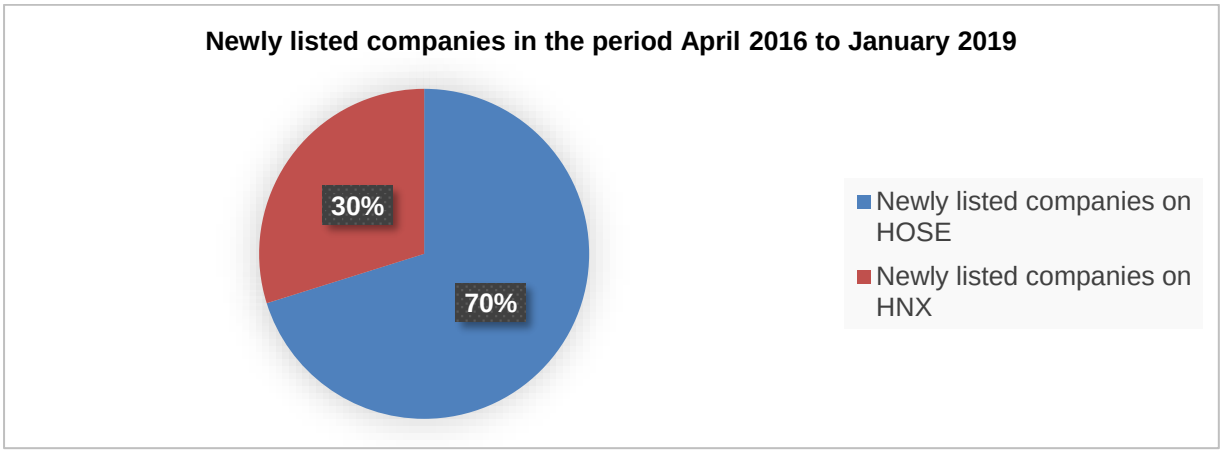

Figure 4.5: Newly listed companies in the period April 2016 to January 2019

Source: Compiled by author.

Fourthly, companies with different sizes could have diversified impacts of the market behaviours. Duy & Phuoc (2016) revealed a negative and significant relationship between firm size and stock returns when evaluating the service companies listed on HOSE. The study of Ul Haq & Rashid (2014) provided sympathised conclusions of the relationship between firm size and stock returns. On the contrary, Mulyono, Suprapto, & Prihandoko (2018) and Dahoei & ParvizSaídi (2012) provided evidence of a positive and prominent relationship between the firm size and the stock prices or returns. Thus, it is suggested to take into account different sizes of the listed companies in the statistical analysis of this study.

While there are only large companies on the HOSE, companies on the HNX are classified into large, medium and small companies. In addition, 3 of the 35 companies newly listed on the HNX are medium-sized while the others listed on the HOSE are large-sized. Therefore, in terms of the 11 newly listed companies, this work selects 1 medium one listed

on the HNX. Among companies listed on HNX, large companies account for 85%, medium ones make up 14% and small ones constitute 1%. Thus, there are 1 medium enterprise and 1 small enterprise among the 7 chosen existing listed companies on the HNX. In brief, the study collects data of 11 large companies chosen from those listed on the HOSE, while it investigates data of 8 large, 2 medium and 1 small companies listed on the HNX.

Additionally, choosing participants and building content of interviews in the following step are conducted based on the foundation of the statistical results by testing historical closing prices. It is essential to have a sample size that would make it possible to conduct interviews and perform qualitative analysis. This study randomly chooses 22 companies which could represent specific characteristics and features of the companies listed in the stock market to statistically examine the efficient market hypothesis and consider them as a good basis for the conduct of the qualitative analysis. Furthermore, the weight of this study is mainly put on quantitative study, and the research mixes quantitative, qualitative, and documentary data to provide findings. Thus, the semi-structured interviews are conducted with managers from some of the 22 selected companies on HOSE and HNX to obtain explanatory discussions. In addition, the in-depth interviews also aim to gain the perspectives of representatives of the stock exchanges as well as experienced and professional experts in this field regarding the Vietnamese stock market efficiency and its impacts on the business performance.

Therefore, the 22 companies are randomly selected from the enterprises listed on the HOSE and HNX. The chosen companies should meet the criteria of cross-sectional choices and time series choices. All the indices come from Cophieu68 Database are dominated in Vietnam Dong (VND). Cophieu68 has become one of the leading financial websites in Vietnam and it is the only website specialising in statistical analysis of stock statistics, and it has more than 20,000 daily users according to statistics of Google Analytics (Value Stock, 2018). The page is highly ranked at the review website Alexa.com (Value Stock, 2018). The secondary data and statistical tests are highly structured, and the researcher is external to them. The list of chosen companies on HOSE and HNX is provided in the ***Table 4.2***:

Table 4.2: Selected companies on HOSE and HNX

No	Listed code	Issuers	Industry	Listing date	Total Resources in 2018 (Billion VND)	Large Companies/ SMEs	Private/ State	Newly/ Existing	Exchange
1	AAA	An Phat Bioplastics Joint Stock Company	Materials	06/10/2016	7,987	LARGE	Private	Newly	HOSE
2	BWE	Binh Duong Water Environment Joint Stock Company	Utilities	05/07/2017	6,207	LARGE	Private		
3	DBD	Binh Dinh Pharmaceutical and Medical Equipment Joint Stock Company	Health care	24/05/2018	1,620	LARGE	Private		
4	DGW	Digiworld Corp	Information Technology	24/07/2015	2,405	LARGE	Private		
5	PLX	Viet Nam National Petroleum Group	Energy	14/04/2017	61,762	LARGE	Private		
6	SAB	Saigon Beer – Alcohol – Beverage Corporation	Consumer Staples	25/11/2016	26,962	LARGE	Private		
7	SCR	Sai Gon Thuong Tin Real Estate Joint Stock Company	Real Estate	06/10/2016	10,884	LARGE	Private		
8	YEG	Yeah1 Group Corporation	Communication Services	19/06/2018	1,515	LARGE	Private		
9	DAG	Dong A Plastic Group Joint Stock Company	Industrials	01/03/2010	1,614	LARGE	Private	Existing	
10	DRC	Danang Rubber Joint Stock Company	Consumer Discretionary	28/11/2006	2,708	LARGE	Private		
11	VCB	Joint Stock Commercial Bank for Foreign Trade of Viet Nam	Financial	06/12/2009	1,222,718	LARGE	Private		

No	Listed code	Issuers	Industry	Listing date	Total Resources in 2019 (Billion VND)	Large Companies/ SMEs	Private/ State	Newly/ Existing	Exchange
12	CDN	Danang Port Joint Stock Company	Transportation and storage	30/11/2016	1,662	LARGE	Private	Newly	HNX
13	CET	Tech - Vina Joint Stock Company	Manufacture	28/07/2017	87	MEDIUM	Private		
14	KHS	Kien Hung Joint Stock Company	Agriculture, forestry, and fishing	26/12/2017	778	LARGE	Private		
15	TA9	Thanh An 96 Installation And Construction Joint Stock Company	Construction	31/07/2015	1,178	LARGE	Private		
16	ACB	Asia Commercial Bank	Finance	21/01/2006	383,514	LARGE	Private	Existing	
17	AMC	Asia Mineral Joint Stock Company	Mining and quarrying, oil, and gas	15/02/2012	92	MEDIUM	Private		
18	LDP	Lam Dong Pharmaceutical Joint Stock Company	Health care	20/07/2010	285	LARGE	Private		
19	MAS	Danang Airports Services Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	15/07/2014	125	LARGE	Private		
20	NDN	Danang Housing Investment Development Joint Stock Company	Real estate activities	21/04/2011	1,701	LARGE	Private		
21	TVC	Tri Viet Asset Management Corporation Joint Stock Company	Professional, scientific, and technical activities; administrative and support service activities and education	23/09/2014	1,917	LARGE	Private		
22	VLA	Van Lang Technology Development and Investment Joint Stock Company	Information, communication, and other activities	04/08/2010	18	SMALL	Private		

Source: Compiled by author.

In summary, the study would obtain historical daily closing prices of VN Index, HNX Index, and the 22 selected companies in the period from January 2018 to January 2019. Between 02 January 2018 and 07 January 2019, there were 252 observations of each index on HOSE and 254 observations of each index on HNX. YEG, the only newly listed company in communication services on HOSE, started listing on 19 June 2018, so there were 137 observations in this case. Thus, this research would totally have 5957 observations to implement statistical tests for weak form and semi-strong form to determine the efficient form of the Vietnamese market and evaluate its development in recent years. The chosen data sample in this study represents specific characteristics and features of the companies listed in the stock market to perform statistical analysis as well as provide a good foundation for doing interviews and carrying out qualitative analysis.

4.5.3. Semi-structured interviews

The crucial advantage of collecting primary data is ensuring that the information gathered could be optimal for issues that are presented in the research questions (Hox & Boeije, 2005). One of the focal points of the research question and objectives attempts to identify the advantages and the disadvantages of listing, trading, and complying the current regulations in the stock market and discover how the performance of listed companies has been affected by the market behaviours. To achieve this aim, it is required to implement a mixture of quantitative and qualitative methods. Firstly, this work conducts the statistical test to investigate the numeric data of market indices and stock prices to get a general view of the problems. After that, it is important to come up with new findings by interviewing and seeking information and opinions from managers of the listed companies, representative of the stock exchanges, and professional and experienced experts in the stock market.

Based on levels of formality and structure, there are three categories of interviews which are considered as structured interviews, semi-structured interviews, and unstructured interviews (Saunders, Lewis, & Thornhill, 2019). A structured interview refers to data collection methods where participants follow a prescribed list of questions with predetermined response categories (Easterby-Smith et al., 2018). A semi-structured interview is known as an interview with a set of themes and open-ended questions in which participants are encouraged to follow guidelines of inquiries and facilitate unbroken discussion in an attempt to cover all the listed issues (Saunders, Lewis, & Thornhill, 2019). An unstructured interview is a loosely structured and informally conducted interview where participants are asked one or more themes without a predetermined list of questions (Easterby-Smith et al., 2018). While structured interviews provide a high level of standardisation of questions and answers, semi-structured and

unstructured interviews demonstrate greater confidentiality because responses of interviewees are more opened and detailed in nature (Saunders, Lewis, & Thornhill, 2019). As each type of interview has its own characteristics, researchers should take into consideration their research purpose and strategy to choose an appropriate form of interview.

In this research, the weight is mainly given to the quantitative strand, and the interviews are carried out with a set of themes and open-ended questions built on the basis of the statistical results in order to link, check, and support the outcomes from quantitative data collection and analysis. The qualitative data from the interviews are expected to support analysis and investigation gained from the quantitative data analysis. In specific, after having a general view of the Vietnamese stock market efficiency by the quantitative analysis, it is vital to explore and explain further by gaining the perspectives of the market participants on the market efficiency. It requires to discover two major points, including: firstly, achieving the perspectives of the market participants regarding efficiency and development of the stock market to recheck and support the quantitative findings; and secondly, examining the advantages and challenges of the listed companies from listing, trading, and complying with the current regulations in the stock market and intensively analysing the effects of the market behaviours on the listed companies. This part is based on the quantitative findings to identify the potential interviewees, build the interview structure and questions, and conduct more in-depth interviews with the managers and other participants in the market. In this work, the interviews strive for encouraging participants to follow the specific list of inquiries built on the basis of the statistical results as well as facilitating opened and detailed discussion to cover all the listed issues, so the semi-structured interviews are considered as the most suitable method from the viewpoint of the author.

This research adopts the explanatory mixed methods, and the semi-structured interviews are conducted to further comprehend the relationships between the variables in the statistical tests. Firstly, the findings obtained from the quantitative analysis are further evaluated and checked again by conducting interviews to investigate the market efficiency from the perspectives of experts, specialists, officials, and managers. The qualitative data collection and analysis initially strives for investigating key determinants of the market efficiency in the case study of Vietnam. It includes information availability and disclosure, the relationship between the information and the stock prices as well as the market valuation from experience and perspectives of the listed companies and other market participants. The first factor is information availability. The more information the market participants have, the more accurate the predication of intrinsic value of stocks will be (Edmans, Jayaraman, & Schneemeier, 2017). It results in greater market efficiency. Additionally, in an efficient market,

all relevant information about listed companies is accessed and captured by the market to determine the companies' stock prices (Malkiel & Fama, 1970). Furthermore, stock prices in an efficient market are accepted as a reliable indicator of the market valuation of the listed companies, so it is vital to clarify whether the market value of the listed companies is fairly and reasonably determined or not (Ali et al., 2018). According to the explanations of the interviewees related to this point, this research attempts to obtain the viewpoints of the market participants on the Vietnamese stock market efficiency and its improvement due to recent policies and regulations in this emerging stock market. Secondly, an efficient market helps to raise capital, develop the company brand value, improve business management, and enhance economic growth (Ang, Goetzmann, & Schaefer, 2011; Çal & Lambkin, 2017; Norman, 2011; Yang, Chou, & Yang, 2020). This research strives to examine opportunities and challenges to the listed companies due to listing, trading, and conforming to the current policies and regulations related to the stock market and then evaluate impacts of market behaviours on the performance of those companies. In this research, the effects are regarded as time valuation of company, enhancement of funds, corporation expansion or business management. After that, the findings from quantitative methods and qualitative methods are checked and reassured by illustrating documentary information from the annual financial statements and sustainable development reports.

In this research, the potential interviewees and the interview guidelines in this section are strongly based on the quantitative tests. Saunders, Lewis, & Thornhill (2019) recommended that the minimum sample size for the semi-structured interviews should be between 5 and 25. Furthermore, the weight of this study is mainly given to quantitative study, and the research mixes quantitative, qualitative, and documentary data to provide research findings. To achieve theoretical saturation, this research ensures to obtain comprehensive information from the in-depth semi-structured interviews with the 10 interviewees who are either managers of the listed companies or experienced and professional experts in the field of finance and the Vietnamese stock market. The selection of interviewees and content of the semi-structured interviews in qualitative data collection and analysis depend on the results from statistical examinations in the quantitative data collection and analysis, and this work selects two interview samples. The first sample includes leaders, managers, members of the board of directors and authorised persons to disclose information working in some of the selected companies listed on HOSE and HNX. Among them, some of these potential interviewees are from newly listed companies, and the others are chosen from the existing companies listed on the Vietnamese stock market. On each stock exchange, the chosen listed companies' leads vary from different sectors. The second sample relates to some leaders,

specialists, experts, officials, and financial advisors working in the stock exchanges and securities companies. The officials from the stock exchanges give viewpoints of the market efficiency as regulators, policymakers, and supervisors. These other participants are expected to be experts from securities companies who not only could access the whole Vietnamese stock market and relevant daily financial information, but they also usually work and support listed companies' representatives and investors in trading big deals on the stock market. Therefore, the managers of the chosen listed companies and experts from stock exchanges and securities companies would express worthy opinions and perspectives on the market efficiency and its effects on the listed companies' performances. The interviews are flexibly conducted via emails, telephones, or direct meetings. The following chapters will explain and discuss the process of this qualitative data collection.

Because this research holds the semi-structured interviews, some other leading and supporting questions are asked to make it easier and more comfortable for the interviewees to get access and open their mind to answer the interview questions in core discussions. The questions in the semi-structured interviews could be modified based on the interviewer's perception of appropriateness and reasonability. To investigate the current market efficiency of the Vietnamese stock market from the viewpoint of the market participants, major interview questions are:

- Could you please explain your view on the informational efficiency of the Vietnamese stock market in recent years?
- Do you believe that the market value of a listed company is reasonable and fair?
- Is all relevant information about listed companies on the stock exchange accessed and captured by the market to determine the stock price and the market value of the company?

In addition, if there is any difference in the market efficiency of HOSE and HNX, an additional question will be asked to the qualified and experienced experts who trade and work on the two stock exchanges. In particular:

- It is stated that HOSE attracts more concerns and more participation from listed companies and investors than HNX does because it better meets their needs of informational efficiency. What do you think about this opinion?

To identify the advantages and challenges from listing, trading, and complying with the current regulations, some questions are put forward to the managers of the listed companies. In particular:

- What opportunities and advantages does your company gain in terms of development and investment since being listed on the stock market?
- What challenges and limitations does your company encounter when complying with the current policies and regulations on listing and information transparency and disclosure?

Correspondingly, the representatives of the stock exchanges or specialists in the stock market also require responses to some relevant questions as follows:

- What advantages do listed companies gain from listing and complying with the current regulations on listing, transparency, and information disclosure?
- What are shortcomings and limitations in the current regulations that could lead to negative effects on the company's market value?

Following that, to evaluate the impacts of market behaviours on the performance of the listed companies, the relevant question is:

- Since listing on the stock exchange and especially in recent years, how efficient have the production and business activities of your company been? Has its efficiency been different as compared to the previous time?

All interviewees are expected to provide advice and suggestions to develop the market efficiency and enhance the benefits for the listed companies. The relevant question is:

- In your opinion, what do you suggest in order to improve the informational efficiency of the Vietnamese stock market and enhance the benefits for the listed companies?

For the interviewees from the newly listed companies, the question is:

- In your opinion, what do you suggest in order to improve the informational efficiency of the Vietnamese stock market and enhance the benefits for the listed companies in general and such newly listed companies as your company in particular?

In general, it is based on the statistical results from the quantitative phase to select and analyse proper qualitative and documentary data to comprehend and support the findings. Choosing the interviewees as well as building the interview contents and guidelines are based on the results from the quantitative data collection and analysis. The quantitative findings give a general overview of the Vietnamese stock market efficiency and its improvements. The interview structure and questions strive to obtain explanations from respondents for their perspectives and experience on the market efficiency, analyse opportunities and disadvantages of listing, trading, and following the current policies and regulations in the stock market to listed companies, and express the impacts of market behaviours on the business performances. The documentary data analysis would generate supports for the research by providing practical as well as economic information and empirically checking the information gained from the previous quantitative and qualitative analysis.

4.6. Techniques and tests in statistical data analysis

This section focuses on different methods of quantitative data analysis. The study firstly deals with numeric data and statistically appraises the efficient market hypothesis in the Vietnamese stock market to illustrate the Vietnamese stock market efficiency and its development. The tests are selected to best meet the research requirements and answer the research question in my viewpoints and used consistently and repeatedly to evaluate the quantitative data.

4.6.1. Random walk model

Martingale version of the efficient market hypothesis states that holding period asset returns should be temporally uncorrelated under risk neutrality. According to the martingale hypothesis, “if the expected returns and price changes projected on the basis of information fully reflected in the current price are zero, the stock price sequence will follow a martingale” (Malkiel & Fama, 1970, p. 386). It means that there is no systematic price movement which could lead to effective linear forecasting rule. It is close to the hypothesis of the efficient market. The efficient market hypothesis provides that the stock price fully reflects all available information, so it is impossible to outperform and gain AR over the market average (Malkiel & Fama, 1970). In a weak form efficient market, future stock prices or returns could not be predicted in any meaningful way by utilising past stock price information because all relevant information anticipated in the past stock prices is completely incorporated into the current stock prices (Malkiel & Fama, 1970). The martingale forms the basis for the development of random walk model, which implies a weak form efficiency (Malkiel & Fama, 1970). The random

walk model states that successive price changes in individual securities are random and independent, implying knowledge of the past price changes cannot be applied to increase expected gains (Malkiel & Fama, 1970; Fama, 1995). The more efficient the market is, the more random the sequence of price changes is (Campbell, Lo, & MacKinlay, 1997). The most efficient market is one in which price movements are completely random and unpredictable. Campbell, Lo, & MacKinlay (1997) classified random walk into three different types.

4.6.1.1. Random walk 1: Independent and identically distributed increments.

The simplest and strongest version of the random walk model is the independently and identically distributed (IID) increments (Campbell, Lo, & MacKinlay, 1997). The dynamics of the stock prices in the random walk could be given in the following form:

$P_t = \mu + P_{t-1} + \varepsilon_t$, $\varepsilon_t \sim$ IID $(0,\sigma^2)$

and the increment is defined as:

$$r_t = P_t - P_{t-1}$$

$$r_t = \varepsilon_t,\ \varepsilon_t \sim \text{IID}\ (0,\sigma^2)$$

where μ represents the expected price change or drift and IID $(0,\sigma^2)$ denotes that the increments ε_t are independently and identically distributed with mean 0 and variance σ^2.

This form of random walk is a fair game but in a much stronger sense than the martingale and it is called RW1. The independence of increments implicates not only that they are uncorrelated, but also any of their nonlinear functions are uncorrelated. The RW1 allows for homoscedasticity, which means consistent variances. Homoscedasticity describes a situation in which the random disturbance in the relationship between the independent and dependent variables is unchanged across all values of the independent ones.

4.6.1.2. Random walk 2: Independent increments

The second category of random walk is independent increments (Campbell, Lo, & MacKinlay, 1997). It makes assumption that all increments are independent but not identically distributed increments. It is more general than the processes of RW1 and RW1 is considered as a special case of random walk type 2 (RW2). RW2 allows for unconditional heteroscedasticity. In statistics, heteroscedasticity happens when the standard errors of a variable are inconstant over a specific period. It implies that time variation fluctuation is allowed as long as the increments are independent. RW2 is weaker than RW1.

4.6.1.3. Random walk 3: Uncorrelated Increments

The third type category of random walk is yielded by further relaxing the assumption of independence (Campbell, Lo, & MacKinlay, 1997). It makes assumptions that all increments include processes with dependent but uncorrelated increments. RW3 is a process for which:

$Cov\ [\varepsilon_t, \varepsilon_{t-1}]$= 0 for $\forall k \neq 0$ and $Cov\ [{\varepsilon_t}^2, {\varepsilon_{t-k}}^2] \neq 0$ for some $k \neq 0$

RW1 and RW2 are special cases of the RW3. RW3 allows conditional heteroscedasticity. RW3 is the weakest form of random walk model among the three categories.

4.6.1.4. Summary

In spite of these differences in definitions of the three random walk types, they have some common properties. In particular, the conditional mean and variance at date t, conditional on some initial value P_0 at date 0:

$$\mathrm{E}[P_t|P_0] = P_0 + \mu t$$

$$\mathrm{Var}\ [P_t|P_0] = \mathrm{a}^2\mathrm{t}$$

It is revealed that the random walk is nonstationary, and the conditional mean and variance are both linear in time.

The RW1 allows for homoscedasticity, and it is known as the homoscedastic random walk hypothesis. Meanwhile, the RW2 and RW3 allow for heteroscedasticity. The RW2 is used to test the assumption of unconditional heteroscedasticity in the random disturbances. The RW3 is more general, and it is used to examine the assumption of conditional heteroscedastic random walk hypothesis. Besides that, RW1 is considered as a special case of RW2, and RW1 and RW2 are special cases of the RW3. The RW1 is the strongest form of random walk, and the RW3 is the weakest one. Thus, this study performs tests to examine RW1 and RW3. The statistical tests are conducted by using EViews software.

4.6.2. Tests for random walk model used in data analysis

To investigate a weak form of market efficiency, it is important to appraise whether the market follows the random walk model or not. The “random walk” characterises that the stock price movement is randomly from the previous stock price (Malkiel & Fama, 1970, p. 387).

Net return on the stock between time t-1 and t is regarded as:

$Y_t + 1 = \frac{P_t}{P_{t-1}}$

Continuously compounded return is:

$y_t = \ln(Y_t + 1) = \ln(\frac{P_t}{P_{t-1}}) = \ln(P_t) - \ln(P_{t-1}) = p_t - p_{t-1}$

To appraise the market efficiency, the random walk model is applied, defined as:

$p_t = \mu + p_{t-1} + \varepsilon_t$, (1)

or $\Delta p_t = y_t = p_t - p_{t-1} = \mu + \varepsilon_t$ (2)

where:

Δp_t (y_t) is the continuously pounded rate of return for a stock at time t,

p_t and p_{t-1} are the natural logarithm (log) of the stock price at time t and t-1,

μ is an unknown drift parameter,

ε_t is random disturbance term.

The hypothesis to be tested is:

H_0: Vietnamese market indices and stock prices follow a random walk,

H_1: Vietnamese market indices and stock prices does not follow a random walk.

Choosing tests for random walk model is based on the literature review related to the weak form efficiency in stock markets in emerging countries and in Vietnam. It is revealed that many statistical tests were applied to examine the random walk model, but tests designed on the variance ratio methodology have been extensively and popularly used to appraise the random walk process to investigate the market efficiency in emerging stock markets including Vietnam (for example, Dong Loc, Lanjouw, & Lensink (2010), Guidi & Gupta (2013), Phan & Zhou (2014), and Shaik & Maheswaran (2017)). Moreover, several authors (for instance, Lo & MacKinlay (1989), Liu & He (1991), Richardson & Smith (1991), and Faust (1992)) showed that the use of variance ratio statistic could be advantageous when testing the random walk model and the variance ratio statistic had optimal power against alternatives.

4.6.2.1. Single variance ratio test by Lo & MacKinlay (1988)

The single variance ratio appraises the null hypothesis that:

H_0: $VR(k) = 1 \; \forall k$

It means that the random walk hypothesis requires that the variance ratio in all sampling intervals should be not statistically different from 1.

Lo & MacKinlay (1988) assumed that k is fixed when $T \rightarrow \infty$ and generated two statistics for the random walk model based on the assumptions of the data series. Assuming

homoscedastic increments, the test statistic $Z_1(k)$ for the null hypothesis of $VR(k) = 1$, is given by:

$$Z_1(k) = \frac{VR(y;k)-1}{\varphi_1(k)^{1/2}} \quad (3)$$

which follows the standard normal distribution asymptotically and in which:

$$\varphi_1(k) = \frac{2(2k-1)(k-1)}{3kT} \text{ is the asymptotic variance} \quad (4)$$

Under the assumption of conditional heteroscedasticity, the heteroscedasticity robust test statistic $Z_2(k)$ for the null hypothesis of $VR(k) = 1$, is given by:

$$Z_2(k) = \frac{VR(y;k)-1}{\varphi_1(k)^{1/2}} \quad (5)$$

$$\text{where } \varphi_1(k) = \sum_{j=1}^{k-1} \left[\frac{2(k-j)}{k}\right]^2 \delta(j) \quad (6)$$

$$\delta(j) = \left\{\sum_{t=j+1}^{T} (x_t - \hat{\mu})^2 (x_{t-j} - \hat{\mu})^2\right\} \div \left\{\left[\sum_{t=1}^{T} (x_t - \hat{\mu})^2\right]^2\right\} \quad (7)$$

The decision-making rules usually used for the standard normal distribution are applied to the test. It is used to test the individual null hypothesis of random walk.

4.6.2.2. Multiple variance ratio test by Chow & Denning (1993)

The variance ratio test of Lo & MacKinlay (1988) was designed to appraise the null hypothesis for an individual value of the particular period *k*. However, the null hypothesis requires to be investigated for all periods of *k*, so it is necessary to implement a joint test in which a multiple comparison of variance ratios is made over different holding periods. Chow & Denning (1993) indicated that failures in controlling the size for the variance ratio tests could cause large Type I errors. To overcome the issues from ignoring the joint nature of using variance ratio test of Lo & MacKinlay (1988), this work undergoes the multiple variance ratio test designed by Chow & Denning (1993) as well.

Chow & Denning (1993) test considers a set of *m* tests and provides a multiple variance ratio test for the joint null hypothesis:

H_0: $VR(k_j) = 1$ for all $j = 1,..,m$

H_1: $VR(k_j) \neq 1$ for any $j = 1,..,m$

To appraise the joint null hypothesis, Chow-Denning's (1993) test statistic is defined as

$$M_1 = \sqrt{T} \max_{1 \leq j \leq} \left|Z_1(k_j)\right| \quad (8)$$

where Z_1 is defined in (3)

Similarly, the test statistic of the joint null hypothesis under the assumption of heteroscedasticity robust can be given as:

$$M_2 = \sqrt{T} \max_{1 \le j \le m} \left| Z_2(k_j) \right| \quad (9)$$

where Z_2 is defined in (5)

As long as the increments are not correlated, the examined relationship is asymptotical even in the presence of heteroscedasticity. The rejection of H_0 for any one or more *j* values results in refusing to accept the random walk hypothesis. The decision rules for the above null hypothesis depend on the maximum absolute value of individual variance ratio statistics. The statistics follow studentised maximum modulus (SMM) distribution with parameters *m* (number of variance ratios) and *T* (sample size) degree of freedom at α significance level, i.e., SMM (α, *m, T*). When *T* is large, the null hypothesis will be not accepted at α significance level if the maximum absolute value M_2 is greater than the critical value of SMM at a chosen significance level. The critical value is tabulated in Stoline & Ury (1979), and it is $\left[1 - (\frac{\alpha^*}{2})\right]^{th}$ percentile of the standard normal distribution where $\alpha^* = 1 - (1 - \alpha)^{1/m}$. It is used to test the joint null hypothesis of random walk.

4.6.2.3. Wald-Type test by Richardson & Smith (1991)

Richardson & Smith (1991) suggested another joint variance ratio test for testing the homoscedastic random walk hypothesis. It is based on the following Wald statistic:

$$RS(k) = T(VR - 1_k)' \Phi^{-1} (VR - 1_k)$$

Where VR is the $(k \times 1)$ vector of sample k variance ratios, 1_k is the $(k \times 1)$ unit vector, and Φ is the covariance matrix ofVR.

The Wald-type statistic follows an asymptotic Chi-squared distribution with k degrees-of-freedom. This Wald-type test is useful whenever the variance ratio tests are conducted over long lags with overlapping observations where the distribution of variance ratio test is abnormal, and neither the Lo-MacKinlay test nor Chow-Denning test is valid (Charles & Darné, 2009b). The Wald-type test could be more powerful than Chow & Denning's multiple comparison variance ratio tests (Fong, Koh, & Ouliaris, 1997). However, the results cannot be hold under the heteroscedasticity (Fong, Koh, & Ouliaris, 1997).

4.6.2.4. Rank tests by Wright (2000)

Wright (2000) developed non-parametric variance ratio tests using ranks. There are two major reasons to perform the tests. Firstly, it is likely to calculate the exact distributions. Secondly, it is more powerful than the other tests if the data distribution is abnormal. In the variance ratio tests based on ranks, standard error estimates assume no heteroscedasticity (EViews, 2017). The Wright variance ratio test statistics are achieved by computing the Lo-MacKinlay homoscedastic test statistic using the ranks or rank scores in place of the original data.

Assuming to have a sample size of T, let $r(y_t)$ be the rank of y_t among y_1, y_2,..., y_t and it is the number from 1 to T. The variance ratios proposed by Wright (2000), R_1 and R_2, are defined as follows:

$$R_1 = \left[\frac{(Tk)^{-1}\sum_{t=k}^{T}(r_{1t}+\cdots+r_{1t-k+1})^2}{T^{-1}\sum_{t=1}^{T}r_{1,t}^2}-1\right]\left[\frac{2(2k-1)(k-1)}{3kt}\right]^{(-\frac{1}{2})}$$

$$R_2 = \left[\frac{(Tk)^{-1}\sum_{t=k}^{T}(r_{2t}+\cdots+r_{2t-k+1})^2}{T^{-1}\sum_{t=1}^{T}r_{2,t}^2}-1\right]\left[\frac{2(2k-1)(k-1)}{3kt}\right]^{(-\frac{1}{2})}$$

where the standardised rank $r_{1,t}$ and $r_{2,t}$ are given:

$$r_{1,t} = \frac{r(y_t)-\frac{T+1}{2}}{\sqrt{\frac{(T-1)(T+1)}{12}}};$$

$$r_{2,t} = \emptyset^{-1}\frac{r(y_t)}{T+1};$$

where $\emptyset(k) = \frac{2(2k-1)(k-1)}{3kT}$ and $\emptyset^{-1}$ is the inverse of the standard normal cumulative distribution function.

The series r_{1t} is regarded as a simple linear transformation of the ranks, standardised to have sample mean 0 and variance 1. The series r_{2t} is inverse normal or Van der Waerden scores, has sample mean 0 and variance approximately equals to 1. The critical values of R_1 and R_2 can be given by stimulating their exact distribution. The Wright variance ratio test statistics test is used to test the RW1 model.

This work implements tests related to homoscedastic random walk hypothesis (RW1), conditional heteroscedastic random walk hypothesis (RW3), and Wright' rank variance ratio. ***Table 4.3*** summarises the use of the statistical tests to examine random walk model in this study. In this research, the single variance ratio test by Lo & MacKinlay (1988) and multiple

variance ratio test by Chow & Denning (1993) are two major decisive tests, while the other tests, such as Wright's rank-based variance ratio test and Richardson & Smith's test, are regarded as supporting tests in this study.

Table 4.3: Statistical tests for random walk model

Hypothesis	Statistical tests	Purpose
Homoscedastic Random walk hypothesis	Single variance ratio test by Lo & MacKinlay (1988)	To test individual null hypothesis
	Multiple variance ratio test by Chow & Denning (1993)	To test joint null hypothesis
	Wald-Type test by Richardson & Smith (1991)	Cannot be applied to test the heteroscedastic random walk model ► To test the joint null hypothesis of homoscedastic Random walk model
Homoscedastic Random walk hypothesis based on the rank-based variance ratio tests of Wright (2000)	Single variance ratio test by Lo & MacKinlay (1988)	Individual null hypothesis
	Multiple variance ratio test by Chow & Denning (1993)	Joint null hypothesis
	Wald-Type test by Richardson & Smith (1991)	Cannot be applied to test the heteroscedastic random walk model ► To test the joint null hypothesis of homoscedastic Random walk model
Conditional Heteroscedastic Random Walk Hypothesis – Martingale differences	Single variance ratio test by Lo & MacKinlay (1988)	To test individual null hypothesis
	Multiple variance ratio test by Chow & Denning (1993)	To test joint null hypothesis

Source: Author.

These tests are applied consistently and repeatedly to illustrate and justify the panel data. In this study, EViews software program facilitates data collection into well organised spreadsheets for data analysis, decreases data entry error, and conducts hypothesis testing. The use of EViews supports to minimise author subjectivity during the process of interpretation and analysis of the data set.

4.6.3. The use of EViews 10

In a weak form efficient market, the future stock prices or returns could not be estimated or predicted in any meaningful way by using past stock price information (Malkiel & Fama, 1970). It means that there is no relationship between the current price and the future price. In this work, the relationship between stock price on date *t* and stock price on date *t-1* would be investigated by running EViews 10 software program. The single variance ratio test by Lo & MacKinlay (1988); multiple variance ratio test by Chow & Denning (1993), Wald-Type test by Richardson & Smith (1991), and rank tests by Wright (2000) are conducted and replicated to test all the chosen market indices and stock prices of the companies. The secondary data and

relevant statistical tests are highly structured, and the researcher is external to them. The application of EViews 10 and multiple tests supports to minimise author subjectivity during the process of interpretation and analysis of the data set.

EViews 10 facilitates data collection into well organised spreadsheets for data analysis, helping to avoid data entry error and conduct hypothesis testing. It is known as a regression package with powerful modelling functions. It offers ideal tools to efficiently and effectively manage data, conduct econometric and statistical analysis, and generate forecasts or model simulations (EViews, 2017). In particular, EViews 10 provides the statistical and econometric tools to analyse time series, cross-sectional data, and panel data (EViews, 2017). Further, it offers a variety of tools to explore and investigate the properties of the data. It provides an extensive set of estimation tools, including basic descriptive statistics, such as basic graphing, histogram, tests for equality, and standard regression analysis, as well as specialised tests, such as long-run variance calculation, unit root test, variance ratio test, and cointegration diagnostics.

In terms of variance ratio test, it allows conducting the test of the random walk model using the differences, log differences, or original data in the series (EViews, 2017). The execution of EViews 10 is controlled by the use of logical commands, loops, and subroutines (EViews, 2017). The variance ratio test procedure starts with opening the stock price series of an index or a company stock, then selecting “View/Variance Ratio Test” to display the dialogue. Firstly, it conducts the variance ratio test under the independently and identically distributed version without biased correction to examine homoscedastic random walk hypothesis (RW1). The author chooses “Exponential random walk” in the “Data specification” section to work with the log differences of stock prices. In “Test specification”, “Original data” is chosen to compute. After that, “Use unbiased variances” and “Use heteroskedastic robust S.E.” checkboxes are unchecked to test the homoscedastic random walk model. According to the study of Lo & MacKinlay (1998), the test statistics were distributed standard normally at the asymptotical level, so the “Probabilities” dropdown is deployed to select the default “Asymptotic normal” results for the tests. Lastly, the “Test period” section identifies the intervals whose variances are expected to be compared to the variance of the one-period innovation. One of the approaches to specify the periods to test is providing a “User-specified list” of values containing the values. The default settings in this study are to compute the test for specified lists of “2 5 10 20 30” to investigate the data in the period of 2, 5, 10, 20, and 30 working days.

Following that, the study repeats the previous procedure but allows for heteroscedasticity in the data and uses bootstrapping to illustrate the statistical significance and test conditional heteroscedastic random walk hypothesis (RW3). The author fills out the dialogue as before but select the “Use heteroskedastic robust S.E.” checkbox. To control the size of the joint test, Chow & Denning (1993) proposed a test statistic that evaluated the maximum absolute value of a set of multiple variance ratio statistics. The statistics followed SMM distribution with parameters *m* (number of variance ratios) and *T* (sample size) degree of freedom at α significance level, i.e., SMM (α, *m, T*). The test focused on whether the increments were uncorrelated or not, so this relationship would hold asymptotically even in heteroscedasticity. According to that, this test chooses the default “Asymptotic normal” in the “Probabilities” dropdown. In the “User-specified list”, specified lists of “2 5 10 20 30” are chosen.

Following that, Wright’s rank variance ratio test is performed. Wright (2000) proposed the variance ratio tests which did not rely on asymptotic approximations and was under homoscedasticity. Based on that, this test chooses “Ranks” in the “Compute using” dropdown in the “Test specification”. The test probabilities are computed using permutation bootstrap with 5000 replications, the Knuth generator, and a seed for the random number generator of 1000 specified in the “Options” to match the statistics of Wright (2000) and follow the guidelines of EViews 10. The specified test periods are “2 5 10 20 30” to investigate the data in the period of 2, 5, 10, 20, and 30 working days and to match the sampling intervals in the statistics of Wright (2000).

Subsequently, the research carries out tests related to RW1, RW3, and Wright’ rank variance ratio. The rank-based variance ratio test of Wright (2000) is conducted under the assumption of no heteroscedasticity, so it is used to test the RW1 model. The single variance ratio test by Lo & MacKinlay (1988) and multiple variance ratio test by Chow & Denning (1993) are performed to test individual null hypothesis and joint null hypothesis, correspondingly. In addition, Wald-Type test by Richardson & Smith (1991) cannot be applied to test the heteroscedastic random walk model, so it is used to test the joint null hypothesis of RW1 model. These tests are implemented to study VN Index, HNX Index, and stock prices of the selected companies with different sizes and from various sectors in HOSE and HNX. If the Vietnamese stock market meets the requirements of weak form efficient market hypothesis, it will continue to be examined whether it is semi-strong form efficient or not.

4.6.4. Event study

If the Vietnamese stock market has weak form efficiency, the semi-strong form efficient hypothesis will be conducted. Event studies are useful to appraise the semi-strong efficient form of markets by examining whether any specific event in the capital market affects the stock market performance (Watson & Head, 2019). Event study gauges the effects of a specific event on the shareholder wealth by investigating an abnormal movement of stock prices around the particular event (Mann & Babbar, 2017). The ARs refer to the difference between the actual returns after an event and the normal returns that a firm would have gained without the effects of such an event (Mann & Babbar, 2017).

Three key time frames of an event study comprise the estimation window, the event window, and the post-event window (MacKinlay, 1997). ***Figure 4.6.*** presents the timeline of an event study:

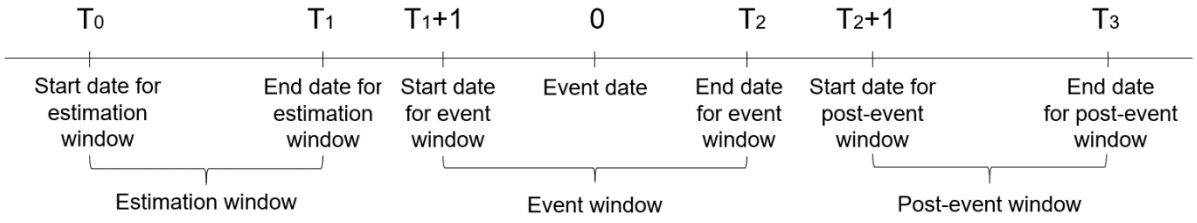

Figure 4.6: Event study timeline

Source: Benninga, 2014.

Let t = 0 represent the time of event when a company announces relevant information or when an important market event occurs (Benninga, 2014). The announcement date of an event is considered as the point of interest. The event window usually starts a few trading days prior to the actual event day, and it is represented from $T_1 + 1$ to T_2. The length of the event window normally lasts for three, five or ten days, and it is focused on the announcement. It is useful to illustrate leakage or anticipation of information prior to the event. Additionally, it supports to determine how long it takes for an event information to be reflected on the stock prices. In this study, 21 days of (-10, +10) are designated as the event window. Besides that, the 11 days of (-5, +5) and 3 days of (-1, +1) would be considered to understand the immediate reaction to information and investigate the existence of information leakage around the events.

The estimation window is used to estimate the normal behaviour of the stock with respect to a market or industry index. It is presented from T_0 to T_1. The most popular model to estimate the normal behaviour is a regression based on the actual return of the stock and the actual return of market index or industry index (Benninga, 2014). However, a system of industry indices in HOSE and HNX has been developed for recent years and some industries

have not had industry index until now, so selecting optimal criteria based on industry indices is such a challenge (Hanoi Stock Exchange, 2019). It indicates that the actual return of VN Index and HNX Index, two major market indices in the Vietnamese stock exchanges, are collected and analysed in this study. Further, different studies choose different estimation windows to research the impacts of events on the stock market (Chen, Liu, & Huang, 2009; Dua, Puri, & Mittal, 2010; Tran & Mai, 2015; Alhashel, 2016; Beltratti, Bortolotti, & Caccavaio, 2016; Evelyn & Basana, 2018). It is necessary to choose an estimation window in which the chosen events did not happen at all and have no impact on the stock price (Brooks, 2014). This study chooses three event days on which there is a huge change in closing prices of the market indices and their rates of returns. The estimation window should not be more than the shortest time gap between announcement dates of any two chosen events affecting the market indices and stock prices in the stock exchange markets. Moreover, the estimation period is the one prior to the event window and the longest event window in this work is 21 days of (-10, +10). The chosen estimation window is less than the difference which is resulted by subtracting 21 days from the mentioned shortest time gap of event announcements. Furthermore, it considers the event windows of (-5; +5) and (-1; +1) to understand the reaction of the stock price to the information raised.

The post-event window is utilised to study the longer-term performance of a company following the event. It is presented from $T_2 + 1$ to T_3. The post-event window can last for as short as 1 month and as long as several years (Benninga, 2014).

The parametric t-test in this work will be conducted based on the studies of Brown & Warner (1985) and Yolsal (2011). With randomly chosen securities and event dates, there should be no abnormal performance on average if the stock market has semi-strong form efficiency (Brown & Warner, 1985). To illustrate the normal behaviour of the market, the market model for a stock *i* could be expressed as the regression:

$$y_{it} = \alpha + \beta y_{mt}$$

where y_{it} represents the stock return on day t,

y_{mt} is the market return on day t,

α and β, which are unchanged parameters, could be estimated by an ordinary least-square regression over the estimation window.

The daily stock return and daily market return are correspondingly expressed as:

$$y_{it} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$$

$$y_{mt} = \frac{P_{m,t} - P_{m,t-1}}{P_{m,t-1}}$$

The ARs are determined as the difference between actual return of a share and its expected return. The expected return of the share is calculated by the market model, which helps to measure the correlation between returns of an individual stock and its correspondent market returns (Yolsal, 2011). The AR for a stock *i* on day *t* is calculated as below:

$AR_{it} = y_{it} - (\alpha_i + \beta_i y_{mt})$

where:

y_{it} represents actual stock return on day t,

$\alpha_i + \beta_i y_{mt}$ represents return expected by the α, β and corresponding market return of the stock.

The cumulative abnormal returns (CAR) for a stock *i* on day *t* is calculated as below:

$CAR_{i,t} = CAR_{i,t-1} + AR_{it}$

where:

$CAR_{i,t-1}$ stands for cumulative abnormal stock return on day t-1,

AR_{it} stands for abnormal stock return on day t.

The event study in this paper aims to test whether an event or publicly available information leads to any abnormal movement in a company stock price or not. Parametric t-test is deployed in this work to investigate whether the ARs and CARs are significantly different from zero. The hypothesis to be tested is:

H_0: The ARs and CARs are close to zero,

H_1: The ARs or CARs are greatly different from to zero.

The parametric t-test in this study will be conducted in the Excel.

4.7. Reliability and validity of quantitative methods

The quantitative method emphasises on the measurement and evaluation of causal relationships between variables (Creswell & Creswell, 2018). It deals with numeric data, so it can be quantified and summarised. It utilises quantitative statistical measures to appraise hypotheses to result in logical and reliable conclusions and generalisation (Easterby- Smith et al., 2018). There is a concern about whether the research instruments used to investigate the relationship between variables sufficiently ensure accuracy and consistency. Reliability and

validity are considered as key aspects of choosing and employing a quantitative research instrument.

Zohrabi (2013) defined reliability as “the consistency, dependability and replicability of results obtained from a piece of research”. It indicates the extent to which the results are consistently obtained cross time and through different measures without bias (Zohrabi, 2013). Two aspects of reliability are internal and external reliability. Whereas internal reliability focuses on assuring consistency during a research project, external reliability refers to whether research techniques and procedures would provide consistent outcomes by repeated by researchers themselves or replicated by other researchers (Saunders, Lewis, & Thornhill, 2019). Tharenou, Donohue, & Cooper (2007) categorised reliability in quantitative research into three types, which are degree of internal consistency, test-retest reliability, and inter-rater reliability. Healed and Twycross (2015) identified three major attributes of reliability, including internal consistency, stability, and equivalence ***(Table 4.4)***.

Table 4.4: Attributes of reliability

Attributes	Description
Internal consistency	The extent to which all the items on a scale measure one construct
Stability	The consistency of results using an instrument with repeated testing
Equivalence	Consistency among responses of multiple users of an instrument, or among alternate forms of an instrument

Source: Healed & Twycross, 2015.

Reliability is considered as a necessary condition but not sufficient one for validity (Tharenou, Donohue, & Cooper, 2007). Validity is defined as “the appropriateness of the used measures, accuracy of the analysis of the results and generalisability of the findings” (Saunders, Lewis, & Thornhill, 2019, p. 214). There are three key categories of validity, comprising content validity, construct validity, and criterion validity (Healed & Twycross, 2015) ***(Table 4.5)***.

Table 4.5: Categories of validity

Categories	Description
Content validity	The extent to which a research instrument accurately measures all aspects of a construct
Construct validity	The extent to which a research instrument measures the intended construct
Criterion validity	The extent to which a research instrument is related to other instruments that measure the same variables

Source: Healed & Twycross, 2015.

Collecting data, choosing statistical tests, and utilising techniques in this research are hugely based on the research question and objectives. In this study, EViews software program

facilitates data collection into well-organised spreadsheets for data analysis, decreases data entry error and conducts hypothesis testing. The single variance ratio test by Lo & MacKinlay (1988), multiple variance ratio tests by Chow & Denning (1993), Wald-Type test by Richardson & Smith (1991), and rank variance ratio tests by Wright (2000), and event study are employed and replicated to examine VN Index, HNX Index, and stock prices of the selected companies with different sizes from various sectors. These tests are conducted from January 2018 to January 2019 to implement tests for weak form and semi-strong form and to evaluate the Vietnamese market efficiency in recent time. The secondary data and statistical tests are highly structured, and the researcher is external to them. The use of EViews software and multiple tests support to minimise author subjectivity within interpretation and analysis of the data set. Furthermore, the statistical findings in the quantitative analysis are reassured by examining the qualitative and documentary data. Thus, the proper procedure ensures the reliability and the validity of the quantitative methods in this research.

4.8. The use of NVivo software

This study attempts to gain a comprehensive view of the Vietnamese stock market efficiency by looking at the level of market and the market participants at the same time. In addition to statistically testing the relevant quantitative data, qualitative data from semi-structured interviews with managers of listed companies and other market participants hugely support to findings of the research. Qualitative methods follow a naturalistic approach that investigates phenomenon in natural settings (Pandey & Patnaik, 2014). They are used to discover social context, lived experiences, and human perceptions (Griensven, Moore, & Hall, 2014). Employing the qualitative data by interviews helps to obtain a deeper understanding of the problem. In terms of qualitative data analysis, computer software has been recognised as assisting researchers to gain an accurate and transparent viewpoint of data (Welsh, 2002).

Trustworthiness is a crucial element in qualitative research, and it is positively related to the generalisability of qualitative research (Golafshani, 2003). There are four main criteria of trustworthiness – credibility, transferability, dependability, and conformability (Lincoln & Guba, 1985). The procedures and findings in this research are generated from mixed data inputs, which include quantitative statistical data, qualitative interviews, and documentary data, to minimise researcher subjectivity. Decisions on contents and potential interviews of the semi-structured interviews are made based on the statistical results. The information gained from the semi-structured interviews is checked by supporting evidence from illustrating documentary information, including financial statements and sustainable development reports of the related companies.

The analysis of qualitative data uses mixed methods. Firstly, this part aims to explain the factors and implications of the Vietnamese market efficiency by using qualitative data analysis software, NVivo 12 software in particular. NVivo 12, a qualitative data analysis computer software package, has several advantages in managing data and ideas, querying data, modelling visually, and reporting. NVivo 12 refers to analysing qualitative data from the interviews by determining key words and counting the frequency of words, and its applications contributes to increasing the trustworthiness and quality of qualitative research (Sinkovics, Penz, & Ghauri, 2008). In this study, the semi-structured interviews are carried out, recorded, and transcribed in Vietnamese. After that, the information is translated to English and organised, managed, worked, and reported with supports of NVivo 12, which is used to conduct administrative tasks of managing and exploiting the data more efficiently and entirely. It supports to development of the concepts, categories, codes, and themes and facilitates the reading of findings. NVivo 12 coding massively aids to reduce manual tasks and provides the author with better time management tools to discover trends, illustrate themes, and derive conclusions from the qualitative data. It is an approach to organise and manage data logically and systematically, identify key themes and patterns, as well as investigate specific data, key words, frequencies and similarities and differences among various transcripts. Following that, based on the directions and key points found out by using NVivo 12, this research attempts to extensively investigate the market efficiency and its impacts on the listed companies as well as critically evaluate the recommendations for improving the market efficiency. The information obtained from the quantitative and qualitative analysis would be reassured and supported by providing practical and economic information from documentary data analysis. It will be explained and discussed further in detail in the following chapters.

4.9. Ethical considerations

In terms of collecting primary data, the author commits to comply with Research Ethics Principles and The Code of Practice for Research of the University of Sunderland. The research rigorously complies with the ethical, legal, and professional obligations and standards. The researcher is transparent and honest with every interviewee and provides an overview of the research. The research information sheet, consent form, and key interview questions are given prior to conducting interviews. The researcher commits that all interviewees supporting this study obtain the right to have information protection when providing primary information through interviews. It is committed that interviews are conducted when interviewees are willing and give consent to participate in the work. The conservations are recorded after receiving the interviewees' permission for audio recording. Moreover, the

potential stakeholders are announced about their rights to withdraw from the research whenever they want without the requirements of giving reasons.

Procedures of data collection and processing complies with the University of Sunderland ethical research guidelines in terms of Principles of Anonymity, Confidentiality, and Data Protection. The personal identification information of participants is secured confidentially and separately when storing the raw data collected from interviews. Besides that, they are informed how these data are used and stored when they are destroyed. The researcher is in control of collecting and analysing data, and the procedures of data transcription, translation and analysis are implemented in private space. The full audio, transcripts, and the other relevant files are encrypted, password protected and stored securely. All information and data gathered during the research are only used by the researcher for the academic purposes. The audio data is used only for this research and removed from the audio device as soon as it is possible when relevant publications are completed and published. The application (Reference Number: 003546) for achieving ethical approval on the Online Ethics Review System of the University of Sunderland was approved on 18 February 2019.

4.10. Conclusion

The methodology of this empirical research is essentially determined by the research question and objectives. Evaluation of the market efficiency requires a positivist and a quantitative approach, whereas exploration of the impacts of market behaviours on the listed companies and the way to improve efficiency needs interviews and a qualitative approach. Hence, the mixed method methodology, which is used in this study, is consistent with a pragmatism philosophy. In term of research approach, the abduction which is the mixture of deduction and induction is employed to accomplish the research question and objectives. Regarding methodological choices, the study uses both the numeric and non–numeric data because the use of either quantitative or qualitative approach is not enough adequate to address and solve the complexity. The mixture of quantitative, qualitative, and documentary data is utilised to meet the requirements. The research follows the explanatory mixed methods design. Its weight is on the quantitative strand. The first phase of research mainly involves with secondary data, while the second phase of study employs both primary data and secondary data. It can be summarised as the ***Figure 4.7***:

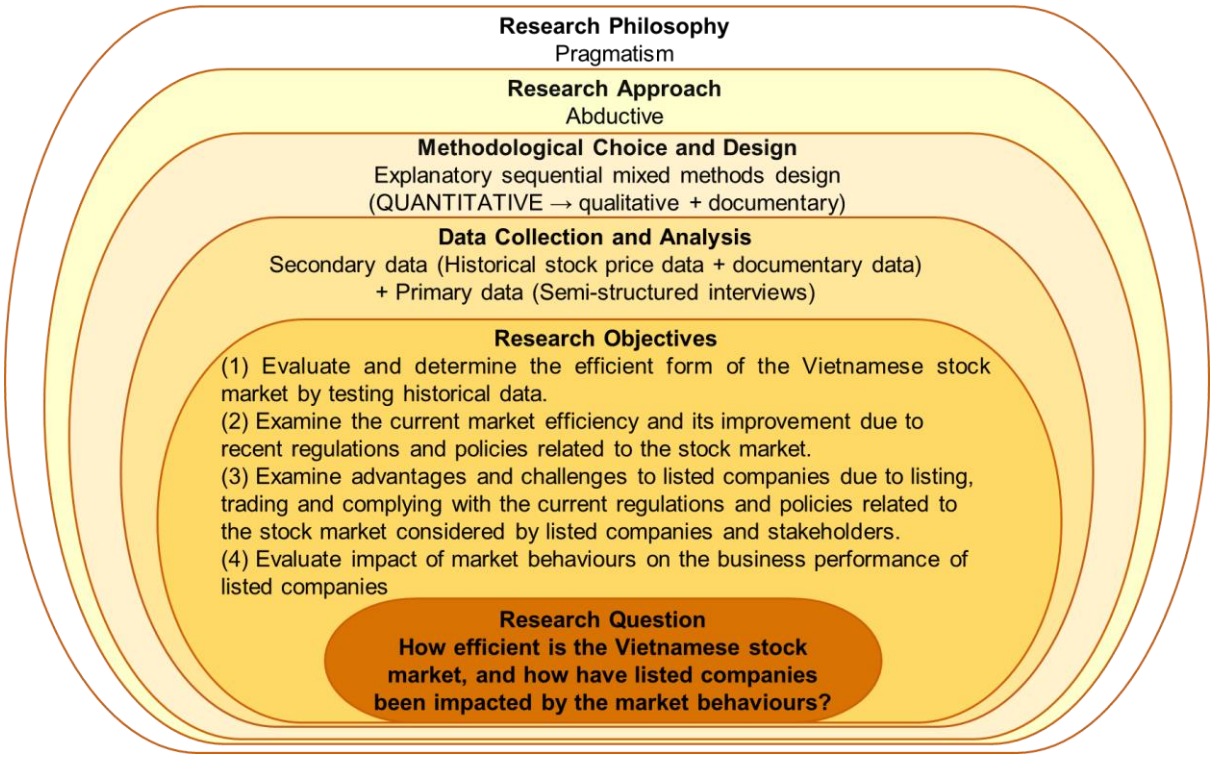

Figure 4.7: Visual presentation of research methodology in this study

Source: Author.

In terms of quantitative data analysis, the random walk model is firstly exploited to test the weak form efficiency hypothesis. If the findings reveal that the Vietnamese stock market follows a random walk model, a semi-strong form efficient hypothesis will be examined. An event study is a highly recommended tool to test the semi-strong form efficiency. The event study in this thesis attempts to justify whether an important announcement leads to ARs. The methods and tests are used consistently and repeatedly to process the secondary data.

The analysis of qualitative data uses mixed methods. Firstly, this part aims to explain the factors and implications of the Vietnamese market efficiency by using qualitative data analysis software, NVivo 12 software in particular. Based on the directions and key points found out by using NVivo 12, this research attempts to extensively investigate the market efficiency and its impacts on the listed companies as well as critically evaluate the recommendations for improving the market efficiency. Procedures for collecting and dealing with the primary data will comply with the requirements recommended by the University of Sunderland ethical research guidelines in terms of Principles of Anonymity, Confidentiality, and Data Protection. The application on the Online Ethics Review System of the University of Sunderland was approved on 18 February 2019.

CHAPTER 5: QUANTITATIVE DATA ANALYSIS

5.1. Introduction

The Vietnamese stock market is currently one of the most dynamic emerging stock markets in Asia (Pham, Nguyen, & Vo, 2018). Restructuring the securities market has been a primary strategic project of the Government of Vietnam and the Ministry of Finance since 2012 (The Prime Minister, 2012b). Several new legislations aim to increase clarity, transparency, and consistency as well as boost market efficiency of HOSE and HNX. As a result, there has been a considerable growth in demand for investment funds in Vietnam, leading to significant market activities of the Vietnamese stock exchanges in terms of both market capitalisation and liquidity (Gupta, Yang, & Basu, 2014; Vo & Truong, 2017). The new listings of companies and participation of foreign investors have also accelerated the Vietnamese market development in recent years (Vo & Truong, 2017). Therefore, this work investigates an example of a case study of Vietnam and provides a comprehensive view of the Vietnamese emerging market efficiency due to the regulatory changes in the market. This chapter is conducted on the basis of the previous chapters, and it focuses on the first objective:

(1) Evaluate and determine the efficient form of the Vietnamese stock market by testing historical data.

In other words, this chapter refers to quantitatively examining and determining the efficient form of the Vietnamese stock market by testing historical data on the two main stock exchanges. Moreover, the chapter targets to investigate the improvement of the stock market efficiency due to recent regulatory changes in comparison with findings of the existing literature review investigating the Vietnamese stock market efficiency, hence it partly deals with the second objective:

(2) Examine the current market efficiency and its improvement due to recent regulations and policies related to the stock market.

The tests are selected to best meet the research requirements and answer the research questions from my viewpoint as a researcher. This research starts with tests on weak form efficiency. To appraise weak form efficiency, it is necessary to examine whether the market follows the random walk model or not, and the “random walk” characterises that the stock price movement is randomly made from the previous stock price (Malkiel & Fama, 1970, p. 387). The research utilises two steps, including graphical analysis and statistical tests, to test the random walk model on the two major stock market indices and stock prices of selected

listed companies. The graphical analysis provides an initial and preliminary view of the market efficiency of HOSE and HNX. In terms of statistical tests, the use of variance ratio tests by EViews 10 targets to explore whether the stock indices or company stock prices follow an exponential random walk or not. Alternatively, it focuses on whether they are independently and identically distributed or martingale differences, which are measured by the log differences of the rates.

The variance ratio methodology is used to appraise an existence of random walk process (Charles & Darné, 2009b). The RW1 is known as the homoscedastic random walk hypothesis, while the RW2 and RW3 allow for heteroscedasticity (Campbell, Lo, & MacKinlay, 1997). Moreover, the RW1 is considered as a special case of the RW2, and the RW1 and RW2 are special cases of the RW3. The RW1 is the strongest form of random walk and the RW3 is the weakest one. Thus, variance ratio tests in this research are designed to study RW1 and RW3 under the assumption of homoscedastic and heteroscedastic increments, respectively. The statistical tests are conducted using EViews 10.

As a researcher, I would like to clarify decision-making guidelines for the weak form of efficient examination. If there is rejection in any tests for a null hypothesis of a RW1, it will reject the null hypothesis of a RW1. It is applied similarly to the null hypothesis of a RW3. In other words, all results of the suggested tests are required to be not rejected if the market meets the requirements of the RW1 or RW3. In this research, the single variance ratio test by Lo & MacKinlay (1988) and multiple variance ratio test by Chow & Denning (1993) are the two key tests, while the other tests such as graphical analysis, Wright's rank-based variance ratio test and Richardson & Smith's test are considered as supporting tests. The single variance ratio test by Lo & MacKinlay (1988) is deployed to test the individual null hypothesis of a random walk, while the multiple variance ratio test by Chow & Denning (1993) is used to examine the joint null hypothesis. This work requires all results of the Lo & MacKinlay's tests and Chow & Denning's tests not to be rejected under the null hypothesis of a RW1 or RW3 if the market meets the requirements of the RW1 or RW3. In this research, the results from Lo & MacKinlay's tests and Chow & Denning's tests are major and decisive. Graphical analysis and the other tests are only supplementary, and they will be discussed briefly.

When the market satisfies weak form efficient assumptions, either the current stock prices entirely reflect the information contained in all past prices or the market follows the random walk model. However, it does not totally inform how security prices quickly and fully react to the newly available information. Thus, if the Vietnamese stock market meets the requirements of weak form efficient market, tests of semi-strong efficient form will be deployed.

The quantitative findings form the major foundation to examine and evaluate how the Asian emerging market efficiency influences the listed companies in the following chapter.

5.2. Histogram and statistics of VN Index and HNX Index

The histogram and statistics display the frequency distribution of data series in a histogram. The series range in histogram is regarded as the distance between the maximum and minimum values, and it is divided into several equal length intervals or bins. It provides the number of observations that fall into each bin.

Figure 5.1 reveals the histogram and statistics of VN Index. Due to errors of software system from Ho Chi Minh City Stock Exchange, the stock exchange has suspended the trading session of 23 January 2019 and 24 January 2019 to fix the system problem (The Voice of Vietnam, 2018). There are 252 observations of VN Index from 02 January 2018 to 07 January 2019. The mean is 1006.267, the median is 988.06 and the skewness is 0.66, so the VN Index has moderately positive skewness, where there is a long right-hand tail and most of data bunched on the right. Besides that, the kurtosis is 2.51, implying that the data has a light-tailed distribution with small outliners.

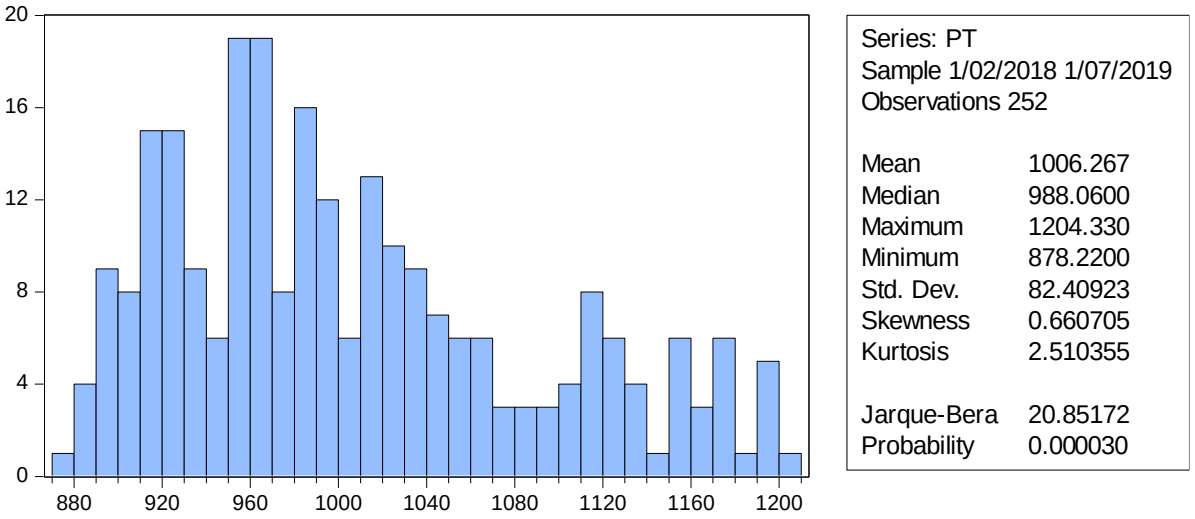

Figure 5.1: Histogram and statistics of VN Index

Source: Outcome from EViews 10.

Additionally, ***Figure 5.2*** demonstrates histogram and statistics of HNX Index. There are 254 observations of VN Index from 02 January 2018 to 07 January 2019. The mean is 114.97, median is 113.2 and the skewness is 0.447, so HNX Index has symmetrical data. Further, the kurtosis is 2.109, meaning that the data has a light-tailed distribution with small outliners.

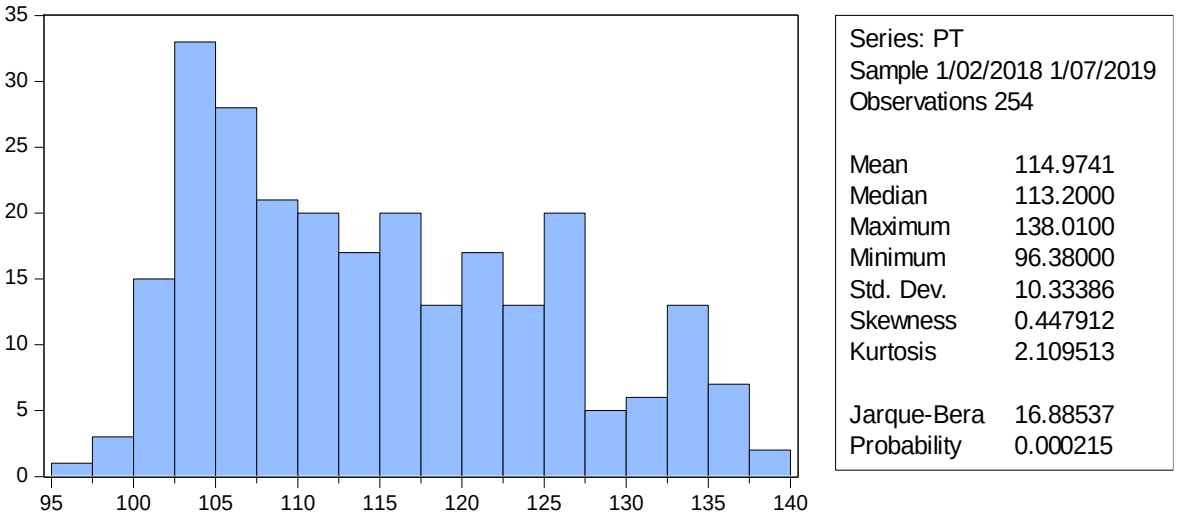

Figure 5.2: Histogram and statistics of HNX Index

Source: Outcome from EViews 10.

Besides that, ***Table 5.1*** shows the histogram and statistics of market indices and stock prices. The skewness measures how symmetric the studied observations are around the mean, and the skewness is 0 for a normal distribution. In the market indices and the selected stocks, daily prices of four stocks have negative skewness with right-skewed distributions. Furthermore, Kurtosis coefficients of seven stocks are greater than 3, manifesting the leptokurtosis characteristics with fat-tailed distributions. Many Kurtosis coefficients of the other stocks are much lower than 3, manifesting the platykurtic characteristics with light-tailed distributions. Additionally, a normality test namely the Jarque-Bera[1] test is deployed to examine the normality of data, which means to measure the difference of the skewness and kurtosis of the series with that from the normal distribution. The statistic is computed as:

$$JB = \frac{N}{6}(S^2 + \frac{(K-3)^2}{4})$$

where *N* is the number of observations in the current sample, *S* is the skewness, and *K* is the kurtosis.

1 The test was first developed by Jarque & Bera (1980)

Table 5.1: Histogram and statistics of market indices and stock prices

Index/Stock	No. of observations	Mean	Median	Maximum	Minimum	Standard deviation	Skewness	Kurtosis	Jarque-Bera	Profitability
VN Index	252	1006.267	988.060	1204.330	878.220	82.409230	0.660705	2.510355	20.851720	0.003%
AAA	252	20.22183	17.975	34.950	13.750	5.519975	1.047849	3.028955	46.124250	0.000%
BWE	252	21.80278	21.325	28.500	15.800	3.748316	0.191068	1.672170	20.046180	0.004%
DAG	252	8.018175	8.095	10.300	6.200	0.929082	-0.125654	2.093561	9.290276	0.961%
DBD	252	42.34056	40.995	50.640	34.590	4.841026	0.021732	1.503332	23.539990	0.001%
DGW	252	24.74048	24.700	29.700	20.000	2.016829	-0.061168	2.437814	3.475702	17.590%
DRC	252	24.51964	24.200	30.900	19.700	2.631437	0.257309	2.102470	11.239130	0.363%
PLX	252	66.21556	63.150	93.100	50.940	10.796630	0.912089	2.803733	35.344570	0.000%
SAB	252	231.1845	227.200	267.500	199.000	14.980550	0.262645	2.398353	6.698029	3.512%
SCR	252	9.749167	9.320	14.400	7.050	1.718603	0.749957	2.642998	24.960530	0.000%
VCB	252	58.88668	57.265	72.503	45.424	5.773614	0.751251	2.839289	23.97510	0.0006%
YEG	137*	244.2555	238.100	343.000	181.000	34.725240	0.227165	2.267631	4.240033	12.003%
HNX Index	254	114.9741	113.200	138.010	96.380	10.333860	0.447912	2.109513	16.885370	0.022%
ACB	254	15.85336	15.447	21.034	12.308	1.920420	0.808847	2.949891	27.72247	0.0001%
AMC	254	21.78189	20.350	28.300	17.500	2.765711	0.647181	2.110409	26.106360	0.000%
CDN	254	16.90118	16.500	22.200	14.400	1.633820	1.079140	4.065905	61.323260	0.000%
CET	254	3.531102	3.400	5.500	2.600	0.521643	1.071099	4.442897	70.601030	0.000%
KHS	254	9.193425	9.290	12.200	7.930	0.869503	0.981661	3.057446	13.056370	0.1462%
LDP	254	26.05	26.400	36.600	18.200	3.634570	0.178022	3.043695	1.361833	50.615%
MAS	254	51.83665	44.850	79.880	34.570	14.830760	0.717012	1.913939	34.247190	0.000%
NDN	254	12.05409	12.150	16.530	7.880	1.896224	-0.415062	2.645739	8.621247	1.3425%
TA9	254	7.654126	7.626	9.734	5.6623	0.98423	0.162744	1.960793	12.55071	0.1882%
TVC	254	10.49488	10.600	12.600	7.800	1.175648	-0.720161	3.454744	24.143940	0.001%
VLA	254	12.49882	12.500	16.000	10.200	1.030426	0.103971	4.354829	19.883990	0.005%
*Note: Data of YEG starts from its first listing date to 07 January 2019.										

Source: Compiled by author.

Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as $\chi^2$with 2 degrees of freedom. If the series is normally distributed, the Jarque-Bera statistic should not be significant. According to the results from ***Table 5.1***, the probability values for DGW, YEG, and LDP are more than the significance level of 5%, which indicates the existence of a normal distribution. The daily prices of the two market indices and the other stocks have small probability values less than the significance level of 5%. The results of this test for the normality imply that the data are not normally distributed. Thus, it needs to extend the sample size to ensure normal distribution and reliability of the results. The data of the market indices and the companies other than DGW, YEG, and LDP will be further appraised for tests of a weak form efficiency from 02 January 2018 to 31 December 2019.

5.3. Examining market efficiency of HOSE

The work performs graphical analysis and statistical tests to examine the random walk model for the VN Index – the market index at HOSE and selected listed companies on HOSE. Weak efficient form is usually associated with the random walk hypothesis, implying that the current stock price moves randomly and unpredictably without depending on price changes in the past (Malkiel & Fama, 1970). The random walk model is a fundamental tool to appraise this weak level of efficiency (Malkiel & Fama, 1970). It is impossible for investors to obtain abnormal excess returns over a sustainable period from trading strategies and technical analysis based on historical price movement and returns in a weak form efficient market (Degutis & Novickytė, 2014; Nalın & Güler, 2015). Information subset of interest in the weak form tests is historical data and relevant information about past prices (or returns) (Malkiel & Fama, 1970). In other words, these tests appraise whether there is no existence of a correlation between stock prices or returns in successive periods of time or not (Howells & Bain, 2008). If HOSE meets the conditions of weak form efficiency, the event study will be carried out to appraise the semi-strong form efficiency.

5.3.1. Graphical analysis of VN Index

The data will be illustrated and examined graphically before using the financial econometrics models. Graphical methods are useful ways of processing and presenting financial data in forms of time series or cross-sectional forms (Koop, 2006). The graphical approach provides an appropriate structure for analysing data by representing possible dependences among the variables in a graph (Abdelwahab, Amor, & Abdelwahed, 2008). The graphical analysis demonstrates an initial investigation to have a preliminary view of the market efficiency of HOSE. The signs and magnitudes of daily rates of return provide information on historical daily fluctuations in the market indices and stock prices. The market

would be regarded as a random walk if no patterns, trends, or predictable behaviours are manifested based on the signs and magnitudes of selected market indices and stock prices in the research period.

Appendix 5.1 reveals daily rates of returns of VN Index, which is the market index on HOSE, and their signs from 02 January 2018 to 07 January 2019. According to ***Appendix 5.1***, suspected patterns of some periods in the 'sign' of the daily rate of return are observed. There were some continuous "+" series in some periods, in particular:

- From 08 January 2018 to 15 January 2018, the signs were (+, +, +, +, +, +).
- From 18 January 2018 to 26 January 2018, the signs were (+, +, +, +, +).
- From 12 March 2018 to 22 March 2018, the signs were (+, +, +, +, +, +, +, +, +).
- From 31 May 2018 to 11 June 2018, the signs were (+, +, +, +, +, +, +, +).
- From 16 August 2018 to 23 August 2018, the signs were (+, +, +, +, +, +).
- From 07 September 2018 to 14 September 2018, the signs were (+, +, +, +, +, +).
- From 16 November 2018 to 22 November 2018, the signs were (+, +, +, +, +).

There were some continuous "-" series in some periods, in particular:

- From 18 October 2018 to 30 October 2018, the signs were (-, -, -, -, -, -, -, -, -).
- From 13 December 2018 to 26 December 2018, the signs were (-, -, -, -, -, -, -, -, -, -).

There were some continuous mixed patterns in some periods, in particular:

- From 04 October 2018 to 12 October 2018, the patterns were (+, -, -, +, -, -, +).
- From 31 October 2018 to 12 November 2018, the signs were (+, -, +, +, -, +, +, -, +).

However, in the mentioned periods with observed patterns, there were no significant fluctuations that could lead to the abnormal rates of return having the absolute values over 5% (including positive returns and negative returns).

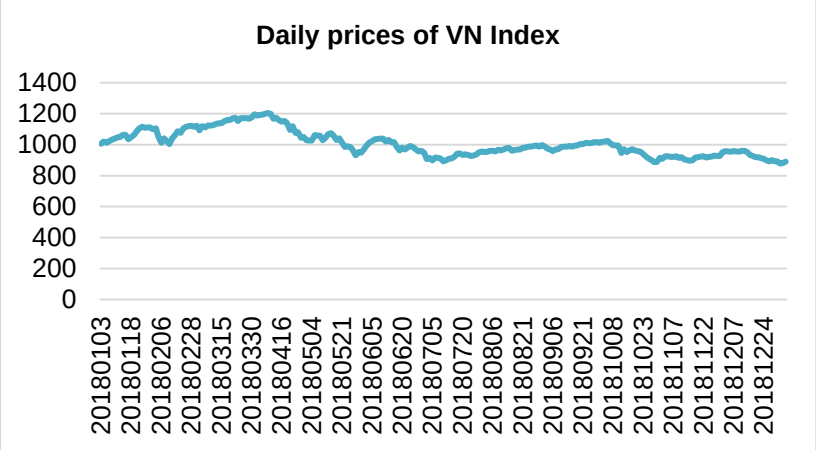

Figure 5.3: Daily prices of VN Index

Source: Compiled by author.

Figure 5.3 expresses daily prices of VN Index. Between 02 January 2018 and 07 January 2019, there was a downward trend from 995.77 points to 889.64 points and the fluctuation of the daily prices was unpredictable.

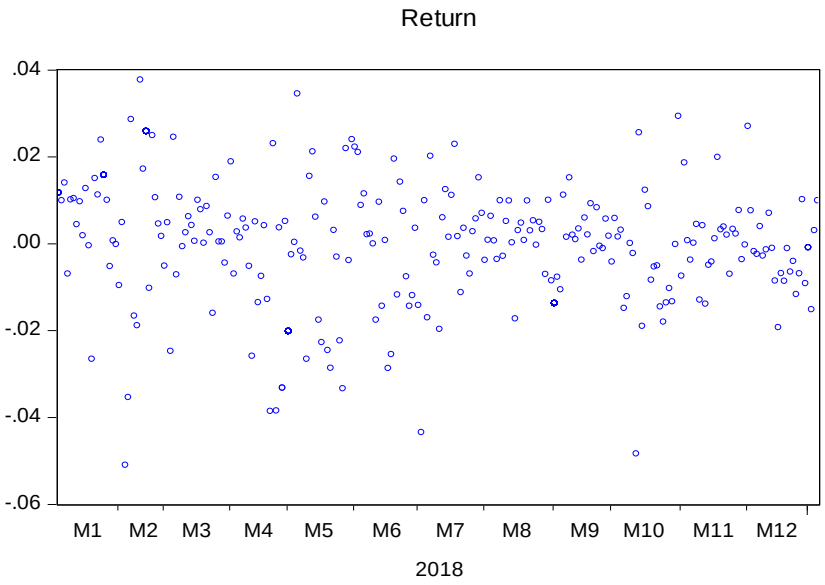

Figure 5.4: Dot plot chart of daily rate of return (%) of VN Index

Source: Outcome from EViews 10.

Further, ***Figure 5.4*** manifests the distributions of its daily rates of return. In this period, there was only one time that the absolute value of the daily rate of return was more than 5%, which was 05 February 2018 with -5.098% on. The scatter dots are observed as random patterns and the random walk behaviours of daily rates of return are described as the footprints of a drunk man. It is not able to accurately forecast the next step of the drunk man by observing his current step. Alternatively, there is no systematic relationship between today's rates of return and yesterday's ones, so it is almost impossible to accurately predict the future price or rate of return of VN Index based on the chart.

According to the above analysis, some similar suspected patterns are observed from the signs of the daily rates of return of VN Index. Investors and researchers could predict a sign pattern in the short-run fluctuation of VN Index based on the current movement trends. However, the magnitudes of its rates of return mostly had the absolute values which was significantly less than 5%, so it was impossible to earn consistent abnormal excess returns from exploiting the historical market indices and their relevant information. Furthermore, the rates of return moved randomly without being impacted by past rates of return. As a result, HOSE stock markets could follow the random walk with unpredictable behaviours. The preliminary results of signs give some suspected patterns and trends, but no consistent abnormal excess returns are obtained in a specific period. Therefore, it is essential to further

investigate and evaluate the market efficiency of HOSE statistically.

5.3.2. Statistical tests of weak form efficiency on HOSE by using EViews 10

In a weak form market, the current stock prices completely reflect information incorporated in all past prices, so it is impossible to exploit the information about the past behaviour of prices or returns to forecast the next price movement and earn consistent excess returns (Malkiel & Fama, 1970). To test a weak form of market efficiency, statistical tests in this study examine whether the market follows the random walk model or not, which means no relationship between the current price and the future price. In this work, the relationship between stock price on date t and stock price on date t-1 is inspected using EViews 10 software program. The use of variance ratio tests based on EViews 10 aims to examine whether the stock indices or company stock prices follow an exponential random walk or not, or alternatively, whether the stock indices or company stock prices returns are independently and identically distributed or martingale difference, which is measured by the log difference of the stock prices.

This study applies both classical and dynamic variance ratio tests to assess weak form efficiency. The statistical testing procedure involves the following steps: (1) variance ratio tests under the independently and identically distributed assumptions are performed without bias correction to test the homoscedastic random walk model. (2) variance ratio tests are performed by repeating the previous procedure but allowing for heteroscedasticity in the data and using bootstrapping to illustrate the statistical significance. The study also conducts Wright's rank variance ratio test to support the tests in steps 1 and 2. Wright (2000) proposed the variance ratio tests that do not rely on asymptotic approximations and are done under homoscedasticity. (3) If the null hypothesis of a random walk model is not rejected in ALL cases, the study then performs event study analysis to test for the semi-strong market form efficiency.

The single variance ratio test by Lo & MacKinlay (1988) and multiple variance ratio test by Chow & Denning (1993) are deployed to appraise individual null hypothesis and joint null hypothesis in the investigations of RW1 and RW3. Further, the Wald-Type test by Richardson & Smith (1991) cannot be applied to test the heteroscedastic random walk model, so it is used to test the joint null hypothesis of the RW1 model. These tests are applied consistently and repeatedly to illustrate and justify the panel data. In this study, EViews 10 software program facilitates data collection into well-organised spreadsheets for data analysis, decreases data entry error and performs hypothesis testing. The use of EViews 10 helps to minimise author subjectivity during the process of interpretation and analysis of the data set.

As a researcher, I expect that all results of the suggested tests need to be not rejected if the market meets the requirements of the RW1 or RW3. In addition, the single variance ratio test by Lo & MacKinlay (1988) and multiple variance ratio test by Chow & Denning (1993) are two major decisive tests, while the other tests, such as Wright's rank-based variance ratio test and Richardson & Smith's test, are regarded as supporting tests in this study. The single variance ratio test by Lo & MacKinlay (1988) is performed to test the individual null hypothesis of random walk, while the multiple variance ratio test by Chow & Denning (1993) is used to examine the joint null hypothesis. This work requires all results of the Lo-MacKinlay and Chow-Denning tests not to be rejected under the null hypothesis of a RW1 or RW3 if the market meets the requirements of the RW1 or RW3.

Table 5.2: Variance ratio test under homoscedasticity (VN Index)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	1.563004	251	0.4664
Wald (Chi-Square)	10.55741	5	0.0609

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.983717	0.063119	-0.257974	0.7964
5	1.216144	0.138288	1.563004	0.1181
10	1.179462	0.213116	0.842085	0.3997
20	0.973767	0.313698	-0.083624	0.9334
30	0.914127	0.389208	-0.220636	0.8254

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00044900167613)

Period	Variance	Var. Ratio	Obs.
1	0.00020	--	251
2	0.00019	0.98372	250
5	0.00024	1.21614	247
10	0.00023	1.17946	242
20	0.00019	0.97377	232
30	0.00018	0.91413	222

Source: Outcome from EViews 10.

When inputting the quantitative data sets of the daily closing prices into the EViews 10, the results related to the two Vietnamese stock indices and listed companies are given. Firstly, it conducts the variance ratio test under the independently and identically distributed version without bias correction to examine the homoscedastic random walk hypothesis known as RW1. In the joint tests with the joint null hypothesis in ***Table 5.2***, the Chow & Denning's maximum $|z|$ statistic in this case of VN Index is 1.563004 associated with the period 5

individual test and it is lower than the critical value of 1.96. The approximate probability of the maximum $|z|$ statistic is achieved using the asymptotic simulated method of moments distribution with infinite degrees of freedom and the corresponding p-value is 0.4664, which is higher than 0.05. It indicates that there is insufficient evidence to reject the joint null hypothesis of a random walk. Moreover, the individual statistics could not reject the individual null hypothesis because all the variance ratio statistics are close to 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. Therefore, the joint and individual null hypotheses could not be rejected based on the Chow-Denning test and Lo-MacKinlay test. It is supported by the statistic result of the Wald-type test for the joint hypothesis which is 10.55741 with the p-value of 0.0609.

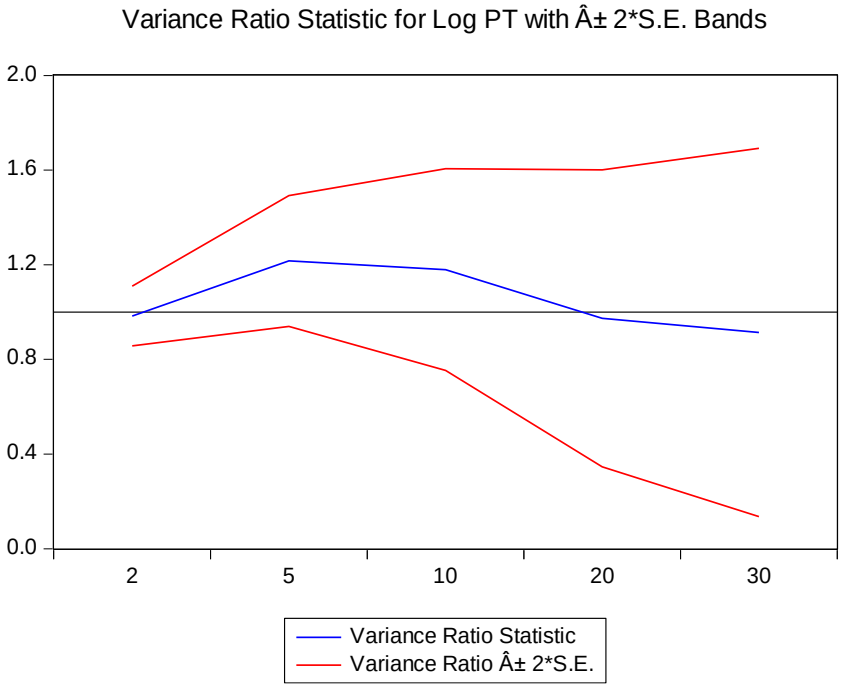

Figure 5.5: Variance ratio test under homoscedasticity (VN Index)

Source: Outcome from EViews 10.

A graph of the variance ratio statistic for log of VN Index is represented as ***Figure 5.5*** and the horizontal reference line at 1 represents the individual null hypothesis. The space between the two red lines indicates asymptotic standard error bands, while the blue line represents the variance ratio statistics. In this graph, the null reference line totally lies inside the asymptotic standard error bands, which declares that all the individual variance ratio statistics are close to 1. It is based on the statistical and graphical results of two main tests, the Lo & MacKinlay's individual variance ratio tests and the Chow & Denning's joint variance ratio tests, to conclude that the individual null hypothesis and the joint null hypothesis of RW1 could not be rejected.

Following that, the study repeats the previous procedure but allows for heteroscedastic

robust standard error estimates to appraise the conditional heteroscedastic random walk hypothesis known as RW3. In ***Table 5.3***, the Chow & Denning's maximum $|z|$statistic of 1.239906 has a bootstrap p-value of 0.7019, and it is associated with the period 5 individual test. In brief, the Chow & Denning's maximum $|z|$statistic of VN Index is less than the critical value of 1.96, and the p-value is extremely greater than 0.05 under heteroscedasticity. It implies that the joint null hypothesis of a martingale could not be rejected. Furthermore, the individual statistic tests reveal that all the variance ratio statistics are close to 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. Thus, it is impossible to reject the individual null hypothesis of a martingale.

Table 5.3: Variance ratio test under heteroscedasticity (VN Index)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	1.239906	251	0.7019

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.983717	0.081614	-0.199514	0.8419
5	1.216144	0.174323	1.239906	0.2150
10	1.179462	0.258089	0.695348	0.4868
20	0.973767	0.365630	-0.071746	0.9428
30	0.914127	0.440921	-0.194759	0.8456

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00044900167613)

Period	Variance	Var. Ratio	Obs.
1	0.00020	--	251
2	0.00019	0.98372	250
5	0.00024	1.21614	247
10	0.00023	1.17946	242
20	0.00019	0.97377	232
30	0.00018	0.91413	222

Source: Outcome from EViews 10.

The results are supported by the presentation in ***Figure 5.6***. The null reference line completely lies inside the asymptotic standard error bands, showing that all the individual variance ratio statistics are close to 1. Subsequently, the statistical and graphical results of Lo & MacKinlay's individual variance ratio tests and Chow & Denning's joint variance ratio tests consistently arrive at a conclusion that the individual null hypothesis and the joint null hypothesis of a martingale could not be rejected under heteroscedasticity.

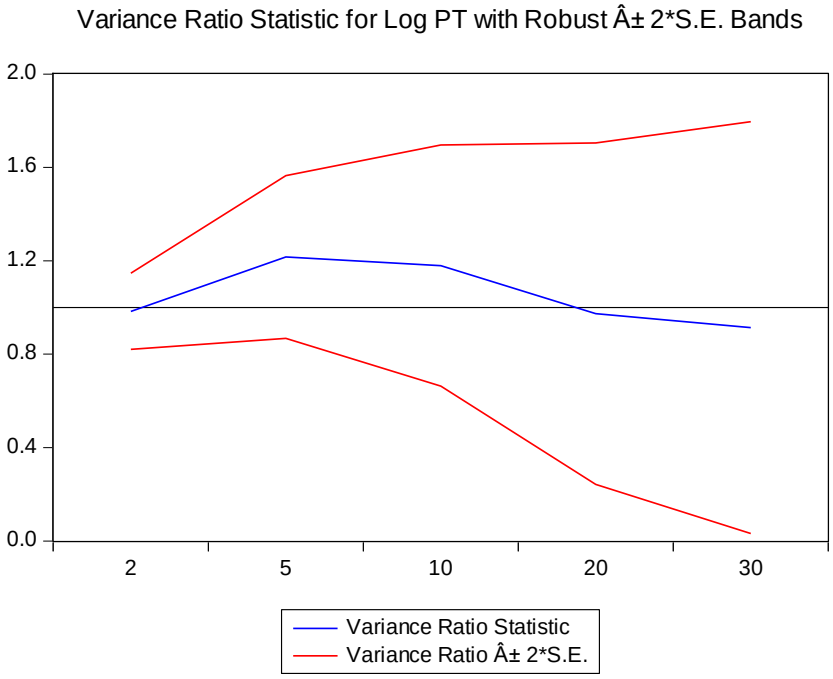

Figure 5.6: Variance ratio test under heteroscedasticity (VN Index)

Source: Outcome from EViews 10.

The study conducts Wright's rank variance ratio test in addition to the above tests. Wright (2000) proposed the variance ratio tests which do not rely on asymptotic approximations and are under homoscedasticity. In the joint tests with the joint null hypothesis in ***Table 5.4***, the Chow & Denning's maximum $|z|$statistic of VN Index is 1.481945 associated with the period 5 individual test, and it is less than the critical value of 1.96. The p-value is 0.3320, which is greater than 0.05. Thus, the joint null hypothesis of a random walk could not be rejected. Additionally, all individual statistics could not reject the individual null hypothesis of a random walk because all the variance ratio statistics are close to 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Therefore, the statistical and graphical results of Lo & MacKinlay's individual variance ratio tests and Chow & Denning's joint variance ratio tests using rank variance ratio do not reject the null hypothesis of a random walk. Moreover, the statistic result of the Wald-type test for the joint hypothesis is 7.288312 which does not fall in the rejection region, and its p-value of 0.1998 is more than 0.05.

Table 5.4: Rank variance ratio test (VN Index)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	1.481945	251	0.3320
Wald (Chi-Square)	7.288312	5	0.1998

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.992443	0.063119	-0.119729	0.9128
5	1.204935	0.138288	1.481945	0.1448
10	1.216772	0.213116	1.017158	0.3344
20	1.065030	0.313698	0.207301	0.8726
30	0.969913	0.389208	-0.077303	0.9572

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	0.99244	0.99244	250
5	1.20493	1.20493	247
10	1.21677	1.21677	242
20	1.06503	1.06503	232
30	0.96991	0.96991	222

Source: Outcome from EViews 10.

The procedure is similarly carried out on data of chosen listed companies on HOSE. ***Table 5.5*** summarises the statistical results of joint null hypothesis tests as follows. There is no rejection for Chow-Denning tests in the tests of homoscedastic random walk hypothesis and conditional heteroscedastic random walk hypothesis. However, in Wright's rank variance ratio tests, the Chow-Denning maximum $|z|$statistic of SAB is 2.024427, which is much greater than 1.96. It leads to disapproval of the joint null hypothesis based on Chow-Denning test using the rank variance ratio. Further, the results from Wright's rank variance ratio reject the joint null hypothesis.

Table 5.5: Results of joint tests of VN Index and companies listed on HOSE

No	Market index/ Company Code	Homoscedastic Random Walk Hypothesis (RW1)		Conditional Heteroscedastic Random Walk Hypothesis (RW3)	Wright's Rank Variance Ratio Tests	
		Joint Null Hypothesis		Joint Null Hypothesis	Joint Null Hypothesis	
		Chow & Denning's Tests (Max |z| at period m)	Wald-type Tests (Chi-Square)	Chow & Denning's Tests (Max |z| at period m)	Chow & Denning's Tests (Max |z| at period m)	Wald-type Tests (Chi-Square)
1	VN Index	1.563004	10.55741	1.239906	1.481945	7.288312
2	AAA	1.320434	4.077156	1.103773	1.335044	3.941815
3	BWE	1.253687	5.258795	1.308467	1.491423	6.871651
4	DAG	1.076361	3.009254	1.024227	1.320799	5.046908
5	DBD	0.867583	1.828717	0.718641	0.986921	1.500091
6	DGW	0.687615	1.270915	0.567438	0.712624	2.248989
7	DRC	1.202203	3.640313	1.169928	1.130753	2.960597
8	PLX	1.190022	5.417670	1.043855	0.975795	2.702319
9	SAB	1.006794	1.646222	0.953932	2.024427	4.899507
10	SCR	1.448142	9.286596	1.217853	0.987598	5.449250
11	VCB	1.056919	7.500282	0.819122	1.448214	7.443981
12	YEG	1.014972	3.760387	0.711141	0.775276	2.011191
No of rejected null		0	0	0	1	0
*Note: Wald test is only used for homoscedasticity assumption because this method is not consistent with the heteroscedasticity robust tests (EViews, 2017).						

Source: Outcome from EViews 10.

The detailed statistical results of all tests for the selected companies on HOSE are presented in ***Appendix 5.2***. Accordingly, ***Table 5.6*** summarises the results of variance ratio tests on the logs of the VN Index and the listed companies on HOSE. There is not enough strong evidence to accept the null hypothesis of a RW1 for the representative stock market index and listed stocks on HOSE. On the other hand, it is consistently concluded that VN Index and the chosen companies on HOSE are conform to the hypothesis of a RW3 and almost certainly random.

Table 5.6: Statistical results of VN Index and companies listed on* HOSE** *(See* ***Appendix 5.2*)*

No	Market index/ Company Code	Homoscedastic Random Walk Hypothesis (RW1)			Conditional Heteroscedastic Random Walk Hypothesis (RW3)		Wright's Rank Variance Ratio Tests		
		Individual Null Hypothesis	Joint Null Hypothesis		Individual Null Hypothesis	Joint Null Hypothesis	Individual Null Hypothesis	Joint Null Hypothesis	
		Lo & MacKinlay's Tests	Chow & Denning's Tests	Wald-type Tests	Lo & MacKinlay's Tests	Chow & Denning's Tests	Lo & MacKinlay's Tests	Chow & Denning's Tests	Wald-type Tests
1	VN Index	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
2	AAA	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
3	BWE	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
4	DAG	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
5	DBD	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
6	DGW	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
7	DRC	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
8	PLX	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
9	SAB	Not reject	Not reject	Not reject	Not reject	Not reject	Reject	Reject	Not reject
10	SCR	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
11	VCB	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
12	YEG	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
No of rejected null		0	0	0	0	0	1	1	0
Note: Wald test is only used for homoscedasticity assumption because this method is not consistent with the heteroscedasticity robust tests (EViews, 2017).									

Source: Compiled by author.

The RW1 is the strictest form of a random walk. In the RW1, there are independently and identically distributed increments with mean 0 and variance σ^2. The independence of increments implicates not only that they are uncorrelated, but also that any of their nonlinear functions are uncorrelated. There are mixed outputs for VN Index, and the selected companies listed on HOSE from tests of the homoscedastic random walk hypothesis. In particular, the results of Chow-Denning test on the logs of VN Index and 11 selected companies on HOSE indicate that there is not enough evidence to reject the joint null hypothesis of a random walk. It is compatible with the results of their corresponding individual tests. It implies that the data of VN Index and 11 selected companies on HOSE could not reject the individual null hypothesis of following a random walk. Thus, there is enough evidence supporting that the data on HOSE meets the necessary conditions to not reject the hypothesis of a homoscedastic random walk (RW1) based on Lo-MacKinlay test and Chow-Denning test. Furthermore, the Richardson-Smith Wald test statistic does not reject the joint null hypothesis in all cases.

However, the random walk null hypothesis is also investigated by the rank variance ratio test, which is also used to test the RW1 model. When a stock market is regarded to be weak form efficient, any market indices or stock prices of any company listed on the market should meet the requirements of weak form efficiency. A rejection of the joint null hypothesis in the case of SAB results in the joint null hypothesis of a random walk being rejected on HOSE based on Chow-Denning test. Moreover, there is a rejection of the individual null hypothesis in the case of SAB based on Lo-MacKinlay test and its null reference line lies slightly below the lower border of the asymptotic standard error bands. As a result, the log of SAB's stock prices does not follow a random walk, so the individual null hypothesis of a random walk is not accepted on HOSE. Therefore, it is unable to strongly accept the null hypothesis of a RW1 based on Wright's rank variance ratio tests, meaning that the data does not meet the supplementary conditions of accepting the null hypothesis of a RW1 under homoscedasticity. The rejection of the null hypothesis of a RW1 implicates that random walk increments of VN Index and stock prices are not independently and identically distributed. The null hypothesis of a random walk is rejected under homoscedasticity. It implies the situations in which the random disturbance in the relationship between the independent variables and the dependent variables is changeable for the values of the independent variables.

Regarding the variance ratio test under heteroscedasticity, all the Chow & Denning's maximum $|z|$statistic values are less than the critical value of 1.96, and their corresponding p-values are all more than the significant value of 0.05. Moreover, in the individual tests, the variance ratio statistics are not significantly and statistically different from 1.0, all absolute values of z-statistic are lower than the critical value of 1.96, and their appropriate bootstrap p-

values are all more than the significance level of 0.05. Consequently, the joint null hypothesis and the individual null hypothesis of a martingale are not rejected under conditional heteroscedasticity based on Chow-Denning test and Lo-MacKinlay test. The null reference line completely lies inside the asymptotic S.E bands. It indicates that the logs of VN Index and the selected listed companies' stock price series on HOSE are almost certainly random and conform to the hypothesis of a RW3. The null hypothesis of a martingale could not be rejected on the case of VN Index and all chosen companies on HOSE at a significance level of 5%. According to the martingale hypothesis, "if the expected returns and price changes projected on the basis of information fully reflected in the current price are zero, the stock price sequence will follow a martingale" (Malkiel & Fama, 1970, p. 386). It means that there is no systematic price movement which could lead to effective linear forecasting rule in the market.

According to histogram and statistics of VN Index and the companies listed on HOSE, the probability values of the Jarque-Bera test of VN Index and companies except for DGW and YEG are less than the significance level of 5%. It indicates the existence of a normal distribution only in the data of DGW and YEG. The data of VN Index and the companies other than DGW and YEG are further analysed from 02 January 2018 to 31 December 2019 in ***Appendix 5.2*** to ensure the reliability of results. The results of over nearly two years are consistent with the mentioned findings from 02 January 2018 to 07 January 2019. In other words, the logs of stock price series of VN Index and the selected companies on HOSE from 02 January 2018 to 31 December 2019 do not reject the joint null hypothesis and the individual null hypothesis of a RW3 based on Chow-Denning test and Lo-MacKinlay test.

The empirical evidence reveals that VN Index and the listed companies on HOSE meet the requirements of weak form efficiency along the lines of RW3. The RW3 is the weakest form of random walk model, which implicates that the increments are uncorrelated, but they are clearly neither independent nor identically distributed because their squared increments are correlated. It indicates that the stock market index and companies' stock prices on HOSE are almost certainly random during the selected period. The result is supported by the graphical analysis of VN Index. The absolute values of magnitudes of its rates of return were mainly much below 5%, so the consistent abnormal excess returns could not be achieved from exploiting the historical market indices and their relevant included information. In addition, the chart of VN Index's daily prices and the distributions of its daily rates of return show that its rates of return move randomly without being affected by past rates of return. Thus, HOSE is fairly efficient in the weak form. It implies that it is unable to accurately predict the price movement of VN Index and the selected listed companies on HOSE to earn consistent excess returns over a sustained period based on their historical price changes.

The statistical findings hugely support that HOSE is approaching a state of being informationally weak form efficient. Nonetheless, it disagrees with Dong Loc, Lanjouw, & Lensink (2010), Do, Le, & Nguyen (2015), Guidi & Gupta (2013), Luu, Pham, & Pham (2016), and Shaik & Maheswaran (2017). The authors conducted investigations on VN Index and companies listed on HOSE to conclude that the Vietnamese stock market or HOSE was inefficient in weak form hypothesis (Dong Loc, Lanjouw, & Lensink, 2010; Do, Le, & Nguyen, 2015; Guidi & Gupta, 2013; Luu, Pham, & Pham, 2016; Shaik & Maheswaran, 2017). It manifests that there has been an improvement in the market efficiency of HOSE from an inefficient form to a weak efficient form. The result is consistent with the research of Gupta, Yang, & Basu (2014) and Phan & Zhou (2014). Their studies consented that there was an improvement in stock market efficiency of the Vietnamese market, especially HOSE, and the stock exchange market had weak form efficiency following the global financial crisis (Gupta, Yang, & Basu, 2014; Phan & Zhou, 2014). Moreover, it was in harmony with the findings from the research in Indonesian stock market of Yang & Pangastuti (2016), Nordic and Baltic stock exchanges of Hellström, Liu, & Sjögren (2018), and the Shanghai stock market of Li & Zhang (2011). These studies supported that the strategic changes in the stock exchange markets enhanced the informational efficiency of these mentioned markets.

This market satisfies weak form efficient assumptions, which means that the current stock prices completely reflect the information contained in all past prices. However, it does not reflect how the price could timely and fully react to the new information. Thus, HOSE meets the conditions of RW3 and obtains weak form efficiency, so it is essential to appraise semi-strong form efficient hypothesis.

5.3.3. Tests of semi-strong form on HOSE: An event study.

This part mainly appraises whether HOSE meets the requirements of semi-strong form hypothesis or not. The key points in the semi-strong efficient form investigate whether the current share prices fully and timely react to all obviously and publicly available information (Malkiel & Fama, 1970). The information refers to all historical information as well as all other publicly available information (Mallikarjunappa & Dsouza, 2014). When the price adjusts promptly and accurately to such information, there is no opportunity to gain ARs or have abnormal losses at this level (Mallikarjunappa & Dsouza, 2014). Tests of semi-strong form efficiency focus on the adjustment of stock prices to one or various types of information generating events (Malkiel & Fama, 1970). Event studies are useful to appraise the semi-strong efficient form of markets by evaluating whether specific events in the capital market affect the stock market performance or not (MacKinlay, 1997; Watson & Head, 2019).

I would like to clarify decision-making guidelines as a researcher for the semi-strong form efficient examination. In this study, if any company has a rejection in any tests related to any events at any point in time in the event window for a null hypothesis of ARs close to zero, the semi-strong efficient hypothesis will be rejected. It will be employed similarly with the null hypothesis of CARs nearly zero. If any CARs are statistically significant in any event window, the null hypothesis of CARs close to zero will be rejected and the market will not meet the conditions of the semi-strong form. In brief, it requires no rejection in any tests of a null hypothesis of ARs or CARs close to zero in order to conclude that the market meets the requirements of semi-strong form efficiency.

5.3.3.1. Event study

Event study gauges the effects of a specific event on the shareholder wealth by examining an abnormal movement of stock prices around the event (Mann & Babbar, 2017; Müller, 2020). The ARs refer to the difference between the actual returns after an event and the normal returns that a firm would have gained without the effects of such an event (Mann & Babbar, 2017; Eryigit & Eryigit, 2019). The event study has a variety of applications and contributions in accounting and finance research, and it is used to investigate several specific firms and economy-wide events (Benninga, 2014). Its examples include mergers and acquisitions, earnings announcements, stock issuance, dividend payment, and announcements of macroeconomic variables (MacKinlay, 1997; Dua, Puri, & Mittal, 2010; Tran & Mai, 2015; Alhashel, 2016; Beltratti, Bortolotti, & Caccavaio, 2016; Evelyn & Basana, 2018). This study randomly chooses three event days on which there is a huge change in VN Index's closing prices and its rates of returns. The information is summarised in ***Table 5.7***:

Table 5.7: Chosen events in event study

No	Date	VN Index			Event
		Pt	Pt-1	Returns	
1	05/02/2018	1048.71	1105.04	-5.10%	Information from the Chairman of the State Securities Commission related to the roadmap of applying an increase of the initial margin and volatility of the United States stock market impacted investors' sentiment.
2	03/072018	906.01	947.15	-4.34%	Fears of an escalating trade war between the United States and China and the problems of climbing exchange rates and lowering expected profits of listed companies.
3	11/10/2018	945.89	993.96	-4.84%	Selloffs of European and American stocks due to concerns about rising US government bond yields and psychological effects of the escalating trade war on investors.

Source: Compiled by author.

On 05 February 2018, there was a considerable drop in VN Index from 1105.04 points to 1048.71 points, and it led to a significant loss rate of -5.10%. The root of the sharp decline is mainly the information from the Chairman of the State Securities Commission (Kieu, 2018). According to their declaration, a proposal was submitted to the Ministry of Finance to extend the roadmap of applying an increase of the initial margin from 50% to 60% to be effective from 01 March 2018 instead of 01 February 2018 as before (Kieu, 2018). This was one of the reasons why investors started to make sell-off sessions to reap profits. In addition, this huge downward trend was due to the United States stock market volatility. The investors considered whether the United States Federal Reserve would gradually tighten monetary policy and raise interest rates more than expected in the coming years (Phong, 2018). As a result, all indices on the United States stock market fell sharply, especially one of which was Dow Jones plummeting by nearly 665.75 points (2.54%) (Kieu, 2018; Phong, 2018). It caused a sharp decrease in the world stock market, so it contributed to the impact on investors' sentiment (Phong, 2018).

On 03 July 2018, VN Index substantially decreased by 41.14 points to 906.01 points. It accounted for -4.34%. Among listed company stocks on HOSE, 248 of them had a fall and only 63 of them had a rise (Nhan Dan, 2018b). The decline of VN Index was influenced by blue-chips (large-cap stocks) when the 20 largest companies only accounted for 78% of the total market capitalisation, but their stock price drop constituted 85% of the downfall of VN Index (Ngoc, 2018). The downward trend of the market was attributed to fears of an escalating trade war between the United States and China (Yuanta Securities Vietnam, 2018). Moreover, the problems of climbing exchange rates and lowering expected profits of listed companies in the continuous days had crucial effects on the stock market and resulted in a loss of belief and trust in investors and stakeholders (Yuanta Securities Vietnam, 2018).

On 11 October 2018, there was a sharp reduction in VN Index from 993.96 points to 945.89 points. In the trading session on 10 October 2018 at night in the time zone of Vietnam, European and American stocks had drastic selloffs, especially in technological stocks, causing Wall Street and European stocks to slump (Nhan, 2018). Concerns about rising US government bond yields and escalating trade war were the major causes of the global stock plunge (Nhan, 2018). In Asian stock markets, Nikkei 225 declined by 3.88%, Shanghai Index diminished by 4.34%, and Hang Seng index decreased by 3.72%. Investors in Vietnam were psychologically affected by the stock markets in the world, so the Vietnamese stock market also witnessed massive selloffs from the morning session (Vietnam Investment Review, 2018b). As a result, VN Index slumped by 4.84% on 11 October 2018.

Three key time frames of an event study comprise the estimation window, the event window, and the post-event window (MacKinlay, 1997). Let t = 0 represent the time of event when relevant information is announced or when an important market event occurs (Benninga, 2014). The announcement date of an event is considered as the point of interest. The event window usually starts a few trading days prior to the actual event day. The length of the event window normally lasts for three, five, or ten days, and it is centred on the announcement. It is useful to illustrate leakage or anticipation of information prior to the event. Additionally, it helps to determine how long it takes for event information to be reflected on stock prices. In this study, 21 days of (-10, +10) are designated as the event window. Besides that, the 11 days of (-5, +5) and 3 days of (-1, +1) are considered to understand the immediate reaction to information and investigate the existence of information leakage around the events.

The most popular model to estimate the normal behaviour is a regression based on the actual return of the stock and the actual return of market index or industry index (Benninga, 2014). However, there is an insufficient and inadequate system of industry indices in HOSE and HNX, so selecting optimal criteria based on industry indices is challengeable (Hanoi Stock Exchange, 2019b; Ho Chi Minh Stock Exchange, 2019b). Besides, only HOSE meets the requirements of weak form efficiency. Thus, the actual returns of VN Index, the major market index in HOSE, are collected and analysed in this study. Additionally, the stock daily closing prices and rates of returns of DRC and BWE, two companies randomly selected from the chosen company stocks on HOSE in this study, are also considered in the examination of semi-strong form hypothesis. BWE is one of the newly listed stocks in the utilities sector, while DRC is one of the existing listed company stocks in the consumer discretionary sector.

The estimation window is used to estimate the normal behaviour of the stock with respect to a market or industry index. It is presented from T0 to T1. It is important to choose an estimation window in which stock prices were not impacted by the mentioned events (Brooks, 2014). In the work, the shortest time gap between announcement dates of any two chosen events impacting the market indices and stocks on the stock exchanges is 70 days. Moreover, the estimation window relates to the period before the event window and the longest event window in this work is 21 days of (-10, +10). The chosen estimation window should be less than the difference which is calculated by subtracting 21 days from the mentioned shortest time gap of event announcements. Thus, in this study, the estimation window is 35 days until the day before the event window (-10; +10). In addition, there are two types of mistakes in a statistical hypothesis test (Stock & Watson, 2015). A type I error is associated with rejecting a null hypothesis when in fact it is true (Stock & Watson, 2015). Meanwhile, a type II error is related to not reject the null hypothesis when in fact it is false (Stock & Watson, 2015). In the

work, the significance level of type I is defined, so it is crucial to evaluate other smaller event windows to limit and minimise the possibility of occurrence of type II error. Thus, this research also considers event window (-5; +5) and (-1; +1) to understand the reaction of the stock price to the information raised.

The event study in this research aims to statistically examine whether an event leads to an abnormal movement in a company stock price or not. With randomly chosen securities and event dates, there should be no abnormal performance on average if the stock market has semi-strong form efficiency (Brown & Warner, 1985). Parametric t-test is utilised to evaluate whether ARs and CARs are significantly different from zero. The parametric t-test in this work is performed based on the studies of Brown & Warner (1985), MacKinlay (1997), Eryigit & Eryigit (2019), and Müller (2020).

The AR for a stock *i* on day *t* is calculated as below:

$AR_{it} = y_{it} - (\alpha_i + \beta_i y_{mt})$

where:

y_{it} represents actual stock return on day t,

$\alpha_i + \beta_i y_{mt}$ represents return expected by the α, β and corresponding market return of the stock.

To test AR, the following t-test can be used: $t_{AR_{i,t}} = \frac{AR_{i,t}}{s(AR_{i,t})}$

with: $s(AR_{i,t}) = \sqrt{\frac{1}{M_i - 2}\sum_{t=\tau_0}^{\tau_1} AR_{i,t}^2}$

where M is the amount of data for stock *i* in the estimation period,

τ_0 as the earliest day of the estimation window,

τ_1 as the latest day of the estimation window relative to the event day.

If there is uncertainty about the time that event information is published to the market, ARs are cumulated for a specific period. The cumulated values are regarded as CAR. MacKinlay (1997) stated that ARs should be cumulated to clarify the general impact of the event, and ARs are cumulated based on time. CAR and t-test are formulated as follows.

The CAR for a stock *i* on day *t* is calculated as:

$CAR_{i,t} = CAR_{i,t-1} + AR_{it}$

or $CAR_{i,(\tau_2,\tau_3)} = \sum_{t=\tau_2}^{\tau_3} AR_{i,t}$

In order to determine whether CARs are statistically significant, the following t-test could be deployed as: $t_{CAR_{i,(\tau_1,\tau_2)}} = \frac{CAR_{i,(\tau_1,\tau_2)}}{s(CAR_{i,(\tau_1,\tau_2)})}$

with: $s(CAR_{i,(\tau_2,\tau_3)}) = \sqrt{L_2}\, s(AR_{i,t})$

where $L_2 = \tau_3 - \tau_2$ be the event window length,

τ_2 as the earliest day of the event window,

τ_3 as the latest day of the event window relative to the event day.

The hypotheses to be tested include:

H_0: The ARs are close to zero,

H_1: The ARs are greatly different from to zero.

and

H_0: The CARs are close to zero,

H_1: The CARs are greatly different from to zero.

The parametric t-test in this study will be conducted in Excel. The alternative hypotheses indicate that ARs and CARs could be less or more than zero, so the tests are two-tailed. With a significance level of 5%, H_0 will not be rejected if the calculated t-value belongs to (-1.96; 1.96).

5.3.3.2. Empirical results for semi-strong form efficiency

According to the mentioned decision-making guidelines, it is required that there is no rejection in any tests of a null hypothesis of insignificant ARs or CARs to not reject the null hypothesis of a semi-strong form. In other words, all results of the suggested tests need to not reject the null hypothesis that ARs or CARs are close to zero in order to conclude that the market meets the requirements of a semi-strong efficient market.

Table 5.8 graphically represents the pattern of daily ARs during the event window period due to effects of information from the Chairman of the State Securities Commission related to the roadmap of applying an increase of the initial margin and impact of volatility of the United States stock market on investors' sentiment. On the event day, ARs under market-adjusted returns of DRC and BWE are -2.463% and -2.948%, respectively. These values are statistically insignificant at a significance level of 5%. On the next day after the announcement, stock prices rise, and investors experience positive ARs with 2.441% in DRC and 0.150% in BWE although the values are not highly statistically significant. However, on the day -6 in the event window of BWE, there is a huge AR of 6.375% and its corresponding t-statistic value is 1.991. It is statistically significant at a significance level of 5%. It intimates that the significant

AR is gained 6 days before the event day by exploiting the relevant information leakage. It leads to rejecting the null hypothesis that ARs are close to zero.

Table 5.8: Event 1 – ARs of DRC and BWE

EVENT 1							
DRC				**BWE**			
Date in event study	AR	t-statistic of AR	Significance	Date in event study	AR	t-statistic of AR	Significance
-10	-1.942%	-0.633	NO	-10	1.418%	0.443	NO
-9	-0.731%	-0.239	NO	-9	0.020%	0.006	NO
-8	-2.823%	-0.921	NO	-8	-4.218%	-1.317	NO
-7	-5.069%	-1.653	NO	-7	-1.430%	-0.446	NO
-6	3.099%	1.011	NO	-6	6.375%	1.991	YES
-5	-0.096%	-0.031	NO	-5	1.225%	0.383	NO
-4	-1.230%	-0.401	NO	-4	-0.031%	-0.010	NO
-3	-3.026%	-0.987	NO	-3	-1.589%	-0.496	NO
-2	-1.046%	-0.341	NO	-2	-0.068%	-0.021	NO
-1	0.090%	0.029	NO	-1	-1.231%	-0.384	NO
0	-2.463%	-0.803	NO	0	-2.948%	-0.921	NO
1	2.441%	0.796	NO	1	0.150%	0.047	NO
2	-0.999%	-0.326	NO	2	1.594%	0.498	NO
3	0.159%	0.052	NO	3	-0.415%	-0.129	NO
4	-0.711%	-0.232	NO	4	0.395%	0.123	NO
5	1.550%	0.506	NO	5	1.264%	0.395	NO
6	-1.139%	-0.372	NO	6	-1.444%	-0.451	NO
7	-1.471%	-0.480	NO	7	-1.167%	-0.364	NO
8	-2.512%	-0.819	NO	8	-0.788%	-0.246	NO
9	-0.861%	-0.281	NO	9	0.713%	0.223	NO
10	-2.026%	-0.661	NO	10	1.127%	0.352	NO

Source: Author.

Furthermore, ***Table 5.9*** also displays the results of the CARs around the event 1 in different event windows of (-10; +10), (-5; +5), and (-1; +1). In the event window of (-10; +10), the CARs of DRC and BWE are all negative with -20.805% and -1.047%. It implies that the market reacts negatively and feels pessimistic to the information related to extending the roadmap of applying an increase of the initial margin and the volatility of the United States stock market, as well as its spreading to the world stock market. The CARs for the event 1 are mostly negative in these stated types of the event window, but they are all statistically insignificant. Thus, there is a lack of evidence to reject the null hypothesis of no significant CARs in this case.

Table 5.9: Event 1 – CARs of DRC and BWE

EVENT 1							
DRC				BWE			
Window	CAR	t-statistic of CAR	Significance	Window	CAR	t-statistic of CAR	Significance
(-10; +10)	-20.805%	-1.481	NO	(-10; +10)	-1.047%	-0.071	NO
(-5; +5)	-5.331%	-0.524	NO	(-5; +5)	-1.653%	-0.156	NO
(-1; +1)	0.068%	0.013	NO	(-1; +1)	-4.029%	-0.726	NO

Source: Author.

Table 5.10 manifests daily ARs during the event window period as a result of fears of an escalating trade war between the United States and China as well as the problems of climbing exchange rates and lowering expected profits of listed companies in recent days. The ARs on the event day of DRC and BWE are 3.907% and 0.838%, respectively, but they are not significant at a significance level of 5%. The same holds good for the entire event window period of DRC as its ARs are not significant on any of the days. On the contrary, on the day -7 in the event window of BWE, there is a massive AR of 7.599% with the t-statistic value of 2.580. It indicates that the AR of BWE could be obtained significantly 7 days prior to the event day. It leads to a rejection of the null hypothesis that ARs are close to zero.

Table 5.10: Event 2 – ARs of DRC and BWE

EVENT 2							
DRC				BWE			
Date in event study	AR	t-statistics of AR	Significance	Date in event study	AR	t-statistics of AR	Significance
-10	8.835%	1.178	NO	-10	-1.928%	-0.655	NO
-9	6.328%	0.844	NO	-9	-2.951%	-1.002	NO
-8	5.324%	0.710	NO	-8	1.542%	0.524	NO
-7	4.497%	0.600	NO	-7	7.599%	2.58	YES
-6	5.155%	0.687	NO	-6	0.773%	0.262	NO
-5	10.496%	1.399	NO	-5	-3.796%	-1.289	NO
-4	9.414%	1.255	NO	-4	0.318%	0.108	NO
-3	8.820%	1.176	NO	-3	2.766%	0.939	NO
-2	6.499%	0.866	NO	-2	0.801%	0.272	NO
-1	6.353%	0.847	NO	-1	0.021%	0.007	NO
0	3.907%	0.521	NO	0	0.838%	0.284	NO
1	0.421%	0.056	NO	1	1.062%	0.361	NO
2	1.746%	0.233	NO	2	0.951%	0.323	NO
3	-0.247%	-0.033	NO	3	-2.683%	-0.911	NO
4	-1.376%	-0.183	NO	4	3.061%	1.039	NO
5	0.047%	0.006	NO	5	0.859%	0.292	NO
6	-0.040%	-0.005	NO	6	0.042%	0.014	NO
7	0.241%	0.032	NO	7	1.096%	0.372	NO
8	0.907%	0.121	NO	8	3.229%	1.096	NO
9	5.762%	0.768	NO	9	1.728%	0.587	NO
10	6.440%	0.859	NO	10	1.951%	0.662	NO

Source: Author.

As can be observed from ***Table 5.11***, the CARs of DRC and BWE for event 2 are all positive in these different event windows, which means the market reacts optimistically to the event. The CAR of DRC in the event window of (-10; +10) is 89.526% and its t-statistic value of 2.604 is much greater than the critical value of 1.96. It could be explained by the continuous positive ARs of DRC from day -10 to day +2 even though the values are insignificant. This suggests that fears of an escalating trade war between the United States and China as well as the issues of increasing exchange rates and reducing expected profits of listed companies have significant positive effects on its CARs in the event window (-10; +10). The significant CAR value of DRC in the event window (-10; +10) results in disapproval of the null hypothesis of no significant CARs. The results display several positive values in the ARs and CARs of DRC and BWE on the event day and in the event window even when VN Index dropped by 41.14 points on 03 July 2018. Furthermore, it is statistically showed that an AR of BWE and a CAR of DRC are greatly different from zero, so the null hypothesis of no significant ARs and CARs is vigorously rejected.

Table 5.11: Event 2 – CARs of DRC and BWE

EVENT 2							
DRC				**BWE**			
Window	CAR	t-statistic of CAR	Significance	Window	CAR	t-statistic of CAR	Significance
(-10; +10)	89.526%	2.604	YES	(-10; +10)	17.277%	1.280	NO
(-5; +5)	46.077%	1.852	NO	(-5; +5)	4.198%	0.430	NO
(-1; +1)	10.680%	0.822	NO	(-1; +1)	1.921%	0.377	NO

Source: Author.

The event 3 considers the impact of selloffs of European and American stocks due to concerns about rising US government bond yields and the psychological influences of an escalating trade war on the market reaction on 11 October 2018. The behaviour of the average ARs of DRC and BWE during the event window related to the event 3 is summarised in ***Table 5.12***. From day -10 to day -3, all ARs of DRC are positive and its AR on the event day is 2.079%. Following that, its ARs are all negative. Meanwhile, the ARs of BWE keep fluctuating during the entire window period and its AR on the event is -3.917%. The ARs of DRC and BWE are entirely insignificant at a significance level of 5%. Therefore, it is unable to reject the null hypothesis of no significant ARs.

Table 5.12: Event 3 – ARs of DRC and BWE

EVENT 3							
DRC				BWE			
Date in event study	AR	t-statistic of AR	Significance	Date in event study	AR	t-statistic of AR	Significance
-10	6.302%	0.695	NO	-10	-1.220%	-0.532	NO
-9	5.910%	0.652	NO	-9	2.154%	0.939	NO
-8	3.899%	0.43	NO	-8	-1.841%	-0.803	NO
-7	2.139%	0.236	NO	-7	-1.473%	-0.642	NO
-6	4.630%	0.51	NO	-6	3.951%	1.723	NO
-5	2.610%	0.288	NO	-5	-1.901%	-0.829	NO
-4	3.819%	0.421	NO	-4	-1.962%	-0.855	NO
-3	2.036%	0.224	NO	-3	-0.755%	-0.329	NO
-2	-1.205%	-0.133	NO	-2	0.885%	0.386	NO
-1	-1.670%	-0.184	NO	-1	-1.875%	-0.818	NO
0	2.079%	0.229	NO	0	-3.917%	-1.708	NO
1	-10.263%	-1.132	NO	1	2.245%	0.979	NO
2	-2.209%	-0.244	NO	2	-1.204%	-0.525	NO
3	-6.845%	-0.755	NO	3	1.037%	0.452	NO
4	-5.962%	-0.657	NO	4	1.057%	0.461	NO
5	-5.168%	-0.57	NO	5	-0.292%	-0.127	NO
6	-5.925%	-0.653	NO	6	-0.328%	-0.143	NO
7	-13.375%	-1.475	NO	7	0.177%	0.077	NO
8	-16.072%	-1.772	NO	8	0.790%	0.344	NO
9	-16.323%	-1.8	NO	9	-0.429%	-0.187	NO
10	-16.229%	-1.789	NO	10	-1.484%	-0.647	NO

Source: Author.

Moreover, ***Table 5.13*** also presents the CARs of DRC and BWE around the event 3 in different event windows of (-10; +10), (-5; +5), and (-1; +1). In the event window of (-10; +10), the CARs of DRC and BWE are completely negative with -67.819% and -6.384%, respectively, but they are statistically insignificant. Their CARs in (-5; +5) and (-1; +1) are also negative and insignificant. It reflects that the market reacts negatively and feels pessimistic to the information, but its impact is not significant. It could not lead to a rejection of the null hypothesis of no significant CARs.

Table 5.13: Event 3 – CARs of DRC and BWE

EVENT 3							
DRC				BWE			
Window	CAR	t-statistic of CAR	Significance	Window	CAR	t-statistic of CAR	Significance
(-10; +10)	-67.819%	-1.632	NO	(-10; +10)	-6.384%	-0.608	NO
(-5; +5)	-22.777%	-0.757	NO	(-5; +5)	-6.682%	-0.879	NO
(-1; +1)	-9.854%	-0.627	NO	(-1; +1)	-3.547%	-0.893	NO

Source: Author.

To sum up, an event study is conducted to study whether all obviously and publicly available chosen information is entirely and timely reflected on the current share prices. The

ARs and CARs around announcement date were examined and the hypotheses are formulated and tested by using a parametric t-test. The empirical findings inform that significant ARs could be gained 6 days or 7 days before the event day, but no significant ARs are on the event date. This emphasises the fact that information is leaked to the market prior to the announcement day. As a result, the null hypothesis of no significant ARs is not accepted. Furthermore, in the results of the event 2, the CAR of DRC in the event window of (-10; +10) is 89.526% and its t-statistic value of 2.604 is much greater than the critical value of 1.96. It leads to rejection of the null hypothesis that CARs are close to zero. Since the investors incur significant ARs and CARs by trading the stocks, it reveals that HOSE does not accurately and punctually incorporate the publicly available information.

Therefore, the shreds of evidence do not support the appearance of a semi-strong form in HOSE. It agrees with the study of Tran & Mai (2015) and Tran, Nguyen, & Pham (2016). Their studies manifested that the Vietnamese stock market is inefficient at the level of semi-strong form (Tran & Mai, 2015; Tran, Nguyen, & Pham, 2016). After examining the event study, this research conducts interviews with managers from some of the selected companies on HOSE and experts in the field of finance and in the stock market. The interviews aim to understand their perspectives of the Vietnamese stock market efficiency and its improvement as well as influences of the market efficiency and behaviours on the business performance. The influences that listed companies would obtain from the Vietnamese stock market are regarded as time valuation of a company, enhancement of funds or business management and development.

5.4. Examining market efficiency of HNX

The testing procedures are repeated in the case of HNX. The research implements graphical analysis and statistical tests to examine the random walk model for HNX Index – the market index on HNX and stocks of the selected listed companies on HNX. If HNX meets the requirements of weak form efficiency, the event study will be conducted to evaluate the semi-strong form efficiency.

5.4.1. Graphical analysis of HNX Index

Appendix 5.3 includes the daily rates of returns and its sign of HNX Index, which is the market index on HNX, between 02 January 2018 and 07 January 2019. Some suspected patterns of some periods in the ‘sign’ of the daily rate of return could be observed as follow.

There were some continuous “+” series in some periods, in particular:

- From 08 March 2018 to 20 March 2018, the signs were (+, +, +, +, +, +, +, +).

- From 07 August 2018 to 13 August 2018, the signs were (+, +, +, +, +).

There were some continuous "-" series in some periods, in particular:

- From 26 June 2018 to 03 July 2018, the signs were (-, -, -, -, -, -).
- From 05 October 2018 to 11 October 2018, the signs were (-, -, -, -, -).
- From 22 October 2018 to 29 October 2018, the signs were (-, -, -, -, -, -).
- From 13 December 2018 to 19 December 2018, the signs were (-, -, -, -, -).

There were some continuous mixed patterns in some periods, in particular:

- From 10 April 2018 to 20 April 2018, the patterns were (-, -, +, -, -, +, -, -, +).
- From 25 December 2018 to 07 January 2019, the patterns were (-, -, +, +, -, -, +, +).

Nonetheless, no significant change could result in abnormal rates of return which are either above 5% or below -5% in the mentioned periods with observed patterns. Moreover, ***Figure 5.7*** reveals daily prices of HNX Index and ***Figure 5.8*** provides the distributions of its daily rates of return between 02 January 2018 and 07 January 2019, respectively. In the mentioned period, there was a downward trend from 118.86 points to 101.92 points and it was unable to accurately forecast the movement and change of the daily prices.

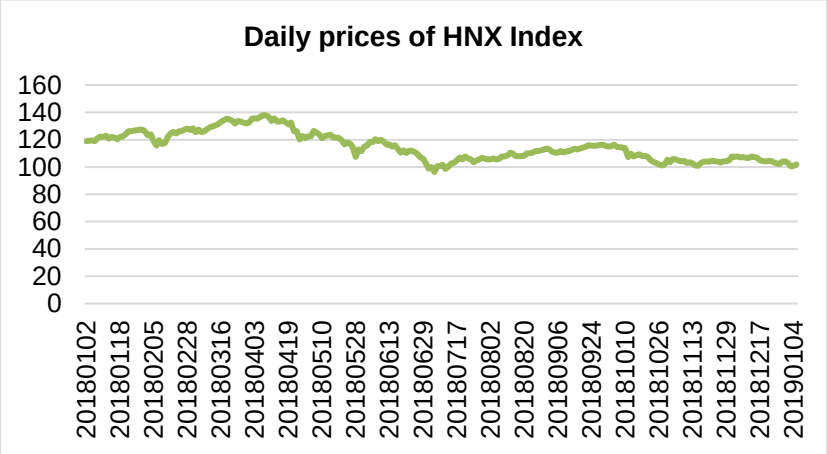

Figure 5.7: Daily prices of HNX Index

Source: Compiled by author.

From 02 January 2018 to 07 January 2019, the absolute value of the daily return was greater than 5% twice. It was -6.211% on 28 May 2018, and it was -5.793% on 11 October 2018. The scatter dots are random during the selected period, and it is difficult to systematically and exactly estimate the future returns based on the current stock prices or rates of return. No systematic relationship between today's rates of return and yesterday's ones is indicated in ***Figure 5.8***. Therefore, it was impossible to precisely forecast the future price or rates of return of HNX Index based on the chart.

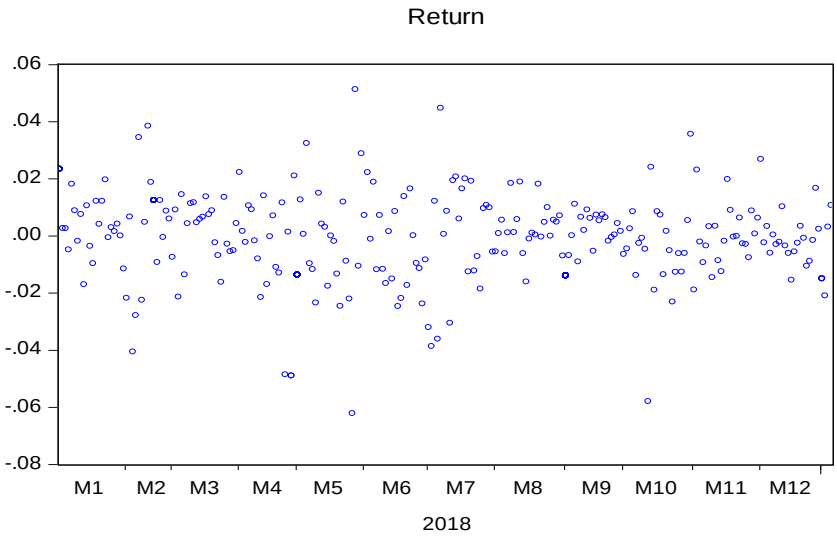

Figure 5.8: Dot plot chart of daily rate of return (%) of HNX Index

Source: Outcome from EViews 10.

Subsequently, investors and researchers could predict a sign pattern in the short-run fluctuation of HNX Index based on the current movement trends. Nonetheless, the absolute value of the magnitudes of its rates of return were mainly below 5%, so it is impossible to earn consistent abnormal excess returns by examining the historical market index and its relevant included information. Additionally, the chart of HNX's daily prices and the distributions of its daily rates of return manifest its rates of return change randomly without being influenced by past rates of return. The preliminary results of signs give some suspected patterns and trends, but there is insufficient evidence showing that consistent abnormal excess returns are obtained in a period. It is crucial to further assess the market efficiency of HNX statistically.

5.4.2. Statistical tests of weak form efficiency on HNX by using EViews 10

The statistical tests of weak form efficiency via the use of EViews 10 are similarly carried out on data of HNX Index and selected listed companies on HNX. When a stock market is regarded to be weak form efficient, any market indices or stock prices of any company listed on the market should meet the requirements of weak form efficiency. The procedure is carried out on data of HNX Index, and the statistical results are presented as follows.

Table 5.14: Variance ratio test under homoscedasticity (HNX Index)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	2.186763	253	0.1358
Wald (Chi-Square)	14.98312	5	0.0104

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.862519	0.062869	-2.186763	0.0288
5	1.013915	0.137740	0.101022	0.9195
10	0.918205	0.212272	-0.385329	0.7000
20	0.850160	0.312456	-0.479558	0.6315
30	0.825879	0.387667	-0.449152	0.6533

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000607739676343)

Period	Variance	Var. Ratio	Obs.
1	0.00024	--	253
2	0.00020	0.86252	252
5	0.00024	1.01391	249
10	0.00022	0.91821	244
20	0.00020	0.85016	234
30	0.00019	0.82588	224

Source: Outcome from EViews 10.

In the Joint Tests with the joint null hypothesis in ***Table 5.14***, the Chow & Denning's maximum $|z|$statistic of HNX Index is 2.186763, which is much higher than the critical value of 1.96 even though its corresponding p-value is 0.1358. It results in disapproval of the joint null hypothesis. The individual statistical test at the period 2 has $|z|$statistic of -2.186763 and p-value of 0.0288, so it offers strong evidence against the individual null hypothesis. Additionally, it is graphically revealed in the ***Figure 5.9*** that the null reference line does not fully lie inside the asymptotic standard error bands. In the period 2, the horizontal reference line lies above the asymptotic standard error bands. Furthermore, the statistic results of the Wald-type test for the joint hypotheses are 14.98312, and its p-value is 0.0104. Subsequently, the null hypothesis of a random walk is strongly rejected based on the Chow-Denning test, the Lo-MacKinlay test and the Richardson-Smith Wald test.

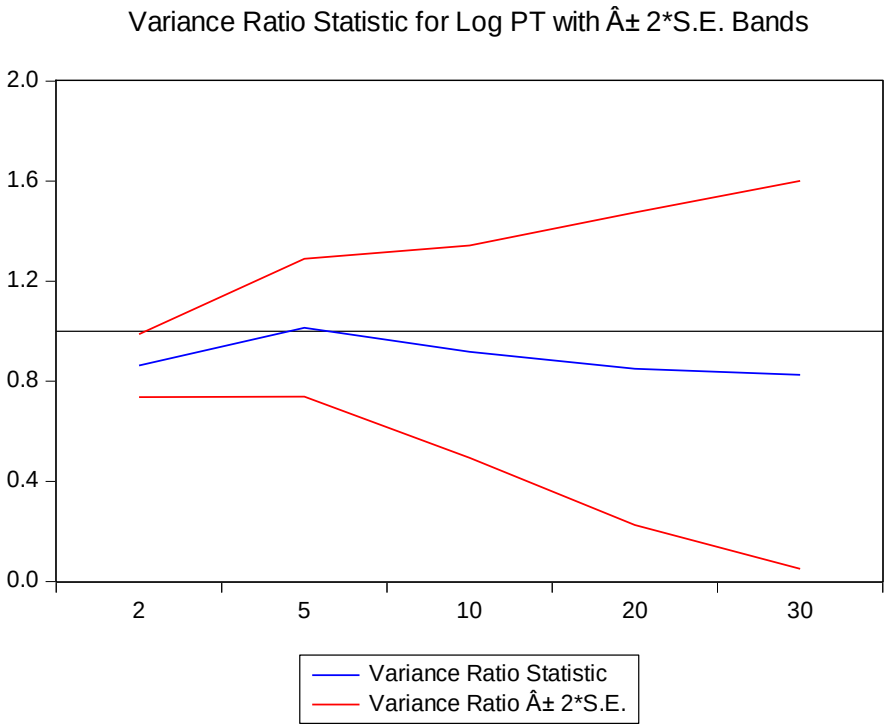

Figure 5.9: Variance ratio test under homoscedasticity (HNX Index)

Source: Outcome from EViews 10.

In ***Table 5.15***, the Chow & Denning's maximum $|z|$statistic of 1.518524 has a bootstrap p-value of 0.4984, and it is associated with the period 2 individual test. In other words, the maximum $|z|$statistic of HNX Index is less than the critical value of 1.96, and the p-value is greater than 0.05 under heteroscedastic robust standard error estimates. Thus, there is no evidence to reject the joint null hypothesis of a martingale. Furthermore, the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96) and their p-values are more than 0.05, so it is unable to reject the individual null hypothesis of a martingale as well.

Table 5.15: Variance ratio test under heteroscedasticity (HNX Index)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.518524	253	0.4984

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.862519	0.090536	-1.518524	0.1289
5	1.013915	0.188736	0.073726	0.9412
10	0.918205	0.270497	-0.302386	0.7624
20	0.850160	0.365104	-0.410405	0.6815
30	0.825879	0.437096	-0.398360	0.6904

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000607739676343)

Period	Variance	Var. Ratio	Obs.
1	0.00024	--	253
2	0.00020	0.86252	252
5	0.00024	1.01391	249
10	0.00022	0.91821	244
20	0.00020	0.85016	234
30	0.00019	0.82588	224

Source: Outcome from EViews 10.

The results are supported by the presentation in ***Figure 5.10***. The null reference line is entirely inside the asymptotic standard error bands, indicating that all the individual variance ratio statistics are close to 1. Therefore, the statistical and graphical results of Lo & MacKinlay's individual variance ratio tests and Chow & Denning's joint variance ratio tests consistently provide no evidence to reject the joint and individual null hypotheses of a martingale under heteroscedasticity robust standard error estimates.

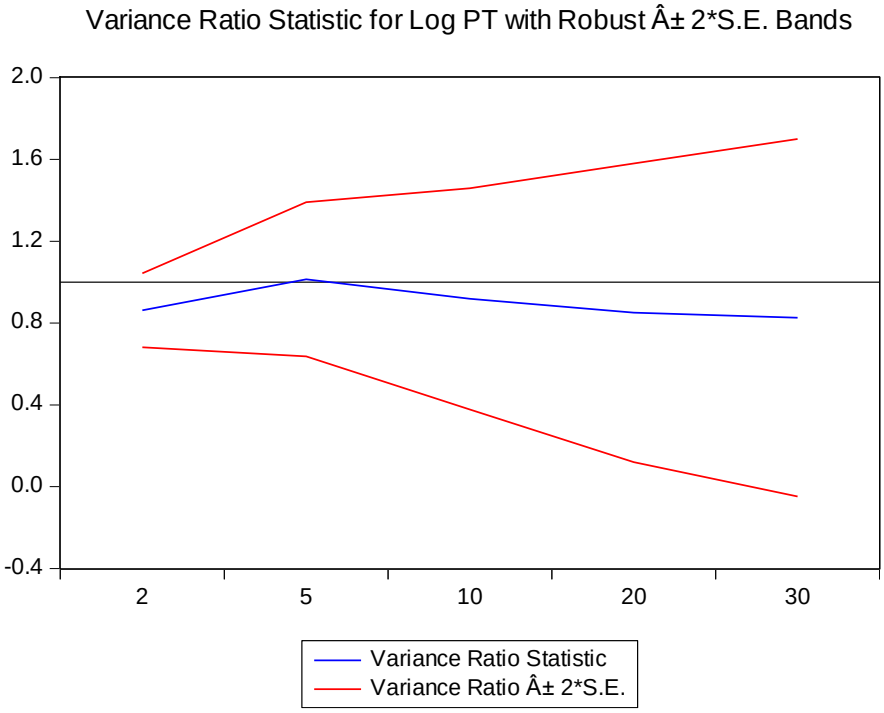

Figure 5.10: Variance ratio test under heteroscedasticity (HNX Index)

Source: Outcome from EViews 10.

In the Joint Tests with the joint null hypothesis in ***Table 5.16***, the Chow & Denning's maximum $|z|$statistic of HNX Index is 1.336235, which is associated with the period 2 individual test and less than the critical value of 1.96. The p-value is 0.4330, which is more than 0.05. Thus, there is no evidence to reject the joint null hypothesis of a random walk. Additionally, all individual statistics could not reject the individual null hypothesis of a random walk because all the variance ratio statistics are close to 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. To sum up, the null hypothesis could not be rejected based on the results of Chow-Denning test and Lo-MacKinlay test. It is supported by the statistic results of the Wald-type tests for the joint hypothesis.

Table 5.16: Rank variance ratio test (HNX Index)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.336235	253	0.4330
Wald (Chi-Square)	8.319924	5	0.1330

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.915992	0.062869	-1.336235	0.1860
5	1.053935	0.137740	0.391571	0.7072
10	0.988455	0.212272	-0.054386	0.9558
20	0.962455	0.312456	-0.120162	0.9200
30	0.951237	0.387667	-0.125786	0.9322

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.91599	0.91599	252
5	1.05394	1.05394	249
10	0.98846	0.98846	244
20	0.96245	0.96245	234
30	0.95124	0.95124	224

Source: Outcome from EViews 10.

The tests are similarly conducted on data of chosen listed companies on HNX. ***Table 5.17*** demonstrates the statistical results of joint null hypothesis tests as follows. They could be considered as strong evidence to reject the joint null hypotheses in tests of homoscedastic random walk hypothesis, conditional heteroscedastic random walk hypothesis, and Wright's rank variance ratio.

Table 5.17: Results of joint tests of HNX Index and companies listed on HNX

No	Market index/ Company Code	Homoscedastic Random Walk Hypothesis (RW1)		Conditional Heteroscedastic Random Walk Hypothesis (RW3)	Wright's Rank Variance Ratio Tests	
		Joint Null Hypothesis		Joint Null Hypothesis	Joint Null Hypothesis	
		Chow & Denning's Tests (Max |z| at period m)	Wald-type Tests (Chi-Square)	Chow & Denning's Tests (Max |z| at period m)	Chow & Denning's Tests (Max |z| at period m)	Wald-type Tests (Chi-Square)
1	HNX Index	2.18676	14.98312	1.51852	1.33624	8.31992
2	ACB	2.33691	12.73411	1.61823	0.73552	3.89016
3	AMC	2.82603	9.37080	2.02957	1.77490	5.41846
4	CDN	3.48580	12.71081	3.13135	2.38808	6.84290
5	CET	2.35706	6.49235	2.16108	2.04127	5.60506
6	KHS	3.43731	14.04965	2.60624	2.61877	12.04229
7	LDP	2.87442	8.60204	2.38248	2.25784	7.05522
8	MAS	1.38879	2.60177	1.07422	0.79218	2.55444
9	NDN	1.48021	4.54249	1.05516	1.45492	3.48283
10	TA9	1.87057	4.54878	1.85072	1.91045	5.12081
11	TVC	2.60823	12.78058	1.25295	1.79622	10.72614
12	VLA	3.18256	12.21038	1.39951	1.83850	6.83507
No of rejected null		9	2	5	4	0
*Note: Wald test is only used for homoscedasticity assumption because this method is not consistent with the heteroscedasticity robust tests (EViews, 2017).						

Source: Outcome from EViews 10.

The detailed statistical results of all tests for the companies listed on HNX are provided in ***Appendix 5.4***. ***Table 5.18*** summarises the results of variance ratio tests on the logs of daily closing prices of HNX Index and the listed companies on HNX. It shows that there is enough strong evidence to reject the null hypothesis of a RW1 for the representative stock market index on HNX. It is consistently concluded that HNX Index conforms to the null hypothesis of a RW3. In a weak form efficient stock market, any market indices or any stock prices of any companies listed on the market need to meet the requirements of weak form efficiency. Data of the chosen listed companies on HNX are also collected and evaluated to gauge the market efficiency of HNX.

Table 5.18: Statistical results of HNX Index and companies listed on HNX *(See* ***Appendix 5.4****)*

No	Market index/ Company Code	Homoscedastic Random Walk Hypothesis (RW1)			Conditional Heteroscedastic Random Walk Hypothesis (RW3)		Wright's Rank Variance Ratio Tests		
		Individual Null Hypothesis	Joint Null Hypothesis		Individual Null Hypothesis	Joint Null Hypothesis	Individual Null Hypothesis	Joint Null Hypothesis	
		Lo & MacKinlay's Tests	Chow & Denning's Tests	Wald-type Tests	Lo & MacKinlay's Tests	Chow & Denning's Tests	Lo & MacKinlay's Tests	Chow & Denning's Tests	Wald-type Tests
1	HNX Index	Reject	Reject	Reject	Not reject	Not reject	Not reject	Not reject	Not reject
2	ACB	Reject	Reject	Reject	Not reject	Not reject	Not reject	Not reject	Not reject
3	AMC	Reject	Reject	Not reject	Reject	Reject	Not reject	Not reject	Not reject
4	CDN	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Not reject
5	CET	Reject	Reject	Not reject	Reject	Reject	Reject	Reject	Not reject
6	KHS	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject
7	LDP	Reject	Reject	Not reject	Reject	Reject	Reject	Reject	Not reject
8	MAS	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
9	NDN	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
10	TA9	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject	Not reject
11	TVC	Reject	Reject	Reject	Not reject	Not reject	Not reject	Not reject	Not reject
12	VLA	Reject	Reject	Reject	Not reject	Not reject	Not reject	Not reject	Not reject
No of rejected null		9	9	6	5	5	4	4	1
Note: Wald test is only used for homoscedasticity assumption because this method is not consistent with the heteroscedasticity robust tests (EViews, 2017).									

Source: Author.

In single variance ratio test, a homoscedastic random walk hypothesis is strongly rejected for HNX Index and the chosen listed companies on HNX based on the tests. In particular, the statistical results confirm that the null hypothesis of a random walk behaviour under the assumption of homoscedasticity is firmly rejected for HNX Index, ACB, AMC, CDN, CET, KHS, LDP, TVC, and VLA based on the Lo-MacKinlay tests. Many of their absolute values of z-statistic are over the critical value of 1.96, and their p-values are less than 0.05 for many values of intervals. It is supported by 9 rejections from the results of the Chow-Denning test. The Chow & Denning's maximum $|z|$statistic values of HNX Index, ACB, AMC, CDN, CET, KHS, LDP, TVC, and VLA are more than the critical value of 1.96. The variance ratio statistics are sometimes not close to 1, and their null reference lines sometimes slightly lie outside the asymptotic standard error bands. Moreover, Richardson-Smith Wald test statistic does not accept the joint null hypothesis in the cases of HNX Index, ACB, CDN, KHS, TVC, and VLA under homoscedasticity. Therefore, the null hypothesis of a RW1 under homoscedasticity could be significantly rejected based on the Lo-MacKinlay test, Chow-Denning test, and Richardson-Smith Wald test.

The rejection of the random walk null hypothesis is supported by the rank variance ratio test, which is also used to test the RW1 model. The rank variance ratio output rejects the null hypothesis of a random walk because the results of CDN, CET, KHS, and LDP reject the null hypothesis in all these tests. Their Chow & Denning's maximum $|z|$statistic values are more than the critical value of 1.96, and their absolute values of z-statistic in some individual periods are also over the critical value of 1.96. The variance ratio statistics are sometimes not close to 1. Furthermore, Richardson-Smith Wald test statistic does not accept the joint null hypothesis in the case of KHS. As a result, the null hypothesis of a RW1 could be completely rejected based on Wright's rank variance ratio tests.

The consistent rejection of the null hypothesis of RW1 means that random walk increments of HNX Index and stock prices are not independently and identically distributed. Therefore, the null hypothesis of a random walk is not accepted under homoscedasticity, which means that the random disturbance in the relationship between the independent variables and the dependent variables is not unchanged across all values of the independent variables.

In addition, the statistical findings indicate that the logs of AMC, CDN, CET, KHS, and LDP's stock prices reject the joint and individual null hypotheses of a martingale under heteroscedasticity. In the joint test, the Chow & Denning's maximum $|z|$statistic values of AMC, CDN, CET, KHS, and LDP are greater the critical value of 1.96. In their corresponding individual tests, some of their absolute values of z-statistic are more than the critical value of

1.96, and some of their bootstrap p-values are less than the significance level of 0.05. The variance ratio statistics are sometimes not close to 1, and their null reference lines sometimes lie outside the asymptotic S.E bands. Therefore, the null hypothesis of a martingale could be strongly rejected in these cases on HNX at a significance level of 5% based on the Chow-Denning test and Lo-MacKinlay test. It denotes that the logs of stock price series of HNX Index and the selected listed companies' stocks on HNX do not exhibit a RW3.

Consequently, the dominant results on HNX manifest that the homoscedastic random walk hypothesis, the conditional heteroscedastic random walk hypothesis, and the null hypothesis of a random walk in Wright's rank variance ratio tests are all rejected on HNX. The statistical results of HNX and some of the chosen companies on HNX show that they are neither independently and identically distributed nor martingale differences. It implies that HNX does not hold a weak form of efficiency and not follow the random walk model, so it is possible to study past trends in share prices to have future stock price predictability and make consistent abnormal excess returns.

Based on histogram and statistics of HNX Index and the companies listed on HNX, only LDP has the probability value of the Jarque-Bera test greater than the significance level of 5%. It shows the existence of a normal distribution only in the data of LDP. The data of HNX Index and the chosen companies except LDP are further studied from 02 January 2018 to 31 December 2019 in ***Appendix 5.4*** to ensure the reliability of results. The findings in the period from 02 January 2018 to 31 December 2019 are consistent with the results from 02 January 2018 to 07 January 2019. Therefore, HNX neither follows the random walk nor has the weak form efficiency based on all these tests.

The outcomes are agreed with the investigations of Do, Le, & Nguyen (2015) and Guidi & Gupta (2013). The studies found a lack of random walk features, so HNX was not weak form efficient (Do, Le, & Nguyen, 2015; Guidi & Gupta, 2013). In comparison with the existing literature, there is no obvious evidence to demonstrate an improvement in the market efficiency of HNX. The findings acquired in the quantitative analysis are further evaluated and checked again by conducting interviews to identify potential opportunities and challenges for the listed companies and explore how market behaviours affect performance of the listed company.

5.5. Conclusion

In summary, there are not enough strong shreds of evidence to accept the null hypothesis of a RW1 for the representative stock market index and listed stocks on HOSE. It

is consistently concluded that VN Index and the chosen companies on HOSE are firmly random during the selected period and conform to the null hypothesis of a RW3, so it meets the requirements of the weakest form of random walk model among the three categories of a random walk. The result is supported by the graphical analysis of VN Index. The absolute values of the magnitudes of its rates of return are mostly below 5%, so no consistent abnormal excess returns could be achieved from exploiting the historical information. Furthermore, the charts of the daily prices and the distributions of daily rates of return of VN Index express that its rates of return move randomly without being affected by past rates of return. Subsequently, HOSE is efficient in the weak form, and it is unable to accurately predict the price movement of VN Index and the selected listed companies on HOSE to gain consistent excess returns over a sustained period based on their historical price changes.

In comparison with the empirical work of Dong Loc, Lanjouw, & Lensink (2010), Do, Le, & Nguyen (2015), Guidi & Gupta (2013), Luu, Pham, & Pham (2016) and Shaik & Maheswaran (2017), it is found that there is an improvement in the market efficiency of HOSE from an inefficient level to a weak form efficient level. In the weak form efficient market, the stock prices completely reflect the information contained in all past prices. The statistical findings significantly show that recent policies designed to improve operations and efficiency of the Vietnamese market have indeed been effective. The improvement of HOSE's market efficiency is also acknowledged by the research of Gupta, Yang, & Basu (2014) and Phan & Zhou (2014). Furthermore, it was in agreement with the findings from the empirical studies in Nordic, Baltic, Indonesian, and the Shanghai stock markets of Hellström, Liu, & Sjögren (2018), Yang & Pangastuti (2016), and Li & Zhang (2011). These studies consistently demonstrated that the strategic changes in the stock exchange markets could make contributions to the improvement of the market efficiency.

Because HOSE meets the conditions of weak form efficient market hypothesis, a semi-strong form efficient hypothesis is conducted. The empirical evidence from the event study reveals that there are significant ARs and CARs by trading the stocks around the events. This finding implies that the stock prices on HOSE do not accurately and timely incorporate the publicly available information, so HOSE fails to satisfy the requirements of a semi-strong form efficient market. To remedy this shortcoming in market operations, a range of new policies designed to eliminate information leakages and enhance transmission of information are needed to further improve this key emerging market efficiency. It is consistent with the study of Tran & Mai (2015) and Tran, Nguyen, & Pham (2016).

The output related to HNX Index and 11 selected stocks on HNX indicates a less positive overview than the results of VN Index and the 11 chosen stocks on HOSE. The predominant

results on HNX provide that the homoscedastic random walk hypothesis, the conditional heteroscedastic random walk hypothesis, and the null hypothesis of a random walk in Wright's rank variance ratio tests are all rejected on HNX. In other words, HNX does not hold a weak form of efficiency and not follow the random walk model as well. It indicates that investors and managers in the market would be able to gain excessive returns based on the past trends in share prices and their relevant information and technical analysis to make trading decisions. The result is compatible with the investigations of Do, Le, & Nguyen (2015) and Guidi & Gupta (2013), so there is a lack of evidence to indicate an improvement in the market efficiency of HNX. To improve the efficiency of HNX and its market operations, a variety of new policies are needed to improve informational efficiency.

The quantitative findings will be evaluated and assured via interviews with managers of some listed companies as well as leaders and experts in the stock market. Based on the quantitative analysis, the research conducts interviews to investigate the Vietnamese stock market efficiency and its improvement in recent years from the perspectives of the market participants. Furthermore, the differences in terms of market efficiency of the two exchanges will be further evaluated by gathering the opinions of the experts who usually get involved in the whole market as well as work on behalf of the listed companies and the investors to trade big deals on the stock market. Additionally, the interviews also target to identify potential opportunities and challenges for the listed companies and explore the effects of market behaviours on business performance. The influences on the business performance are regarded as time valuation of a listed company, enhancement of funds, corporation expansion or business management.

CHAPTER 6: QUALITATIVE DATA COLLECTION AND ANALYSIS

6.1. Introduction

As mentioned in the previous chapters, there are three major gaps in the current empirical studies. The first gap is appraising the market efficiency by only examining the level of market and mainly using the quantitative methods (Dong Loc, Lanjouw, & Lensink, 2010; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran & Mai, 2015; Tran, Nguyen, & Pham, 2016). The second gap refers to inefficient studies regarding the effects of the current regulations on the market efficiency (Dong Loc, Lanjouw, & Lensink, 2010; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran & Mai, 2015; Tran, Nguyen, & Pham, 2016). The third gap involves providing an understanding by investigating only the market indices or the five oldest listed shares (Dong Loc, Lanjouw, & Lensink, 2010; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017). Thus, the contributions from this research are providing a theoretical framework to examine the efficient forms of the stock market as well as evaluate its impacts and implications on the business performance. This research gives a profound understanding of the linkages between stock market efficiency and business performance in emerging markets by applying mixed methods to evaluate evidence of the level of market and the market participants at the same time. Thanks to this, it bridges the existing gaps in the literature on market efficiency and its potential benefits to listed companies in stock exchange markets. Moreover, this research contributes to the literature by assessing the current market efficiency and its improvement due to recent policies and regulations in the emerging stock exchange markets by taking the case study of Vietnam as an example. In addition, this research analyses the data related to the listed companies in different sectors in addition to the market indices to ensure the reliability and the validity of testing the Vietnamese stock market efficiency.

This chapter intends to conduct interviews with managers of listed companies, officials of stock exchanges, and experts having the wealth of experience in the field of finance and stock market to recheck and reassure the quantitative findings. The statistical results provide that HOSE is weak form efficient while HNX is inefficient as well as show an improvement of the Vietnamese stock market efficiency compared to the existing findings in the relevant literature review. Therefore, this chapter firstly aims to investigate key determinants of the Vietnamese stock market efficiency in recent years from the viewpoints of market participants. According to their explanations related to this point, the interviewees express their opinions and share their practical experiences regarding the Vietnamese stock market efficiency and its improvement due to recent policies and regulations in the stock market. Additionally, it is important to further explore the difference in the statistical findings for market efficiency of the

two stock exchange markets from the perspectives of the experts getting involved in the whole market. Furthermore, this part targets to examine opportunities and challenges to listed companies due to listing, trading, and complying with the current policies and regulations in the stock market before evaluating impacts of market behaviours on business performance. It also explores suggestions to improve the Vietnamese stock market efficiency and increase benefits for the listed companies.

6.2. Semi-structured interviews

Research interview is considered as an effective tool to obtain viewpoints of managers of some of the chosen listed companies and other market participants in addition to statistically testing the stock prices. Research interview refers to purposeful conversation between the interviewer and the interviewee, in which the interviewer prepares and asks concise and unambiguous questions while the interviewee responds and listens proactively (Saunders, Lewis, & Thornhill, 2019). In this research, the quantitative data collection and analysis are the foundation for building the interview questions, choosing the potential interviewees, and doing the interviews. The in-depth interviews are conducted to check, reassure, and support the quantitative findings. The semi-structured interviews are considered as the most suitable method from the viewpoint of the researcher as they encourage the participants to not only follow the set of themes and open-ended questions but also naturally interact and engage in in-depth discussions. The interviews are conducted to discover the Vietnamese stock market efficiency and its influences on the performance of the listed companies from viewpoints and experiences of the respondents. Moreover, the findings from quantitative and qualitative methods are supported by illustrating documentary information from the annual reports and the sustainable development reports of the relevant listed companies. The triangulation ensures reliability of the collected information because the relevant data is independently obtained from a variety of primary and secondary sources.

6.2.1. Selection of participants

The selection of participants in this qualitative part is linked to the quantitative data collection and analysis, and this research selects two interview samples. The first sample involves leaders, managers, staffs, and authorised persons to disclose information working in some of the selected companies listed on HOSE and HNX. The second sample includes some leaders, officials, specialists, experts, and financial advisors working in the stock exchanges and the securities companies.

Firstly, it is crucial to conduct semi-structured interviews with managers and authorised persons to disclose information from some of the chosen companies listed on HOSE and HNX to reassure and support the quantitative findings. ***Table 6.1*** summarises information of the 11 chosen companies listed in 11 different sectors on HOSE which are investigated in the statistical tests. In these companies, AAA, BWE, DBD, DGW, PLX, SAB, SCR, and YEG are newly listed companies, while DAG, DRC, and VCB are existing companies listed on HOSE. As a result of the quantitative analysis, the empirical evidence on HOSE demonstrates that the data of VN Index and the selected companies all satisfy the requirements of a RW3. It indicates that HOSE is firmly weak form efficient, and it is impossible to accurately predict the price movement of VN Index and the stocks listed on HOSE to earn consistent ARs over a sustained period based on their historical prices. Moreover, the statistical findings show an improvement of the market efficiency of HOSE. Thus, it is vital to interview the representatives of some listed companies on HOSE for further explaining the quantitative results.

Table 6.1: Selected companies on HOSE

No	Listed code	Issuers	Industry	Listing date	Newly/ Existing
1	AAA	An Phat Bioplastics Joint Stock Company	Materials	06/10/2016	Newly
2	BWE	Binh Duong Water Environment Joint Stock Company	Utilities	05/07/2017	
3	DBD	Binh Dinh Pharmaceutical and Medical Equipment Joint Stock Company	Health care	24/05/2018	
4	DGW	Digiworld Corp	Information Technology	24/07/2015	
5	PLX	Viet Nam National Petroleum Group	Energy	14/04/2017	
6	SAB	Saigon Beer – Alcohol – Beverage Corporation	Consumer Staples	25/11/2016	
7	SCR	Sai Gon Thuong Tin Real Estate Joint Stock Company	Real Estate	06/10/2016	
8	YEG	Yeah1 Group Corporation	Communication Services	19/06/2018	
9	DAG	Dong A Plastic Group Joint Stock Company	Industrials	01/03/2010	Existing
10	DRC	Danang Rubber Joint Stock Company	Consumer Discretionary	28/11/2006	
11	VCB	Joint Stock Commercial Bank for Foreign Trade of Viet Nam	Financial	06/12/2009	

Source: Compiled by author.

Similarly, the other 11 companies from 11 different sectors are chosen from listed companies on HNX in the quantitative analysis. ***Table 6.2*** presents brief information of the selected companies. CDN, CET, KHS, and TA9 are newly listed companies, while ACB, AMC, LDP, MAS, NDN, TVC, and VLA are existing companies listed on HNX. According to the

statistical evidence, HNX is inefficient, and investors could gain consistent excess returns based on the past trends of share prices on HNX as well as their relevant information and technical analysis. Subsequently, it is important to acquire the perspectives of the representatives of some listed companies on HNX regarding the stock market efficiency.

Table 6.2: Selected companies on HNX

No	Listed code	Issuers	Industry	Listing date	Newly/ Existing
1	CDN	Danang Port Joint Stock Company	Transportation and storage	30/11/2016	Newly
2	CET	Tech - Vina Joint Stock Company	Manufacture	28/07/2017	
3	KHS	Kien Hung Joint Stock Company	Agriculture, forestry, and fishing	26/12/2017	
4	TA9	Thanh An 96 Installation And Construction Joint Stock Company	Construction	31/07/2015	
5	ACB	Asia Commercial Bank	Finance	21/01/2006	Existing
6	AMC	Asia Mineral Joint Stock Company	Mining and quarrying, oil, and gas	15/02/2012	
7	LDP	Lam Dong Pharmaceutical Joint Stock Company	Health care	20/07/2010	
8	MAS	Danang Airports Services Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	15/07/2014	
9	NDN	Danang Housing Investment Development Joint Stock Company	Real estate activities	21/04/2011	
10	TVC	Tri Viet Asset Management Corporation Joint Stock Company	Professional, scientific, and technical activities; administrative and support service activities and education	23/09/2014	
11	VLA	Van Lang Technology Development and Investment Joint Stock Company	Information, communication, and other activities	04/08/2010	

Source: Compiled by author.

In the first interview sample, there are two major criteria for selecting the interviewees working in the listed companies. Firstly, one of the research objectives focuses on investigating the impacts of market behaviours on business performance, so it is necessary to obtain opinions and information of managers, leaders, staffs, and authorised persons to disclose information from some of the chosen companies listed on HOSE and HNX. In this sample, some of these potential interviewees come from the newly listed companies, and the others are chosen from the existing companies listed in the Vietnamese stock market. Secondly, firm-specific characteristics are one of the factors that impact the behaviours of expected stock returns, and companies from different sectors exert different impacts due to some unique attributes (Duy & Phuoc, 2016; Handayani et al., 2018). As a result, it is

significant to carry out interviews with the participants from listed companies in different sectors. Therefore, the selection of the representatives of listed companies follows the stratified random sampling with these two criteria to assure that chosen companies are good representatives to conduct interviews regarding the Vietnamese stock market efficiency. The in-depth interviews with the representatives of the listed companies strive to discover key determinants of the market efficiency. Further, this study aims to discover the opportunities and challenges of the listed companies from listing, trading, and complying regulations in the stock market as well as the impacts of the market behaviours on their business performance from their perspectives. The influences refer to the effects on time valuation of a company, increase of funds or business management and growth. Following that, the interviews intend to obtain their suggestions to improve the market efficiency and enhance the benefits for the listed companies.

With regard to the second sample, it is vital to interview some leaders, officials, specialists, experts, and financial advisors working in stock exchanges and securities companies for some reasons. Firstly, the participants from the securities companies are the experts who participate in the whole stock market and obtain relevant information every day. They usually work and support listed companies and investors as well as trade on their behalf in the Vietnamese stock market. Moreover, the quantitative results show that HOSE is weak form efficient while HNX is inefficient, so HOSE could attract the interest and participation of listed companies and investors more actively than HNX. Thus, the interviews with these specialists intend to not only gain comprehensive and strong opinions on the market efficiency as a whole but also explain the mentioned difference of market efficiency of the two stock exchanges. Secondly, the managers and the officials from the stock exchanges who act as regulators, policymakers, and supervisors could give their valuable insights about the market efficiency. Subsequently, the managers, the experts, and the practitioners in the stock exchanges and the securities companies could offer worthy and practical opinions on the Vietnamese market efficiency and its key determinants. Moreover, they could critically analyse and justify the opportunities and shortcomings from listing, trading, and conforming to the current regulations in the stock market to the listed companies before providing constructive advice to improve the Vietnamese stock market efficiency as well as benefit the listed companies.

The list of participants in the interviews is provided in the ***Table 6.3***, and the interviewees have individual participant codes to ensure their names secured confidentially and separately when storing the interview contents. The in-depth interviews are carried out with the 10 interviewees who are either managers or members of the board of directors of the listed

companies or experienced leaders and experts in the stock market to achieve theoretical saturation and obtain comprehensive information.

Table 6.3: List of interviewees

No	Interviewee name	Organisation/ Company	Job title	Participant code	Note
1	Mr. NGUYEN Ngoc Tam	Danang Port Joint Stock Company (HNX: CDN)	Head of Finance - Accounting/Authorised person to disclose information	VNSM01	Newly listed company
2	Mrs. TRAN Thi Dieu Thuy	Thanh An 96 Installation and Construction Joint Stock Company (HNX: TA9)	Chief of Supervisory Board	VNSM02	Newly listed company
3	Mr. PHAN Minh Anh Tuan	Asia Commercial Bank (HNX: ACB)	Deputy Director of Saigon Branch	VNSM03	Existing listed company
4	Mr. LE Hoang Khanh Nhut	Danang Rubber Joint Stock Company (HOSE: DRC)	Chief Executive Officer /Member of Board of Directors	VNSM04	Existing listed company
5	Mr. TRUONG Quang Minh	Joint Stock Commercial Bank for Foreign Trade of Viet Nam (HOSE: VCB)	Deputy Director of Ho Chi Minh Branch	VNSM05	Existing listed company
6	Mr. NGUYEN Quoc Khanh	Ho Chi Minh Stock Exchange	Deputy Director of Transaction Supervision Department	VNSM06	
7	Mr. LE Vu Kim Tinh	Phu Hung Securities Corporation	Branch Director of Tan Binh Branch	VNSM07	
8	Mr. HOANG Cong Binh	Phu Hung Securities Corporation	Senior Broker	VNSM08	
9	Mr. NGUYEN Hieu	Viet Dragon Securities Corporation (HOSE: VDS)	General Director/ Member of the Board of Directors	VNSM09	Newly listed company
10	Mr. PHAM Hoang Lan	Mirae Asset Securities (Vietnam) Limited Liability Company	Senior Broker	VNSM10	

Source: Author.

Among these participants, the first five participants are managers and authorised persons to disclose information from some of the chosen listed companies. CDN, TA9, and ACB are listed on HNX, while DRC and VCB are listed on HOSE. In each stock exchange, the mentioned companies do business in different industries. On HNX, CDN is from transportation and storage, TA9 is from construction, and ACB is from finance. Whereas on HOSE, DRC is from consumer discretionary sector, and VCB is from financial sector. In addition, CDN and TA9 are newly listed companies, while DRC, VCB, and ACB are existing listed companies. Additionally, Mr. NGUYEN Hieu is an acknowledged and professional expert as he has had over twenty years of experience in the field of finance and stock market. He is General Director and a member of the board of directors of VDS, which is a newly listed company on HOSE. It

means that he gives opinions as not only the qualified and experienced expert but also the member of the board of directors and the top manager of the newly listed company on HOSE. Subsequently, the information is gained from three participants of the listed companies on HOSE and three participants of the listed companies on HNX. Out of these six participants, three participants come from newly listed companies, and the others come from existing listed companies.

Furthermore, an interview is conducted with Mr. NGUYEN Quoc Khanh, who is the deputy director of the transaction supervision department at HOSE. Additionally, some specialists, experts, and financial advisors in the securities companies are interviewed. They mainly have had at least ten years of experience in this field and get involved in the whole stock market on a daily basis. They usually work and support listed companies and investors in terms of valuation of enterprises and issued shares, stock listing and trading, capital raising, providing strategic advice for business development, as well as doing big deals with large-volume trades in the stock market on their behalf. Thus, the respondents from the stock exchanges and securities companies express expert opinions on the Vietnamese market efficiency as well as opportunities and challenges to listed companies due to listing, trading, and complying with the current policies and regulations in the stock market. Moreover, the specialists from the securities companies could offer explanations for the difference in the market efficiency of these two stock exchanges.

The pilot study and the interview process were deployed in an ongoing global pandemic of coronavirus disease (COVID) in the period of 2020 – 2021. The pandemic was not only a health crisis but also an unprecedented socio-economic crisis. I went back home to conduct the interviews in July, and I had to be quarantined for two weeks. Unfortunately, my hometown, Danang, was in lockdown from the end of July to September 2020 (Shira, 2020). After that, some other cities and provinces also imposed social distancing and lockdown. National and local transportations were significantly reduced and suspended. Moreover, people in Ho Chi Minh City were partly subject to lockdown due to COVID from 01 December 2020 to 15 December 2020 and from 26 December 2020 to 10 January 2021. Vietnam imposed series of lockdowns in Chi Linh, Hai Duong, Quang Ninh, Bac Giang, Gia Lai, Hanoi, Binh Duong, and Ho Chi Minh due to spread of the new COVID variants from the end of January to the beginning of March 2021. From April to September 2021, Vietnamese authorities announced new lockdown measures in Hanoi, Ha Tinh, Hai Duong, Khanh Hoa, Lao Cai, Ninh Binh, Bac Ninh, Thanh Hoa, Quang Ninh, Da Nang, Quang Nam, Hue, Ho Chi Minh City, and 18 southern cities and provinces. In this situation, the unpredictable spread of COVID variants caused some challenges and delays in the interview process.

Due to impacts of the pandemic and series of lockdown measures in several cities and provinces, it was challenging to physically visit the listed companies to directly invite the unfamiliar managers and experts to engage in the research during this pandemic, hence the researcher attempted to overcome the challenges. The researcher utilised networking skills to contact super connectors and connect with potential interviewees. Besides, the interviewer flexibly used emails, telephones, and other communication tools to collect contact of potential respondents as well as to provide an overview of this research and make appointments with them in advance. Some participants were only willing to participate in interviews via telephone or mails due to the impacts of the COVID and their enormous workload. In particular, a phone interview was conducted with the participant coded VNSM04, and the participant coded VNSM09 sent his responses to the interview questions via mails according to their requests and preferences. The other interviewees were willing to have face-to-face interviews, so this type of the interviews was mainly deployed.

Therefore, the in-depth semi-structured interviews gather comprehensive data from managers, leaders, specialists, and experts in the field of finance and the stock market. The data collection in this research in general and this selection of interviewees in specific ensure to efficiently meet the research requirements and achieve theoretical saturation.

6.2.2. Interview questions

The study follows explanatory mixed methods design. It starts with statistically appraising the market indices and the stock prices of the randomly selected companies. The statistical results from quantitative analysis show that HOSE is relatively efficient in the weak form, while HNX is inefficient. Furthermore, they reflect an improvement of the Vietnamese stock market efficiency in comparison with the existing studies in the literature review. The findings gained in the quantitative analysis are further evaluated and reassured by the qualitative data from the interviews, which means that the secondary data is supported and complemented by the primary data.

The interview questions are constructed to not only meet the research question and objectives but also hold fluent and fascinating conversations with the respondents. They are derived from the research question and objectives, the literature review, and the quantitative data analysis. To assure the validity and reliability of the interview questions, the researcher follows various steps, including:

Step 1: The researcher builds the questions in English languages with guidance and advice from the supervisors.

Step 2: The questions are translated from English to Vietnamese and vice versa to ensure consistent meaning of the questions in both languages.

Step 3: The questions in both Vietnamese and English languages are reviewed by some professional experts and academic researchers who fluently use both Vietnamese and English languages and have the wealth of knowledge and experience in finance. This step makes attempts to determine potential confusion or misunderstanding in the questions, identify potential issues of the national culture and translation from English to Vietnamese as well as ensure consistency and cohesion of questions in both Vietnamese and English languages.

Step 4: The researcher improves the questions in both English and Vietnamese languages based on the feedbacks and advice of the supervisors and the reviewers.

As a result, there are two sets of key interviewing questions to capture information from the two described interview samples, and their details are concisely given in ***Tables 6.4*** and ***6.5***. The interview questions not only help interviewers and interviewees to follow the topic and achieve the research requirements but also allow the interviewees to enhance and explain any other relevant issues that seem significant to them. The interviewer could add some supportive questions based on responses and reflections of the interviewees to clarify and investigate further information in the semi-structured interviews.

Table 6.4: Interview questions for participants from listed companies

Participants	Interview questions	Parts of research question	Research objectives and other purposes	Gap to fulfil
Leaders, managers, staffs, and authorised persons to disclose information working in some companies listed on HOSE and HNX	• Could you please explain your view on the informational efficiency of the Vietnamese stock market in recent years? • Do you believe that the market value of your company is reasonable and fair? • Is all relevant information about your listed company accessed and captured by the market to determine the stock price and the market value of the company?	How efficient is the Vietnamese stock market	(2) Examine the current market efficiency and its improvement due to recent policies and regulations related to the stock market.	The current empirical studies on efficient market hypothesis related to the Vietnamese stock market only evaluate the market efficiency by mainly using quantitative methods and provide understanding by looking at the market only.
	• What opportunities and advantages does your company gain in terms of development and investment since being listed on the stock market? • What challenges and limitations does your company encounter when complying with the current policies and regulations on listing and information transparency and disclosure?	How have listed companies been impacted by the market behaviours	(3) Examine advantages and challenges to listed companies due to listing, trading, and complying with the current policies and regulations in the stock market considered by listed companies and stakeholders.	
	• Since listing on the stock exchange and especially in recent years, how efficient have the production and business activities of your company been? Has its efficiency been different as compared to the previous time?	How have listed companies been impacted by the market behaviours	(4) Evaluate impacts of market behaviours on the market value and performance of companies.	
	• In your opinion, what do you suggest in order to improve the informational efficiency of the Vietnamese stock market and enhance the benefits for the listed companies as your company?	How efficient is the Vietnamese stock market, and how have listed companies been impacted by the market behaviours?	Provide suggestions and recommendations	

Source: Author.

Table 6.5: Interview questions for participants from stock exchanges and securities companies

Participants	Interview questions	Parts of research question	Research objectives and other purposes	Gap to fulfil
Some leaders, specialists, experts, officials, and financial advisors working in stock exchange and securities companies	• Could you please explain your view on the informational efficiency of the Vietnamese stock market in recent years? • Do you believe that the market value of a listed company is reasonable and fair? • Is all relevant information about listed companies accessed and captured by the market to determine the stock price and the market value of the companies?	How efficient is the Vietnamese stock market	(2) Examine the current market efficiency and its improvement due to recent policies and regulations related to the stock market.	The current empirical studies on efficient market hypothesis related to the Vietnamese stock market only evaluate the market efficiency by mainly using quantitative methods and provide understanding by looking at the market only
	• It is stated that HOSE attracts more concerns and more participation from listed companies and investors than HNX does because it better meets their needs of informational efficiency. What do you think about this opinion? *	How efficient is the Vietnamese stock market	(2) Examine the current market efficiency and its improvement due to recent policies and regulations related to the stock market.	
	• What advantages do listed companies gain from listing and complying with current regulations on listing and information transparency and disclosure? • What are shortcomings and limitations in the current regulations that could lead to negative effects on the company's market value?	How have listed companies been impacted by the market behaviours	(3) Examine advantages and challenges to listed companies due to listing, trading, and complying with the current policies and regulations in the stock market considered by listed companies and stakeholders. (4) Evaluate impacts of market behaviours on the business performance of listed companies.	
	• In your opinion, what do you suggest in order to improve the informational efficiency of the Vietnamese stock market and enhance the benefits for the listed companies?	How efficient is the Vietnamese stock market, and how have listed companies been impacted by the market behaviours?	Provide suggestions and recommendations	

**Note: This question is for the experts who trades and works on the two stock exchanges.*

Source: Author.

6.2.3. Pilot study

The pilot interviews, which are regarded as a rehearsal for the major interviews, are designed to examine the suitability of the interview questions. The pilot test aims to refine the set of interview questions to identify potential issues in asking and answering the questions and recording the data that could impact the quality and validity of qualitative results (Saunders, Lewis, & Thornhill, 2019). The pilot interviews, which were in the period of October and November in 2020, were carried out prior to deploying the major interviews. The research proposal including abstract, research question, research objectives, contributions of the research, and the initial interview questions are provided to two external people who are willing to participate in the pilot study. Moreover, the participants read the participant information sheet and sign on the consent forms before they start to engage in the research in general and in the pilot study in particular. Thanks to doing so, they obtain a brief and solid overview of this research to review and ensure that the interview questions and the primary data from the interviews strive towards the research question and objectives. Additionally, this pilot study aims to check for the clarity and appropriateness of the interview questions, ensure the respondents' comprehension of the questions, and estimate the required length of time to conduct the interviews.

The interview questions are pilot tested with the two participants prior to being used to collect data from the interviewees. The interview was firstly pilot tested with Ms. NGO Nguyen Bao Tran in October 2020. She is currently a career service director and a lecturer at Department of International Business and Management, VNUK Institute for Research and Executive Education, The University of Danang. She graduated with a master's degree in accounting and finance at the University of Surrey, and she used to work at KPMG in the past. She claimed that four key sections in an interview included warm-up, exploration of discussion points, core discussion, and summarising. To enhance the efficacy of the core discussion, she suggested creating a convivial and welcoming atmosphere which would be conducive to an open and free-flowing discussion in the warm-up. The greetings and the questions should be constructed based on features of the interviewees and their organisations or companies. Moreover, she advised me to add some introductory and general questions to the warm-up and the exploration of discussion points in order to build warm rapport and help the interviewees capture and respond with an open mind to the interview questions in the core discussion.

After that, the interview was pilot tested again with Mr. TRAN Thuan Hoa in November 2020. He is one of the members of the board of directors of Saigon Commercial Joint Stock Bank. Additionally, he is General Director of Central Law Investment Consultant Company Limited, which is one of the reputable legal consulting firms in Vietnam in terms of project investment, mergers and acquisitions, corporate operation, banking and finance, taxes, and other legal support activities. He has had nearly 20 years of experience in the financial industry in general and the Vietnamese stock market in particular. He was one of the staffs working in HOSE in the initial years of its establishment and development in the 2000s. Firstly, he advised me to interview staffs and financial experts working in securities companies in addition to participants from the listed companies and the stock exchanges. They were the ones representing the listed companies and the investors to make big deals and they usually worked with relevant information in the market every day, so they obtained a comprehensive view on the informational efficiency of the whole market. Moreover, they could give explanations for the difference in the market efficiency of HOSE and HNX and advise the approaches to improve the Vietnamese stock market efficiency. Secondly, he offered me tips for the successful interviews and some advice on modifying the interview questions to adapt to the Vietnamese culture, ensure their clarity and appropriateness, as well as remove psychological barriers of the interviewees to encourage them to express their perspectives comfortably and smoothly.

Thanks to the constructive feedback and advice, the researcher improves the initial interview questions with a clear reference to the research question and objectives, and some constructive questions are flexibly added to the interviews. For example:

- Could you please explain your view on the informational efficiency of the Vietnamese stock market in recent years?
- Could you please explain your opinion on valuing the company market value based on stock prices?

Moreover, the interviewer not only learns by experience from the pilot study but also obtains some practical advice on establishing a good rapport with interviewees to remove their psychological barriers and encourage their open-mindedness. The total duration of face-to-face interviews is estimated at around thirty minutes to an hour in total.

6.2.4. Interview process

The primary data collection and analysis complies with Research Ethics Principles and The Code of Practice for Research and ethical research guidelines in terms of Principles of Anonymity, Confidentiality, and Data Protection of the University of Sunderland. The research rigorously complies with the ethical, legal, and professional obligations and standards. The choice of Vietnam as the primary location for this fieldwork is driven by the research questions and objectives. Due to the effects of the COVID, the fieldwork, including the pilot study and the interviews, was engaged within six months and it was conducted in Vietnam between October 2020 and March 2021. The duration of each face-to-face conservation was totally thirty minutes to an hour. The interviewing process includes several following steps:

- The researcher collects information of potential participants as well as utilises networking to contact super connectors and connect with target interviewees. The interviewer and the super connectors contact them beforehand to introduce the interviewer as an academic researcher working on meeting the research requirements, briefly introduce the research, and arrange appointments for the interviews.
- The interviewer provides a brief explanation of the research and the interviews to all participants in advance to encourage them to get involved in the study willingly and pleasantly. The information sheets, consent forms, and key interview questions are given in both Vietnamese and English to offer them a preliminary view of the research and the interviews as well as avoid or clear up any misunderstandings. The participants have and clearly understand their right to obtain information protection when providing primary information through interviews and comprehend their right to “withdraw” or “change their mind” when engaging in the study. It is committed that the interviews are conducted when the interviewees accept the invitations of the interviewer to participate in the work with written consent. They will be required to tick “×” in the boxes and then sign and give their full name in the form if they agree with the statements and are willing to attend the interviews. Otherwise, the author would give great thanks for their time and close the interviews. The information sheet and consent forms signed by the participants in the pilot study, and the interviews are provided in ***Appendix 6.1*** and ***Appendix 6.2***, respectively.
- The interviewees are informed that the interview conversations are recorded via a digital recorder. If they give consent to record the interviews, the digital recorder will be turned on and start to record as well as the researcher will take notes simultaneously. Otherwise, the interviewer would take notes only upon their permission.

- After finishing the discussion and turning off the digital recorder, the interviewer summarises the interview content at the end of each interview to assure that the researcher comprehends their responses. The respondents are informed of how these data are used and stored as well as when they are destroyed.
- The participant names are coded to ensure the confidentiality of the participants' personal data in the qualitative data analysis in NVivo 12 software. Besides, the procedures of data transcription, translation, and analysis are implemented in the private space. The full audio, transcripts, and the other relevant files are encrypted and stored securely.
- The interview contents are transcribed in Vietnamese and then translated into English before being analysed with the assistance of NVivo 12 software. The qualitative findings gained from interviews is reassured by relevant documentary data.
- The digital data collected during the research are only used by the researcher for academic purposes. The audio data is removed from the audio device when relevant publications of this research are completed and published.

6.3. Method of data analysis

This study attempts to gain a comprehensive view on the Vietnamese stock market efficiency by investigating at the level of market and looking at the reflection of market participants simultaneously as well as combining quantitative and qualitative methods. Qualitative methods follow a naturalistic approach researching things in natural settings, and they are used to discover social context, lived experiences and human perceptions (Griensven, Moore, & Hall, 2014; Pandey & Patnaik, 2014). The findings in this research are generated from mixed data, including quantitative statistical data, qualitative interviews, and documentary data, to minimise research subjectivity. Decisions on interview content and potential interviews of the semi-structured interviews are made based on the statistical findings. The qualitative data collected from in-depth semi-structured interviews helps the researcher gain a deeper understanding of the Vietnamese stock market efficiency and the effects of market behaviours on the business performance. The information obtained from the interviews is reassured by evidence from illustrating documentary information, including annual reports, sustainable development reports, and relevant documents of the companies.

Thematic analysis is regarded as a popular method for analysing qualitative data in several disciplines to address different research questions (Pearse, 2019). Thematic analysis is “a method for identifying, analysing, and reporting patterns (themes) within data” and it allows for qualitative information processing using “coding” (Braun & Clarke, 2006, p. 79). It is a realist and

essentialist method which analyses experiences, meanings and the reality of respondents and a constructionist method which studies the ways and the effects of subjects within society (Braun & Clarke, 2006). However, the sole use of the thematic analysis has several disadvantages (Kiger & Varpio, 2020). If the specific orientation of the analysis is not clearly stated, the manual use of thematic analysis will have a risk of being applied broadly, improperly, and inconsistently as well as only offer mere description and limited interpretative power (Kiger & Varpio, 2020). Moreover, it could be challenging for the researchers to determine key aspects of data in their analysis (Kiger & Varpio, 2020).

The challenges are overcome by the assistance of computer-assisted qualitative data analysis software. The qualitative analysis software excels at searching and coding for large data sets as well as efficiently organising and managing the data and it is used to investigate systematically the material to explore major aspects, consistencies, and contractions in the responses (Welsh, 2002). It allows the researchers to read each interview thoroughly to code the emerging themes and do systematic revisions by opening a node to see all the references gathered there at any time (Welsh, 2002). As a result, the use of qualitative data analysis software supports to gain accurate and transparent viewpoints of data, speed up the process, stimulate the rigour and trustworthiness, as well as provide more flexibility and orientations in data analysis from a variety of perspectives (Oliveira, Bitencourt, Teixeira, & Santos, 2013; Paulus, Woods, Atkins, & Macklin, 2017). From the viewpoint of a researcher, the mixed methods are the most suitable in the qualitative data analysis in this study. This research firstly uses the qualitative data analysis software to discover key factors and implications of the Vietnamese market efficiency. The preliminary findings provide initial directions for further in-depth examination and exploration of the market efficiency and its impacts on the listed companies as well as suggestions for its improvement.

NVivo, MAXQDA, and ATLAS.ti are regarded as the most common software programs in qualitative data analysis (Oliveria et al., 2013; Paulus et al., 2017). All these three qualitative data analysis software allows the researchers to find, display, and visualise data-code relationships (Oliveria et al., 2013; Paulus et al., 2017). However, while both NVivo and MAXQDA have hierarchical coding, ATLAS.ti has no code hierarchy (Oliveria et al., 2013; Paulus et al., 2017). Hierarchical coding, in which the broad higher-order codes offer a good overview and general directions of the interviews, while detailed lower-order codes allow the investigation of the consistencies and differences both within and between cases, gives the most suitable codes in the form of quality hierarchy (Cassell & Symon, 2004). Thus, NVivo and MAXQDA are preferred

to utilise to code and analyse interviews of various respondents. Compared to NVivo, MAXQDA does not support data import, export, and management which aim to identify opinions or attitudes towards topics or entities (Oliveria *et al.*, 2013). Therefore, from the viewpoint of a researcher, NVivo is the most useful qualitative analysis software to analyse the perspectives, and attitudes of various specialists and practitioners towards the Vietnamese stock market efficiency. NVivo 12 refers to determining key words and counting the frequency of words and its application contributes to the enhancement of trustworthiness and quality of qualitative research (Sinkovics, Penz, & Ghauri, 2008). It supports to identify major categories, codes, themes, and patterns as well as facilitate data queries, visualisations, reviews, and retrievals.

This qualitative data analysis by using NVivo 12 software is a pivotal starting point for reviewing the material and determining key themes and points regarding the Vietnamese market efficiency and its impacts on the business performance in the interviews. NVivo 12 utilises the documents and nodes as central organising concepts to not only reduce manual tasks and offer better time management tools but also support the researcher to organise, manage, and exploit the data more efficiently, systematically, and logically. In this study, nodes are determined and linked to several passages in the interviews of the participants in the coding process. After that, NVivo queries find and analyse the words or phrases in the data sources and nodes as well as explore the patterns, the trends, and the frequencies based on the coding. Additionally, the visualisation techniques help to visualise, explore, and present the trends, the connections, and the hierarchy in the source material. The powerful queries and visualisations in NVivo 12 pave the way for investigations and reflection of the consistency and the differences in various perspectives. The extracts allow the exportation of data results in NVivo 12 for complementary analysis. Furthermore, the use of NVivo 12 contributes to the expansion of analytical avenues and enhances the rigour of the qualitative data analysis procedures. Therefore, the applications of NVivo 12 initially provide preliminary and general directions of the qualitative analysis. The key points include the major factors of the market efficiency, reasons for differences in the market efficiency of two stock exchanges, opportunities and challenges of listed companies from listing and complying the current regulations, as well as the impacts of market behaviours on the business performance. The important points in suggestions for the improvement of the market efficiency are also indicated.

Following that , the research carries out a deeper exploration of the qualitative data based on the broad orientations of the initial qualitative analysis in NVivo. The results of NVivo 12 software pave the ways for more thorough and comprehensive reading, analysis, and

interpretation of the qualitative findings. The emerging themes, common patterns, and major trends which are indicated in NVivo 12 software are more extensively investigated. Based on the NVivo queries and visualisations, this step aims to obtain more detailed and critical discussion and comparisons of the responses regarding the Vietnamese stock market efficiency and its impacts on the listed companies.

In conclusion, the mixed methods are adopted for qualitative data analysis. Initially, the applications of NVivo 12 software in this data analysis play crucial roles in reviewing the source material, determining key themes, patterns, and trends, as well as systematically organising data. After that, it is based on the general directions and main points gained in the preliminary analysis by using NVivo 12 to carry out a further in-depth exploration and analysis of the market efficiency and its impacts on the business performance. Additionally, it critically evaluates the suggestions of the managers and the experts for improving the market efficiency.

6.4. Qualitative data analysis

The mixed methods are adopted to analyse the qualitative data. The qualitative data analysis by using NVivo 12 software is a useful starting point for reviewing the data material and providing common themes and general directions before a more extensive exploration and evaluation of the Vietnamese stock market efficiency and its impacts on the listed companies. At the early stage, the study uses the word frequency query not only to list most frequently occurring words and identify possible themes in the sources but also to visualise the results in a word cloud in ***Figure 6.1***.

Figure 6.1: Word frequency query of the Vietnamese stock market efficiency

Source: Outcome from NVivo 12.

Based on the research requirements, the quantitative findings, and the word frequency query, the qualitative data analysis focuses on some crucial points. Firstly, it identifies the key factors of the Vietnamese stock market efficiency and discovers potential opportunities and challenges of the listed companies from listing, trading, and complying with the current policies and regulations in the stock market. Additionally, it examines the effects of market behaviours on the business performance, which are regarded as time valuation of the company, capital enhancement, and business management and development. Following that, the suggestions for enhancing the stock market efficiency and increasing benefits for the listed companies are discussed.

6.4.1. Key factors of the Vietnamese stock market efficiency

The quantitative findings are checked and affirmed by the interviews. To understand the current stock market efficiency from the perspectives of the market participants, some major questions were asked to managers, leaders, officials, specialists, experts, and financial advisors as following:

- Could you please explain your view on the informational efficiency of the Vietnamese stock market in recent years?
- Do you believe that the market value of a listed company is reasonable and fair?
- Is all relevant information about listed companies accessed and captured by the market to determine the stock price and the market value of the company?

Beside the mentioned key questions, other supportive questions are added based on the reflections and responses of the interviewees. According to the findings from NVivo 12, three key factors of the Vietnamese stock market efficiency include information availability in the stock market, relationship between the information and the stock prices, and market valuation. ***Figure 6.2*** shows hierarchy for the mentioned key factors of the Vietnamese stock market efficiency.

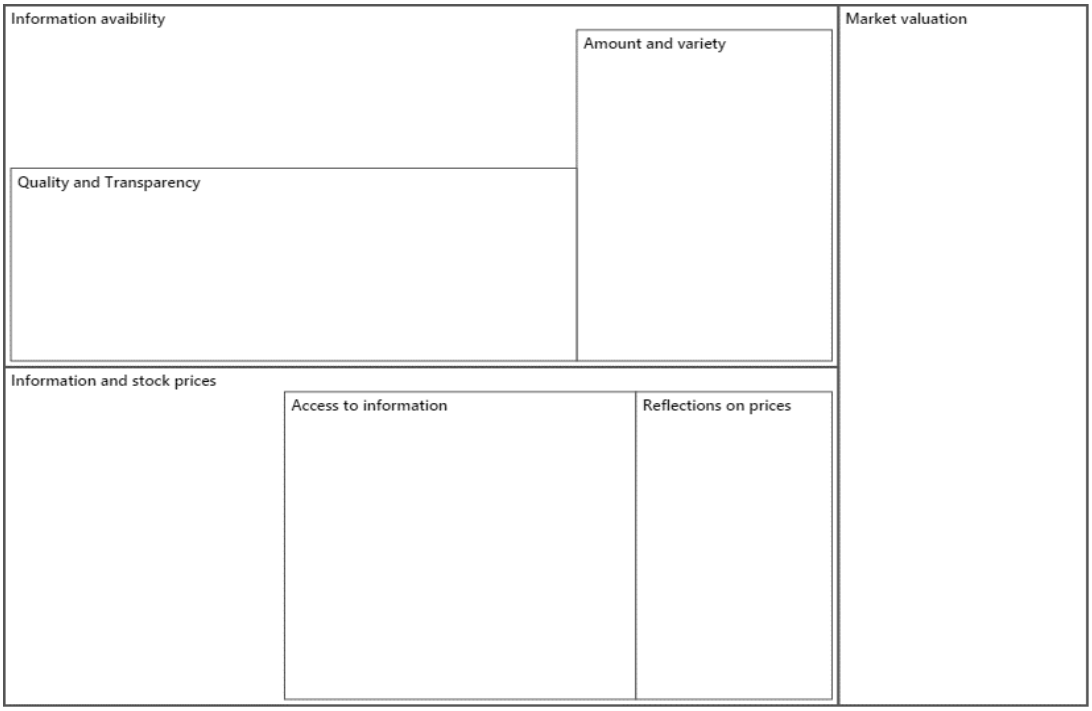

Figure 6.2: Hierarchy for key factors of the Vietnamese stock market efficiency

Source: Outcome from NVivo 12.

Firstly, two important elements of the information availability in the stock market are amount and variety of the information as well as quality and transparency of the information. When stock prices are more informative, the market participants suffer from less informational asymmetry, and the investors are more willing to provide capital to firms and facilitate investment (Edmans, Jayaraman, & Schneemeier, 2017). Therefore, the information availability, including the amount and the diversification as well as the quality and the transparency of information, plays important roles in the Vietnamese market efficiency.

Secondly, the relationship between the information and the stock prices makes significant contributions in the Vietnamese stock market efficiency, and it refers to access to the information and reflections of the information on stock prices. The more and better information the market participants access and obtain, the more accurate the market estimation of intrinsic value is. It leads to more efficient market (Malkiel & Fama, 1970). Moreover, the market efficiency refers to reflections and incorporation of the available and relevant information into the current stock prices (Rehman et al., 2018). When the market satisfies weak form efficient assumptions, the current stock prices entirely reflect the information contained in all past prices or the market follows the random walk model (Malkiel & Fama, 1970). Hence, in weak efficient market, all relevant and

fundamental information is accessed and captured by all market participants and the value of stocks reflects the value of the company reasonably and fairly (Mobarek & Fiorante, 2014).

Thirdly, the stock prices offer reliable signals and tools for market valuation of listed companies and their stock prices in an efficient market. The market efficiency positively supports managers and investors in making decisions efficiently and effectively as well as implementing the best strategies (Ali et al., 2018). Thus, the market valuation is an important factor of this stock market efficiency.

Table 6.6: Matrix coding for key factors of the Vietnamese stock market efficiency

	Information availability		Information and stock prices		
	A: Amount and variety	**B: Quality and Transparency**	**C: Access to information**	**D: Reflections on prices**	**E: Market valuation**
1: VNSM01	0	1	1	2	3
2: VNSM02	1	0	2	1	2
3: VNSM03	2	1	1	0	2
4: VNSM04	1	2	1	1	2
5: VNSM05	2	2	2	0	3
6: VNSM06	1	1	1	2	2
7: VNSM07	1	2	3	1	4
8: VNSM08	0	1	1	0	4
9: VNSM09	0	1	1	0	2
10: VNSM10	1	1	1	1	2

Source: Outcome from NVivo 12.

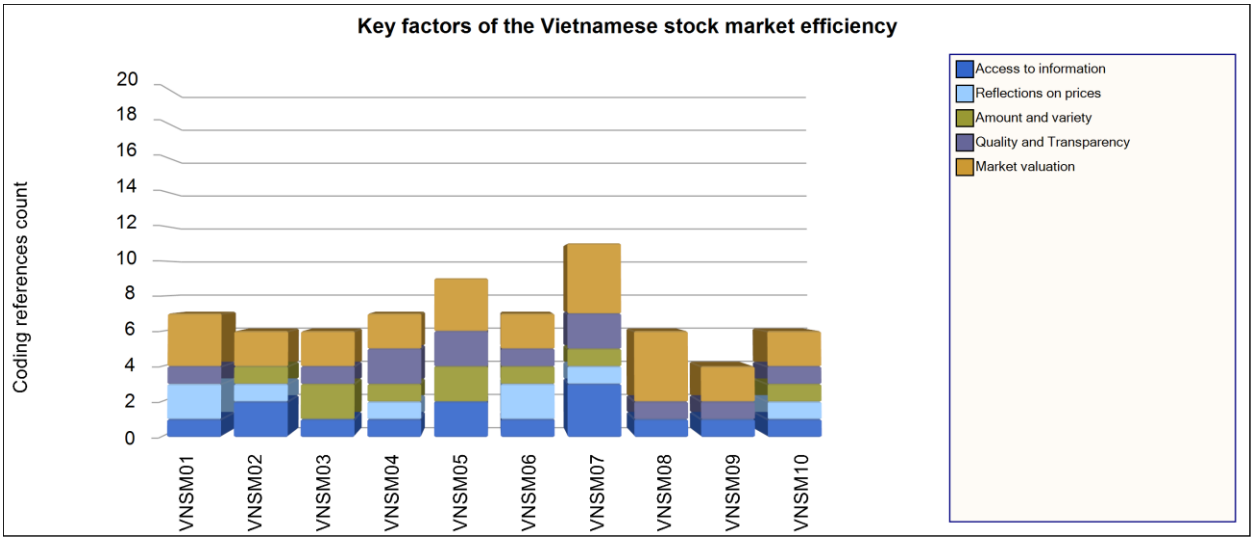

Figure 6.3: Matrix coding for key factors of the Vietnamese stock market efficiency

Source: Outcome from NVivo 12.

Table 6.6 and ***Figure 6.3*** reflect matrix coding query results for key factors of the Vietnamese stock market efficiency. Regarding the information availability, seven interviewees mentioned about the amount and variety of the information, and nine respondents noticed the quality and transparency of the information when explaining their views on the current market efficiency of the Vietnamese stock market. In terms of the relationship between the information and the stock prices, all participants consented that all relevant information were accessed and captured by the market participants, and five out of ten participants mentioned the reflections of the information on the stock prices. All these participants discussed the market valuation in the Vietnamese stock market.

Table 6.7: Cluster analysis results for key factors of the stock market efficiency

Code A	Code B	Pearson correlation coefficient
Market valuation	Amount and variety	0.196025
Quality and Transparency	Market valuation	0.205184
Market valuation	Access to information	0.294697
Reflections on prices	Market valuation	0.330453
Reflections on prices	Access to information	0.594335
Reflections on prices	Quality and Transparency	0.653416
Reflections on prices	Amount and variety	0.658201
Amount and variety	Access to information	0.658559
Quality and Transparency	Access to information	0.68353
Quality and Transparency	Amount and variety	0.798562

Source: Outcome from NVivo 12.

Cluster analysis, which serves as an exploratory technique for the qualitative data representation through visualisation, supports to discover the correlation between the elements in the mentioned key factors of the Vietnamese stock market efficiency. The correlation is visible through word similarity in the nodes, and Pearson correlation coefficient is a frequently used approach to measure the similarity between each pair of items in this software. ***Table 6.7*** above completely shows positive coefficient correlations among the elements. In other words, every increase in one of the elements results in positive rise in the other elements. The quality and transparency as well as the amount and variety have the strongest positive relationship with approximately 0.799. The two elements of the information availability also have a strong positive relationship with the access to information with nearly 0.684 and 0.659, respectively. In addition, the reflections on prices have good positive relationships with the elements of information availability and the access to information as the values are greater than 0.50.

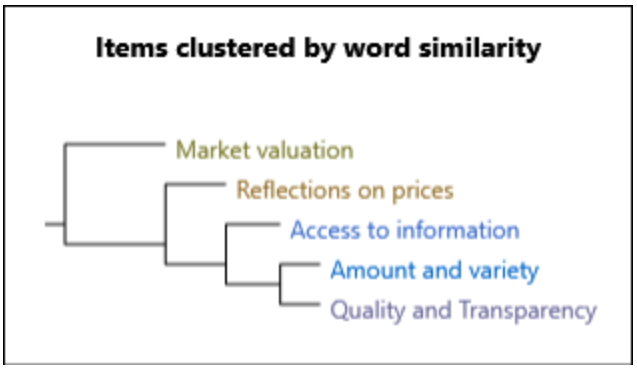

Figure 6.4: Results using word similarity for key factors of the stock market efficiency

Source: Outcome from NVivo 12.

The results are supported by ***Figure 6.4*** that the interconnected nodes are grouped together. The cluster analysis by word similarity shows that reflections on prices, access to information, amount and variety of information as well as quality and transparency of information are closely connected to each other. The market valuation has weak positive relationships with other factors of the Vietnamese stock market efficiency.

6.4.1.1. Information availability in stock market

The two key elements of the information availability in the stock market are the amount and variety of the information and the quality and transparency of the information. The amount and diversification as well as the quality and transparency of information play vital roles in the Vietnamese market efficiency. The diagram comparing between the node of the amount and variety and the node of the quality and transparency is provided in ***Figure 6.5***.

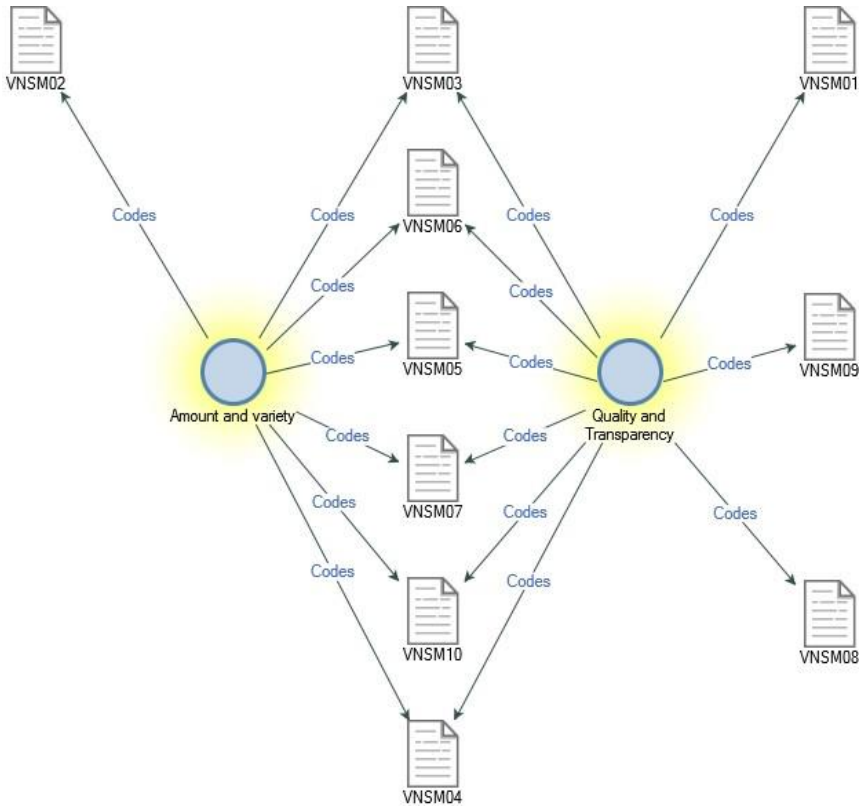

Figure 6.5: Comparison diagram related to information availability

Source: Outcome from NVivo 12.

With reference to the information availability, seven interviewees gave opinions on the amount and variety of the information, and nine participants mentioned the quality and transparency of the information when explaining their views on the current market efficiency of the Vietnamese stock market.

- **Amount and variety**

With regard to the amount and variety of information, the participants mainly stated that the information in the stock market was massive, abundant, various, and diversified. Further, they also indicated the enhancement of the information. The findings were evident from the interview responses in ***Appendix 6.3***. In particular, the interviewee VNSM04, who is Chief Executive Officer and also a member of the board of directors of DRC, supported that the market participants deeply understood the listed company and the market *"due to the investigation from various sources of information, in general, informational socialisation".* Furthermore, interviewee VNSM07, a branch director of Phu Hung Securities Corporation, expressed: *"In recent years, our information is more stable, better, and more."* The interviewee VNSM10, a senior broker of Mirae Asset Securities,

agreed: *"Now, the sources of information are various and diversified."* Their opinions are in alignment with the viewpoints of the interviewee VNSM06 who is Deputy Director of Transaction Supervision Department of HOSE, the interviewee VNSM02, and the interviewee VNSM05 ***(Appendix 6.3)***. On the other hand, the interviewee VNSM03, who is Deputy Director of Saigon Branch of ACB – a listed company on HNX, said: *"I think that there is a lack of information in the current stock market."* In summary, the key point noted in the responses excluding the opinion of the interviewee VNSM03 implies that the information in the stock market is great, abundant, stable, various, and diversified. Only the interviewee VNSM03, the manager of the listed bank on HNX, thought that there was a lack of information in the current stock market. Their explanations added that the information had been enhanced and developed.

- **Quality and transparency**

With reference to the quality and transparency of the information, there has been an improvement of the information quality and transparency thanks to the current regulations. Furthermore, the information is dominantly considered to be sufficient, sensitive, timely, good, and comprehensive. It was supported by the evidence from the interviews of the nine participants in ***Appendix 6.3***. Particularly, the interviewee VNSM04, Chief Executive Officer of DRC, stated:

> *"I find that the information is extremely good, and it is also comprehensive. It is comprehensive and especially the information used to evaluate is extremely good. It helps the investors learn more about the company."*

The interviewee VNSM06, the representative of HOSE, was of the same mind on this regard and claimed: *"the current regulations on information disclosure in Vietnam are very strict and tight"* and *"all requirements for the information disclosure of business to the market are timely".* Interviewee VNSM08, who is a senior broker of Phu Hung Securities Corporation, supported: *"Regarding the information, the information is now very fast and sensitive".* The interviewee VNSM07 added: *"In recent years, our information is more stable, better, and more."* More detailed information of their expert opinions is provided in ***Appendix 6.3,*** and they supported by the viewpoints of the interviewee VNSM09, the interviewee VNSM01, the interviewee VNSM08, and the interviewee VNSM10.

On the contrary, the interviewee VNSM03, who is the manager of a listed bank on HNX, said that the internal information was limitedly provided to external people and his statement is provided as follows:

"They limitedly provide the internal information which can be provided outside. They will limitedly provide any unfavourable information. And they will provide the beneficial information. It makes the listed price untransparent."

With regard to the information availability, the main point taken from their responses is that the information in the stock market is massive, abundant, diversified, sufficient, sensitive, timely, good, and comprehensive. Moreover, the relevant responses consistently indicate improvement and enhancement of the information availability in the Vietnamese stock market thanks to the current regulations. Only the interviewee VNSM03, the manager of the listed company on HNX, thought that there was a lack of information transparency in the current stock market.

6.4.1.2. Relationship between information and stock prices

The relationship between the information and the stock prices involves the access to the information and the reflections of the information on the stock prices. The diagram comparing between the node of the access to the information and the node of the reflections of the information on the stock prices is provided in ***Figure 6.6***.

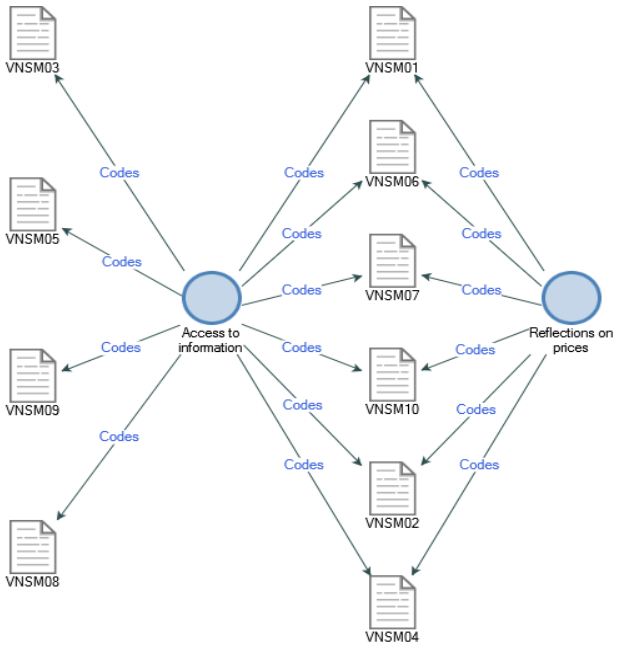

Figure 6.6: Comparison diagram for relationship between information and stock prices

Source: Outcome from NVivo 12.

All participants discussed whether all relevant information is accessed and captured by the market participants, and six participants explained the reflections of the information on the stock prices.

- **Access to information**

With reference to accessing and capturing information, most of the participants consented that all relevant information about the listed companies and the market is accessed and captured by the market to determine the stock price and market value of the listed companies. It was supported by the evidence from their interview responses in ***Appendix 6.3***. In this regard, the interviewee VNSM08 approved: *"All relevant information about the listed companies is accessed and captured by the investors for stock valuation in the market."* In this regard, the interviewee VNSM02 definitely adopted consistent perspective regarding the access to the information, in particular: *"I think it is fully captured. Because we mostly publish new information, and it affects the stock prices."* Moreover, the interviewee VNSM06 strongly agreed with this opinion, and he explained that the stock price is affected by the available information and the investment styles. In particular:

> *"It will be certainly right. The stock price is based on the supply and the demand, and the supply and the demand are based on the available information and the investment style. For example, Vietnamese people like to buy the shares of banks, securities companies, and real estate companies but foreigners like to buy shares of technological companies, so it is not the same."*

The full responses of these participants in this regard are provided in ***Appendix 6.3***, and the interviewee VNSM04, the interviewee VNSM07, the interviewee VNSM05, the interviewee VNSM09, the interviewee VNSM01 as well as the interviewee VNSM10 also went along with this opinion. The interviewee VNSM10 added that it would be more advantageous if the information was obtained soon and fully ***(Appendix 6.3)***. On the other hand, the interview VNSM03, the manager of the listed company on HNX, disagreed: *"According to me, it is limited for the investors to access that information."*

The provided responses predominantly support that all relevant information about the listed companies and the market is accessed and captured by the market to determine the stock price and the market value of the listed companies. Moreover, the information is extremely important

and the sooner the information is captured, the more advantages it provides for the managers and investors.

- **Reflections of information on stock prices**

In their responses, six interviewees discussed the reflections and the incorporation of the information on the stock prices and the detailed information is provided in ***Appendix 6.3***. It was primarily agreed that the stock prices contained all relevant information related to the listed companies and the market. In particular, the interviewee VNSM06, the representative of HOSE, expressed: *"The public information has effects on the stocks."* He added:

> *"The positive information causes an increase, the negative information causes a decrease, and the neutral information causes an insignificant changed price."*

Additionally, when the interviewer asked whether all the relevant information was reflected on the stock prices, the interviewee VNSM04 responded:

> *"Yes. Exactly, exactly. It is nearly like that. Every event. For example, when there is a resolution or an announcement of quarterly business results and production as well as business performance or investment projects or personnel changes, there are changes on the market."*

In this regard, the interview VNSM01 claimed that it played vital roles when participating in the stock market and the sooner the reflection of the information on the stock prices was, the better it was. In particular:

> *"Now, when we participate in the stock market, I see that business information is extremely important. Having those experiences, I think the sooner the better."*

The interviewee VNSM02, the interviewee VNSM07, and the interviewee VNSM10 sympathised with the provided perspective, and the further information of their responses are given in ***Appendix 6.3***.

Regarding the relationship between the information and the stock prices, the dominant point noted in the provided responses refers that all the relevant information about the listed companies and the market is accessed and captured by the market to determine the stock price and the market value of the listed companies. Furthermore, the stock prices contain all relevant

information related to the listed companies and the market. The information is extremely important for the market participants, and the sooner the better.

6.4.1.3. Market valuation

In an efficient market, the stock prices are regarded as reliable indicators for market valuation of the listed companies and positively support managers and investors in making the right decisions and implementing the best strategies. All the interviewees discussed the market valuation in the Vietnamese stock market. The diagram related to the node of market valuation is provided in ***Figure 6.7***. The provided answers of the participants consistently indicated the crucial contribution of the stock prices towards the market valuation in the Vietnamese stock market. In their responses, they mainly believed that the market values of the listed companies were fair and reasonable.

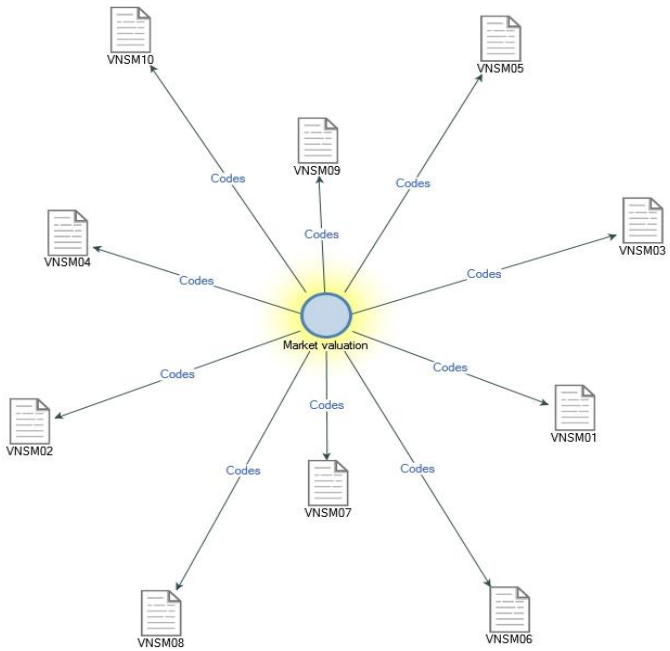

Figure 6.7: Diagram related to market valuation

Source: Outcome from NVivo 12.

The interviewee VNSM04 and the interviewee VNSM05 strongly claimed that the valuation of their listed companies based on their stock prices was adequate, and their market valuation was greatly reasonable and extremely fair ***(Appendix 6.3)***. The interviewee VNSM06, the manager of HOSE, was in agreement with the managers of the companies listed on HOSE. He explained that the market price was based on the supply and the demand in the market, so it was reasonable as compared to the book value. It was evident from his response as follows:

“Comparing the book price and the market price based on the supply and the demand in the market, the market price based on the supply and the demand in the market is reasonable.”

“The market value is always used in investors’ purchase and sales, and it is determined by the supply and the demand in the market. Thus, I think it is "fair". Being low does not mean that it is not "fair”. Because they valuate the future value, and the stock price is the future price not the present price. It depends on the potential and implicit value of the business in the future.”

In terms of the market valuation, the interviewee VNSM03 entirely agreed with the provided idea and stated:

“I think it is extremely proper and reasonable.”

With respect to the market valuation and the market value of the listed companies, the interviewee VNSM10, and the interviewee VNSM07, the interviewee VNSM08 showed consent with the given idea, and it was evident from their answers in ***Appendix 6.3***.

Additionally, the interviewee VNSM09 expressed that the businesses with good fundamentals and good performance would be basically and sustainably valuated well, in accordance with the actual value of the business. He stated that the stock price was one of its factors of the market valuation in the short term. It was evident from his answer as follows:

“In the short term, the movements of market price of listed companies are always volatile under the impacts of the market supply and demand. However, the businesses with good fundamentals and good performance will be basically and sustainably valuated well, in accordance with the actual value of the business. Therefore, the market price of the stock is only one factor in the valuation.”

The interviewee VNSM02 and the interviewee VNSM01, the managers of the newly listed companies on HNX, also approved that the stock prices are considered as one of the key factors contributing to the market valuation, and they believed that the market values of their listed companies were relative ***(Appendix 6.3)***. In addition, the interviewee VNSM01 added that the shareholder structure was important to the assessment:

“It is easier to evaluate any enterprises in which shareholders own it evenly with low proportion. The higher the liquidity, the easier it is."

The findings from the responses of the 10 interviews consistently showed the significant contribution of the stock prices to the market valuation in the Vietnamese stock market. Furthermore, it was dominantly believed that the market value of your company was fair and reasonable because the market price was based on the market supply and demand. Among the managers, the interviewee VNSM04 and the interviewee VNSM05, the managers of the listed companies on HOSE added that the market valuation of their listed companies based on their stock prices was adequate and relatively accurate. Meanwhile, the interviewee VNSM01 and the interviewee VNSM02, the managers of the newly listed companies on HNX, claimed that it was required to investigate the other factors in addition to the stock prices to comprehensively assess their company values.

In summary, the access to information and the market valuation are hugely attracted and mentioned by all these participants, and they are the two most important factors determining the Vietnamese stock market efficiency from their perspectives. The responses predominantly support that all relevant information about the listed companies and the market is accessed and captured by the market to determine the stock price and market value of the listed companies. In addition, the information is extremely important and the sooner the information is captured and reflected on the stock prices, the better decisions and investment are made. Regarding the market valuation, the responses consistently show the significant contribution of the stock prices to the market valuation in the Vietnamese stock market. Additionally, the market value of the listed companies is fair and reasonable from their perspectives because the market price is based on the supply and demand in the market.

The findings of this research are in harmony with the opinions of Anhar (2015), Rehman et al. (2018), Rejeb & Boughrara (2013), and Yang, Chou, & Yang (2020). They are in entire agreement with the empirical study in Indonesia of Anhar (2015), which indicated that the market prices and their trends were greatly useful and efficient to measure the company market value in accordance with the investors’ expectation. Rejeb & Boughrara (2013) and Rehman et al. (2018) claimed that investors could instantaneously, fully, and fairly obtain all relevant information in an efficient market, so the perspectives of listed companies were accurately and fairly revealed to the share prices. Additionally, the empirical research in Taiwan of Yang, Chou, & Yang (2020) showed that the information transparency had a significant influence on the enterprise value.

Regarding the key factors of the Vietnamese stock market efficiency, the representative of HOSE and the managers of companies listed on HOSE always provided positive perspectives, while the managers of companies listed on HNX sometimes provided unfavourable or mixed views apart from their favourable opinions. It was in alignment with the quantitative results which indicated that HOSE was weak form efficient while HNX was not efficient. In addition, the relevant statements consistently indicated improvement and enhancement of the information availability in the Vietnamese stock market thanks to the current regulations. The information in the stock market has become more abundant, diversified, sufficient, sensitive, and comprehensive in recent years thanks to the current strict and tight regulations in the Vietnamese stock market. It was in alignment with the statistical results in the quantitative data analysis regarding the improvement in the market efficiency of HOSE from an inefficient level to an efficient one. It completely agreed with the previous studies in Vietnam of Gupta, Yang, & Basu (2014) and Phan & Zhou (2014). Furthermore, it was in harmony with the research in Nordic, Baltic, Indonesian and the Shanghai stock markets of Hellström, Liu, & Sjögren (2018), Yang & Pangastuti (2016), and Li & Zhang (2011). These studies manifested that the strategic changes in the stock exchange markets enhanced the informational efficiency of these mentioned markets.

6.4.2. Reasons for differences in market efficiency of two stock exchanges

The quantitative data analysis manifested that the HOSE is fairly efficient in the weak form while the HNX does not hold a weak form of efficiency and not follow the random walk model. Moreover, in terms of the key factors of the Vietnamese stock market efficiency, the representative of HOSE and the managers of the companies listed on HOSE mostly provided positive perspectives, while the managers of companies listed on HNX sometimes expressed unfavourable or mixed opinions. To clarify the reasons for this pattern, the interviews strive to gain the perspectives of the experienced and professional experts and advisors who usually participate in both HOSE and HNX. In detail:

- It is stated that HOSE attracts more concerns and more participation of listed companies and investors than HNX does because it better meets their needs of informational efficiency. What do you think about this opinion?

According to ***Figure 6.8***, there are three primary reasons explaining why HOSE is more efficient than HNX. Firstly, HOSE delivers better performance and more stricter standards than

HNX. In addition, the differences of their market efficiency depend on the size and the goals of the companies listed on the stock exchanges.

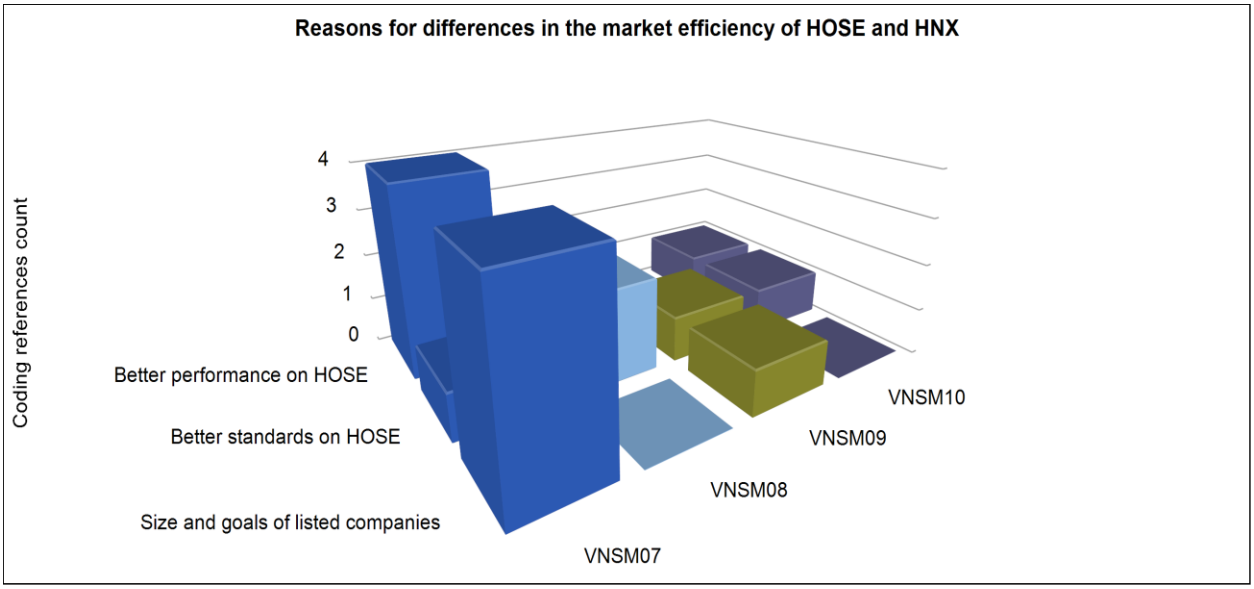

Figure 6.8: Reasons for differences in the market efficiency of HOSE and HNX

Source: Outcome from NVivo 12.

Table 6.8 entirely indicates positive relationships in the principal reasons for the differences in the market efficiency of the two exchanges. It means that every increase in one of the elements could lead to positive rises in the other ones. The size and goals of listed companies and better standards on HOSE has the strongest positive relationship with nearly 0.569. Thus, the mentioned nodes are interconnected.

Table 6.8: Cluster analysis results for differences in the market efficiency of two exchanges

Code A	Code B	Pearson correlation coefficient
Better standards on HOSE	Better performance on HOSE	0.481761
Size and goals of listed companies	Better standards on HOSE	0.569308
Size and goals of listed companies	Better performance on HOSE	0.537252

Source: Outcome from NVivo 12.

It is evident from the full responses of the experienced and professional experts and advisors in ***Appendix 6.4.*** Firstly, the interviewee VNSM07, the interviewee VNSM08, and the interviewee VNSM10 consistently approved that the performance on HOSE was more vibrant and

better than that on HNX, so it attracted more investors and greater listed companies ***(Appendix 6.4)***. In particular, the interview VNSM07 strongly claimed:

> *"HOSE has ever been a vibrant stock exchange, and it has attracted the foreign investors, especially funds. Its market capitalisation is also massive and concentrating on HOSE sets a precedent. The important thing is that there are many indices and multiples on which the investors would base to calculate the indices and on which the foreign investors base to calculate the ratios. Thus, it is also the reason."*

> *"There are not many indices on HNX, and there are a lot of exchange trade funds on HOSE but not on HNX."*

In addition, the interviewee VNSM10 supported:

> *"And the information of the companies listed on HOSE is usually updated and reflected on the stock prices faster and more sensitively than the information of the companies listed on HNX. Several companies on the HNX want to develop and increase their credibility and safety, so they have transferred listing from HNX to HOSE."*

Secondly, the interviewee VNSM08 and the interviewee VNSM10 stated that there were better and stricter standards and listing conditions on HOSE, so it obviously gained more trusts and interests from the investors, the listed companies, and the other market participants ***(Appendix 6.4)***. The VNSM08 declared:

> *"Usually, the companies listed on HOSE must meet the standards to enter HOSE. The standards on HNX are lower, so its efficiency is obviously not as good as that of the companies on HOSE. Therefore, the investors are less interested. It is obvious."*

> *"The standards are higher in terms of information quality and businesses."*

On the other hand, the interviewee VNSM07 and the interviewee VNSM09 thought that there was almost no difference in the quality of information on the stock exchange and the information disclosure requirements on the two stock exchanges ***(Appendix 6.4)***. From the perspective of the interviewee VNSM09, the only difference referred to the capital size of the listed companies and it led to greater performance and better information disclosure, so more investors devoted their attention. In particular:

"The only difference refers to the capital size of the listed companies (the UPCOM of HNX requires less information disclosure). However, because the large companies listed on HOSE have better capacity and conditions, their information disclosure is more sufficient and more detailed than the companies listed on HNX, thereby attracting more attention of investors."

The interviewee VNSM07 entirely agreed that all large-cap, good, and reputable companies were listed on HOSE. He expressed that the companies decided to list on HOSE because it was a practical way to bring benefits for their shareholders, and they might strive towards raising capital, promoting their brands, and creating leverage of going abroad ***(Appendix 6.4)***.

In summary, their responses consistently affirm that HOSE has better market efficiency than HNX. Firstly, the performance on HOSE is more vibrant and better than that on HNX. Secondly, there are better and stricter standards and listing conditions on HOSE. Thirdly, all the listed companies on HOSE are large companies, and they aim to bring benefits for their shareholders, so they deliver better performance and better information disclosure. Therefore, HOSE significantly attracts more concerns and participation of listed companies and investors than HNX does. The finding is in alignment with the previous opinions of the managers of the listed companies on the two exchanges, and it is consistent with the quantitative data analysis showing that HOSE is firmly weak form efficient, and HNX is inefficient.

6.4.3. Opportunities and challenges from listing and trading on stock market

This part targets to investigate opportunities and challenges to listed companies from listing, trading, and complying with the current policies and regulations from the perspectives and opinions of the participants. Some questions are asked to managers of the listed companies. In particular:

- What opportunities and advantages does your company gain in development and investment since listing on the stock market?
- What difficulties and limitations does your company encounter when complying with the current policies and regulations on listing and information transparency and disclosure?

Correspondingly, some relevant questions are interviewed to the managers of the stock exchange or the specialists in the stock market as below:

- What advantages do listed companies gain from listing and complying with the current regulations on listing and information transparency and disclosure?
- What are shortcomings and limitations in the current regulations that could lead to negative effects on the company's market value?

The diagram comparing between the node of opportunities and advantages, and the node of limitations and challenges is provided in ***Figure 6.9***.

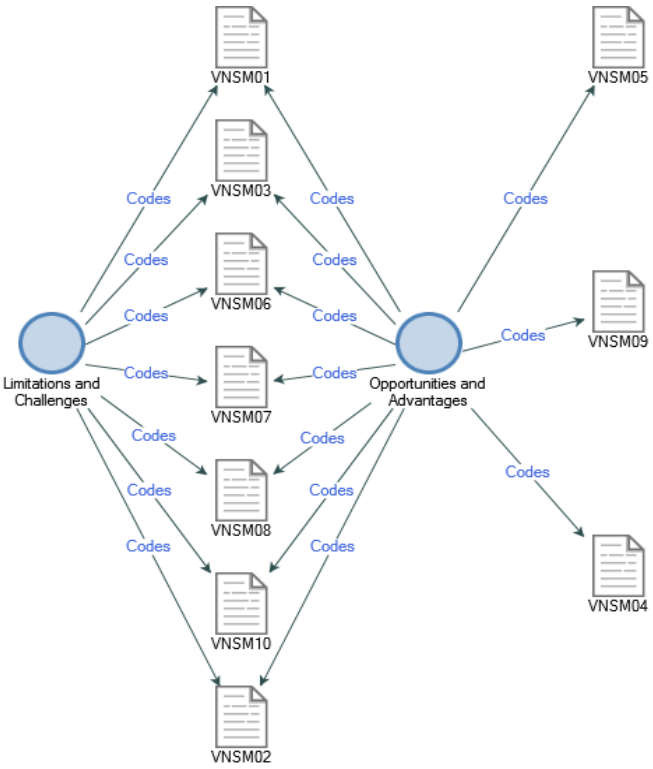

Figure 6.9: Comparison diagram of opportunities and challenges

Source: Outcome from NVivo 12.

All participants consistently agreed that the listed companies could gain the opportunities and advantages from listing, trading, and complying with the current regulations. In addition, seven out of ten participants stated that the listed companies experienced some challenges from participating in the stock market. The detailed information is provided in ***Appendix 6.5*** and ***6.6***.

6.4.3.1. Opportunities and advantages

According to the findings from NVivo 12, there are five major opportunities and advantages from listing, trading, and complying with the current regulations. They refer to branding, business

management and development, capital mobilisation, information transparency, as well as trust and confidence of investors. ***Figure 6.10*** shows the hierarchy for opportunities and advantages.

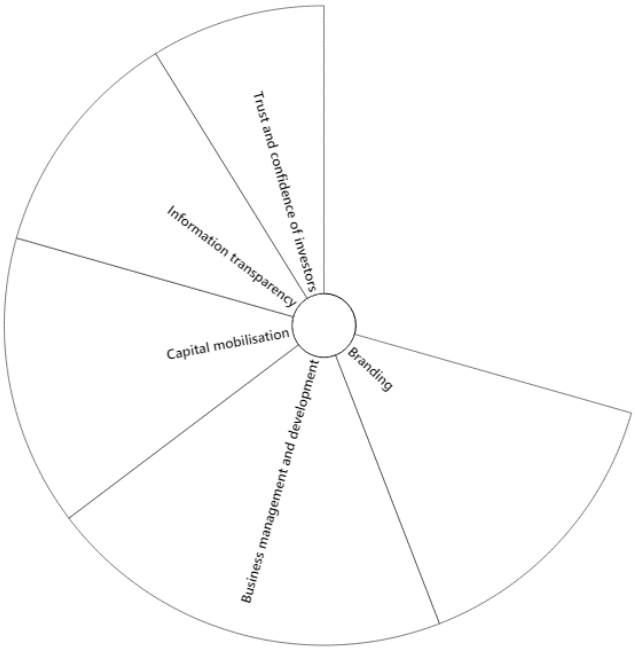

Figure 6.10: Hierarchy for opportunities and advantages

Source: Outcome from NVivo 12.

Table 6.9 and ***Figure 6.11*** manifest matrix coding query results for opportunities and advantages of the listed companies from listing, trading, and conforming to the current regulations in the stock market.

Table 6.9: Matrix coding for opportunities and advantages

	A: Branding	B: Business management and development	C: Capital mobilisation	D: Information transparency	E: Trust and confidence of investors
1: VNSM01	0	3	1	0	0
2: VNSM02	0	0	0	0	0
3: VNSM03	0	0	1	0	0
4: VNSM04	0	1	0	0	0
5: VNSM05	1	1	0	0	0
6: VNSM06	1	0	1	2	0
7: VNSM07	1	0	1	1	1
8: VNSM08	0	0	0	0	1
9: VNSM09	1	1	0	0	1
10: VNSM10	1	1	1	1	0

Source: Outcome from NVivo 12.

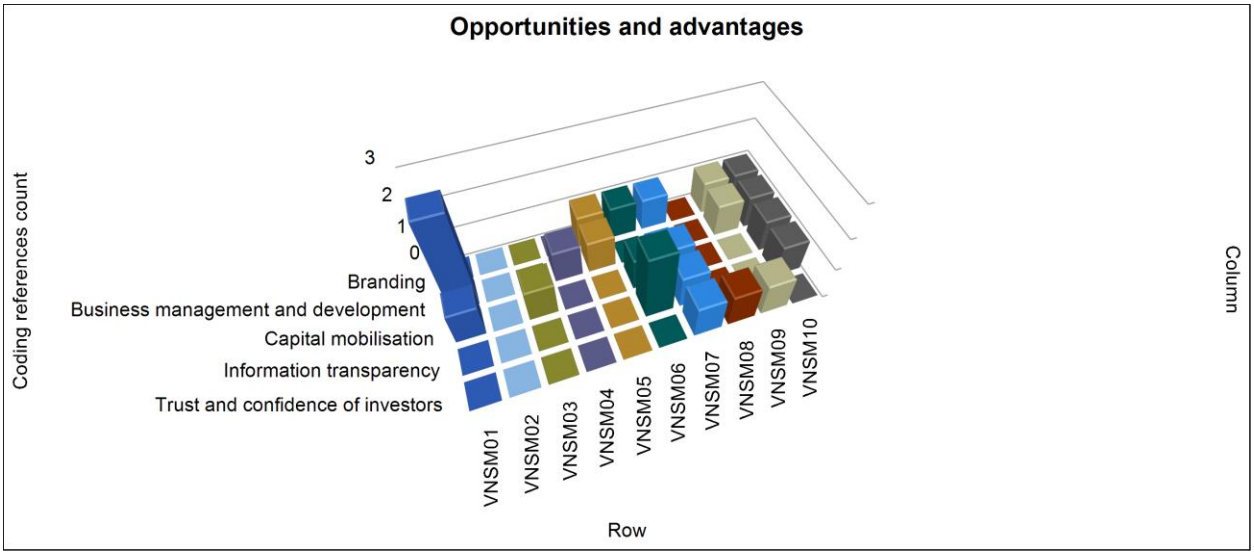

Figure 6.11: Matrix coding for opportunities and advantages

Source: Outcome from NVivo 12.

All the participants excluding the interviewee VNSM02 supported that the participation in the stock market provided them with massive opportunities and advantages ***(Appendix 6.5)***. The interviewee VNSM02, the manager of the newly listed company on HNX, stated:

> *"Regarding the advantages in the field of construction, there are almost small opportunities and advantages. Especially due to the feature of sector in which our company runs, its effects are not great."*

Among the other respondents, five participants considered branding as one of the favourable influences. Further, five interviewees believed that the listed companies would gain opportunities of business management and development, and five respondents mentioned capital mobilisation in their responses. In addition, information transparency as well as trust and confidence of investors were equally stated by three participants.

- **Branding**

With reference to branding, the interviewee VNSM05 who is the manager of the bank listed on HOSE expressed that the brand of his bank widely expanded thanks to listing, trading, and conforming to the current regulations in the stock market. In particular:

> *"The first thing refers to automatically promoting the brand to expand the network. I think my network increased by 40%, around 30-40% in 5 years ago."*

The interviewee VNSM06, Deputy Director of Transaction Supervision Department of HOSE went along with this opinion and responded:

"It is clear that the company information as well as the brand are naturally promoted to not only domestic investors but also foreign investors when listing on the stock exchange. The international investors know about the business and then they use its products. It is an objective factor for the enhancement. When companies are listed in Vietnam, it can also be listed in foreign countries, and it raises the capital not only in the country but also in the foreign countries. In addition to the business development, it also supports for the development of the economy."

The interviewee VNSM07, the interviewee VNSM09, and the interviewee VNSM10 claimed that the brand of the listed companies widely expanded, thereby easily accessing better business opportunities ***(Appendix 6.5)***. The dominant point noted in the provided responses refers that the listed companies could gain huge opportunities and advantages in their brand promotion thanks to listing, trading, and abiding by the regulations in the stock market.

- **Business management and development**

The findings from the responses of five interviewees consistently showed that the listed companies achieved significant opportunities and advantages in terms of their business management and development from engaging in the stock market. The interviewee VNSM04, Chief Executive Officer of the listed company on HOSE, stated:

"The information on the internet and the listing information on the stock exchange is a channel to examine whether our decision-making abilities are proper or not."

Moreover, the interviewee VNSM09, General Director of the newly listed company on HOSE and also an acknowledged expert in this field, added:

"Improve the professionalism and quality of management."

The interviewee VNSM01 who is Head of Finance – Accounting and also the authorised person to disclose information of the newly listed company on HNX, the interviewee VNSM05 who is the manager of the bank listed on HOSE, and the interviewee VNSM10 also entirely agreed with this given opinion ***(Appendix 6.5)***. The findings from the mentioned respondents significantly

indicate that the engagement in the Vietnamese stock market could help to improve their professionalism and efficiency of management and stimulate their business development.

- **Capital mobilisation**

On this subject, five participants consented that listing and trading on the stock exchanges enabled and facilitated the businesses to raise funds. The interviewee VNSM06, the manager of HOSE, claimed:

> *"In fact, it is obvious that listing on the stock exchange brings a lot of advantages. Firstly, the company will mobilise capital from the whole economy. Mobilising the capital in the power of people is called as drilling the power of people. In other words, the first thing aims to mobilise the capital for the economy and ensure the greater development of businesses instead of borrowing capital from banks. The capital flow is stronger with lower costs than bank loans and it is also more active than the bank loans."*

The interviewee VNSM01 strongly agreed with him and added:

> *"Previously, we raised our charter capital by 50%. Our charter capital was 660 billion, and then it increases by 330 billion to 990 billion."*

With reference to attracting the investors and the capital, the interviewee VNSM03, the interviewee VNSM07, and the interviewee VNSM10 also went along with the given perspective ***(Appendix 6.5)***. The interviewee VNSM10 expressed:

> *"According to me, the first benefits of listed companies are that it is easier to raise capital. The company has access to new capital raising channels and mobilises the capital from the investors through the issuance of shares. Listing on the stock market also allows the businesses to approach both domestic and international investors through their trading activities and shareholder meetings. Raising capital of the listed companies is much more advantageous than unlisted companies."*

In summary, it is consistently demonstrated that listing and trading on the stock market allows the businesses to approach the investors, and it is regarded as an important channel to raise capital. The capital mobilisation of the listed companies is much more advantageous than that of the unlisted companies. Furthermore, building an efficient and vibrant stock market not

only improves capital allocation in the economy but also stimulates the long-term economic growth of the emerging economy.

- **Information transparency**

The interviewee VNSM06, the interviewee VNSM07, and the interviewee VNSM10 claimed that the listed companies have the benefits of information transparency thanks to listing on the stock market and regulatory compliance of the listed companies ***(Appendix 6.5)***. The manager of HOSE stated that participation in the stock market helped to enhance the information transparency, and there had been an improvement in the regulations on HOSE in recent years. In particular:

> *"The second thing is enhancing the transparency of the business for investors as well as for the economy."*

> *"In terms of the regulations, the regulations are always updated and changed so they can better support the listed companies, provide more transparency to the market, and bring more freedom and fairness for the investors who buy and sell shares. According to me, the current regulations are too good and follow the international practices, especially they follow European practices. The Vietnamese regulations follow European practices, and the listing conditions and the information disclosure conditions are extremely sufficient. And I think it is getting more and more rigid and many countries are not as good as us."*

The interviewee VNSM07 and the interviewee VNSM10 were aligned with the given idea and appreciated the importance of the information transparency for the listed companies ***(Appendix 6.5)***. Overall, the listed companies grasp tremendous opportunities and advantages related to the information transparency thanks to listing on the stock market and regulatory compliance. When being transparent, the companies attract more investors and shareholders.

- **Trust and confidence of investors**

Some respondents claimed that listing, trading, and complying with the current regulations strongly supported the listed companies to gain trust and confidence of the investors. The interviewee VNSM07 stated:

"Because we are transparent and meet our commitments, many investors place trust. Since then, our brand value has increased and a lot of people devote attention to us, so we can do anything, increase the capital, and expand more."

The interviewee VNSM08 and the interviewee VNSM09 who is the professional expert and the top manager of the newly listed company on HOSE were of the same mind on this regard ***(Appendix 6.5)***. Attracting the attention and earning trust of the investors are considered as one of benefits from listing and disclosing information fully and transparently.

In general, the provided responses indicate that listing, trading, and conforming to the current regulations in the stock market obviously offer a plenty of tremendous opportunities and advantages to the listed companies. The crucial opportunities and advantages refer to promoting their brands, boosting their efficiency of management and business development, facilitating them to mobilise their capital, enhancing their information transparency, as well as gaining trust and confidence of the investors. The current regulations better support the listed companies, bring more transparency to the market and the economy, as well as allow more freedom and fairness for the investors.

The findings are in harmony with the opinions of Ang, Goetzmann, & Schaefer (2011), Çal & Lambkin (2017), Norman (2011), and Yang, Chou, & Yang (2020). Çal & Lambkin (2017) and Norman (2011) acknowledged branding and promotion as the advantages and opportunities of listing on the stock exchanges in Tanzania, Turkey, and Ireland. Norman (2011) added that some further merits would refer to raising capital, encouraging investment and expansions, building the confidence of the domestic and foreign investors. Additionally, Ang, Goetzmann, & Schaefer (2011) and Norman (2011) entirely agreed that supports in decision-making process and business management of the listed companies were regarded as other vantage points. According to the study of Yang, Chou, & Yang (2020) in Taiwan, full compliance with the regulations of information transparency could provide huge opportunities for the companies to improve management efficiency and positively impact their corporate image.

6.4.3.2. Limitations and challenges

Regarding limitations and challenges from the perspectives of the market participants, according to ***Figure 6.12***, three representatives of listed companies on HOSE stated that they did not experience any challenges and disadvantages from engaging in the stock market while the other respondents listed some limitations and challenges that would impact the listed companies.

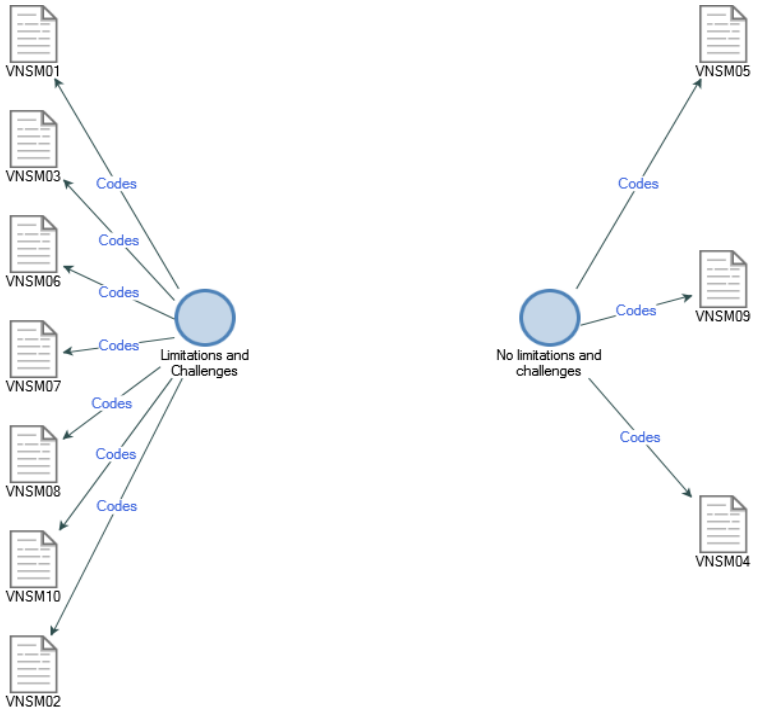

Figure 6.12: Comparison diagram for limitations and challenges

Source: Outcome from NVivo 12.

Thus, the participants are divided into two groups. The first group includes the interviewees showing that no limitations or challenges really exist. The other group consists of the interviewees proving the inevitability of limitations and challenges. The complete details of their responses in this regard are given in ***Appendix 6.6***.

6.4.3.2.1. No limitations and challenges

It is required to mention some limitations and challenges that the listed companies could encounter from participating in the stock market. The interviewee VNSM04, VNSM05, and VNSM09, the managers of three listed companies on HOSE, responded that there were no limitations and challenges ***(Appendix 6.6)***. Particularly, the interviewee VNSM04, Chief Executive Officer and the member of the board of directors of the consumer discretionary company listed on HOSE, strongly stated:

> *"Actually, all the information and data as well as the publications on the stock exchange are very transparent now. Therefore, we almost comply with them. There is no problem at all."*

Moreover, he firmly assured:

"There are no difficulties and limitations. Yes, I am satisfied with the current regulations."

Although the interviewee VNSM06, the manager of HOSE, also mentioned some challenges that the listed companies could have, he totally agreed that the current regulations better supported the listed companies, provided more transparency to the market, and allowed more freedom and fairness for the investors. He added:

"In terms of the regulations, the regulations are always updated and changed so that they can better support the listed companies, provide more transparency to the market, and bring more freedom and fairness for the investors buying and selling shares. According to me, the current regulations are too good and follow the international practices, especially they follow European practices. The Vietnamese regulations follow European practices, and the listing conditions and the information disclosure conditions are extremely sufficient."

The dominant point noted in the provided responses implies that there are no challenges and limitations for the listed companies, especially those on HOSE. Further, the current regulations in the market and especially on HOSE greatly encourage and support the listed companies.

6.4.3.2.2. Relevant limitations and challenges

From the perspectives of the seven respondents, three major challenges and disadvantages refer to information asymmetry, pressure from information disclosure as well as young stock market and trickery. ***Figure 6.13*** shows the hierarchy for limitations and challenges.

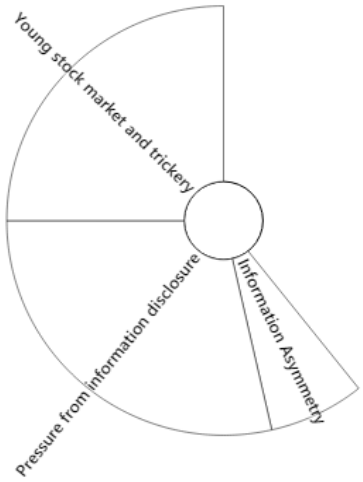

Figure 6.13: Hierarchy for limitations and challenges

Source: Outcome from NVivo 12.

Table 6.10 and ***Figure 6.14*** manifest matrix coding query results for limitations and challenges of the listed companies from listing, trading, and conforming to the current regulations in the stock market as follows:

Table 6.10: Matrix coding for limitations and challenges

	A: Information Asymmetry	B: Pressure from information disclosure	C: Young stock market and trickery
1: VNSM01	0	0	1
2: VNSM02	0	2	0
3: VNSM03	2	0	2
4: VNSM06	0	2	1
5: VNSM07	0	0	1
6: VNSM08	0	1	0
7: VNSM10	0	1	0

Source: Outcome from NVivo 12.

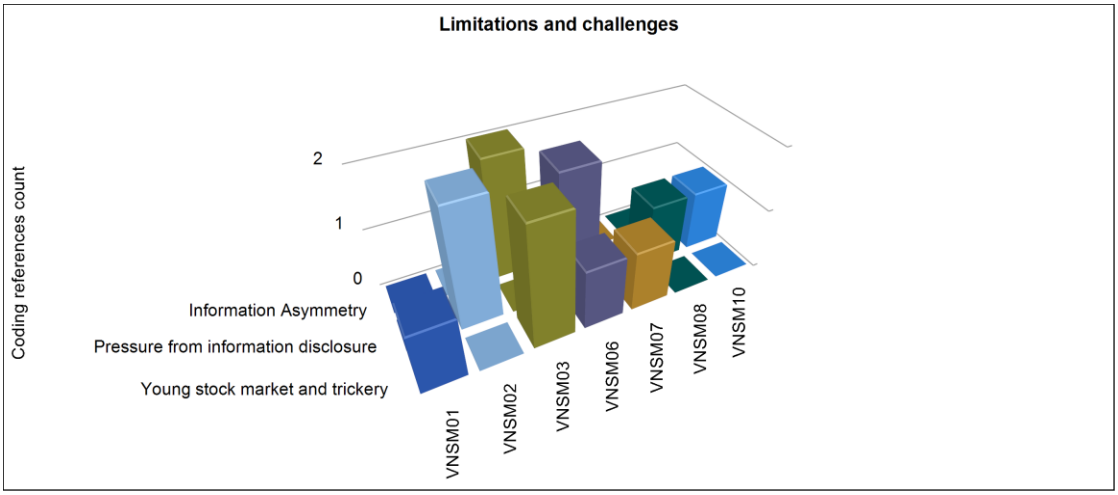

Figure 6.14: Matrix coding for limitations and challenges

Source: Outcome from NVivo 12.

Among these participants, four respondents said that the listed companies would face the pressure from information disclosure. Moreover, four managers and experts mentioned the young stock market and some trickeries in the market as their challenges. Only a manager of the bank listed on HNX regarded the information asymmetry as their disadvantage. Their detailed opinions are supplied in ***Appendix 6.6***.

- **Pressure from information disclosure**

Some of the interviewees regarded pressure from releasing information as one of the challenges and disadvantages of the listed companies. The interviewee VNSM06, the representative of HOSE, supported:

"Regarding to the disadvantages of the listed companies but not the regulations, they must disclose information transparently and they are unable to keep the business secrets because they must be transparent. Secondly, they must disclose their financial statements clearly. It is things that many Vietnamese businesses do not like."

"The disadvantage refers that the businesses must disclose information in several forms. Many companies were listed on the stock exchange and then cancelled the listing."

Additionally, the interviewee VNSM02, the interviewee VNSM08, and the interviewee VNSM10 were of the same opinion on this subject ***(Appendix 6.6)***. Furthermore, the interviewee VNSM10 added that the listed companies would be strongly affected by the influences and diffusion of the negative information in short term. He stated:

"The listed companies also face some challenges. The company face the risk of spreading negative information. When there is bad news, the stock price is strongly impacted because of the influences and diffusion of the information. The stock price slips from its current value for a short time."

- **Young stock market and trickery**

With regard to the challenges and limitations, four respondents mentioned the late establishment of the stock market and some trickeries in the market as the challenges. The findings were evident from the interview responses in ***Appendix 6.6***. In particular, the interviewee VNSM01, who is Head of Finance – Accounting and the authorised person to disclose information of the newly listed company on HNX, stated that the stock market was currently new, so it did not attract significant attention as well as efforts from all managers. Furthermore, the proportion of state ownership in the ownership structure also impacted their attention and investment ***(Appendix 6.6)***. His opinion was briefly expressed as follows:

"Firstly, our stock market is currently new. Business managers and leaders even acquire limited knowledge of securities. When they have limited knowledge, their reaction is also limited. When they do not understand it deeply, they do not focus on it too much."

The interviewee VNSM03, who is the representative of the bank listed on HNX, also strongly agreed with this given perspective, and added that building only one stock exchange like other countries massively contributed to further improvement of the stock market efficiency. He added:

"The State continuously adjusts the policies but there is still a need of improvement. As in the other stock markets, there is only one stock exchange in the foreign countries, but we have Ho Chi Minh Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX). There are several impacting factors."

On the other hand, the interviewee VNSM07 stated that we took advantage of being a later-established market ***(Appendix 6.6)***. From his perspective, they could learn from other countries and limit several issues in fact. Nevertheless, it was impossible to completely solve all trickeries even when the regulations in the stock market were extremely good. The interviewee VNSM06 mentioned back-door listing as one of the challenges in the stock market even when they continuously improved the regulations and made huge efforts to avoid back-door listing ***(Appendix 6.6)***.

- **Information asymmetry**

From the viewpoint of the interviewee VNSM03, the manager of the bank listed on HNX, another challenge referred to information asymmetry. He believed that it would be difficult to get success without the internal information. He responded:

"Secondly, as I know, in the stock market, most people having a lot of information will get success. People without information will not succeed. Thirdly, it mainly follows the crowd, meaning that they buy and sell continuously. It makes the F0 investors feel that they are caught up in the trend. Accidentally, some eagles eat them."

"Without the internal information, it is difficult to succeed."

According to the above analysis supported by the details in ***Appendix 6.6***, the current regulations in the market and especially on HOSE greatly encourage and support the listed companies. On the other hand, there are some challenges and disadvantages considered by the experts and the managers of companies listed on HNX. Firstly, the requirements of the information disclosure could put the listed companies under pressure. The transparent regulations require the businesses to disclose all important and relevant information in several forms, and the newly listed company could be under tremendous pressure due to enormous and urgent workload as well as various procedures to disclose information properly and transparently. The negative information sometimes strongly affects the companies. Furthermore, it is obvious that late establishment of the stock market is also regarded as an advantage because it is able to learn

from other countries and limit several issues, but the listed companies in the young market do not attract significant attention and efforts from all managers. Moreover, it is impossible to entirely solve all trickeries even when the regulations in the stock market are good and efficient. Additionally, information asymmetry is minorly considered as a challenge.

6.4.4. Impacts of market behaviours on business performance

This part focused on investigating the effects of the stock market behaviours on the performance of listed companies from the perspectives of the market participants. A specific question for the managers of the newly listed companies is:

- Since listing on the exchange, how efficient have production and business activities of your company been? Has its efficiency been different as compared to before listing on the exchange?

Respectively, the similar question is asked to the managers and representatives of the existing listed companies as follows:

- Since listing on the stock exchange and especially in recent years, how efficient have production and business activities of your company been? Has its efficiency been different as compared to the previous time?

From the perspectives of the five managers from the chosen listed companies, the market behaviours of the Vietnamese stock market have beneficial effects on the business performance. ***Figure 6.15*** shows the hierarchy for the impacts of the market behaviours on the performance of the listed companies. Four crucial impacts refer to business management and corporate governance, enhancement of funds, financial performance and operational efficiency, as well as value and brand growth.

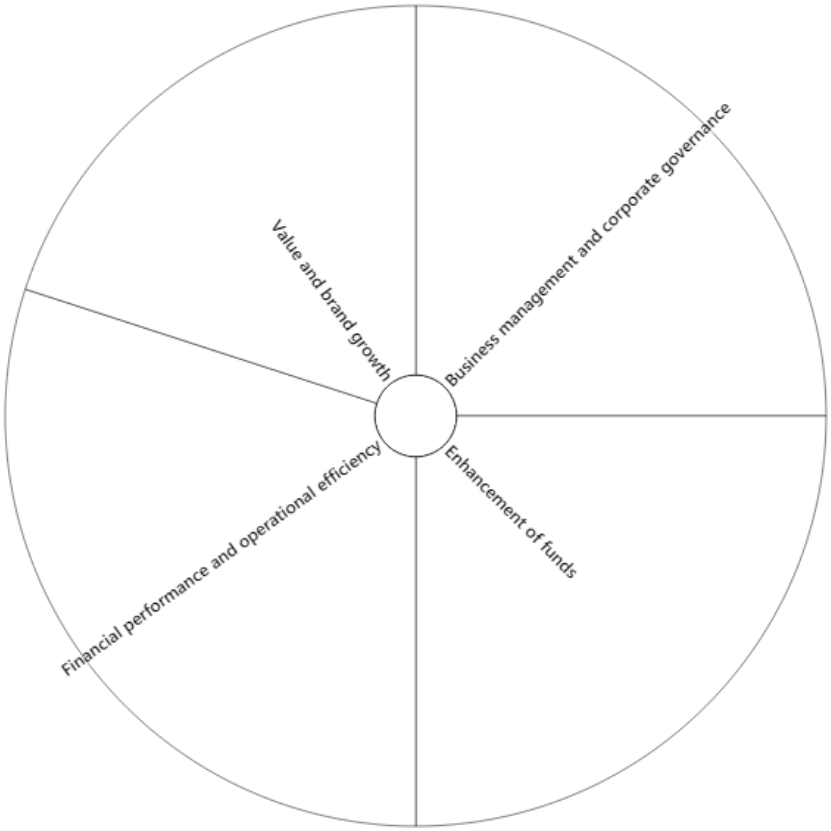

Figure 6.15: Hierarchy for impacts of market behaviours on the business performance

Source: Outcome from NVivo 12.

Table 6.11 and ***Figure 6.16*** show matrix coding query results for the impacts of the market behaviours on the performance of the listed companies.

Table 6.11: Matrix coding for impacts of market behaviours on business performance

	A: Business management and corporate governance	B: Enhancement of funds	C: Financial performance and operational efficiency	D: Value and brand growth
1: VNSM01	2	0	3	0
2: VNSM02	0	2	1	0
3: VNSM03	1	1	0	1
4: VNSM04	2	1	0	2
5: VNSM05	0	1	2	1

Source: Outcome from NVivo 12.

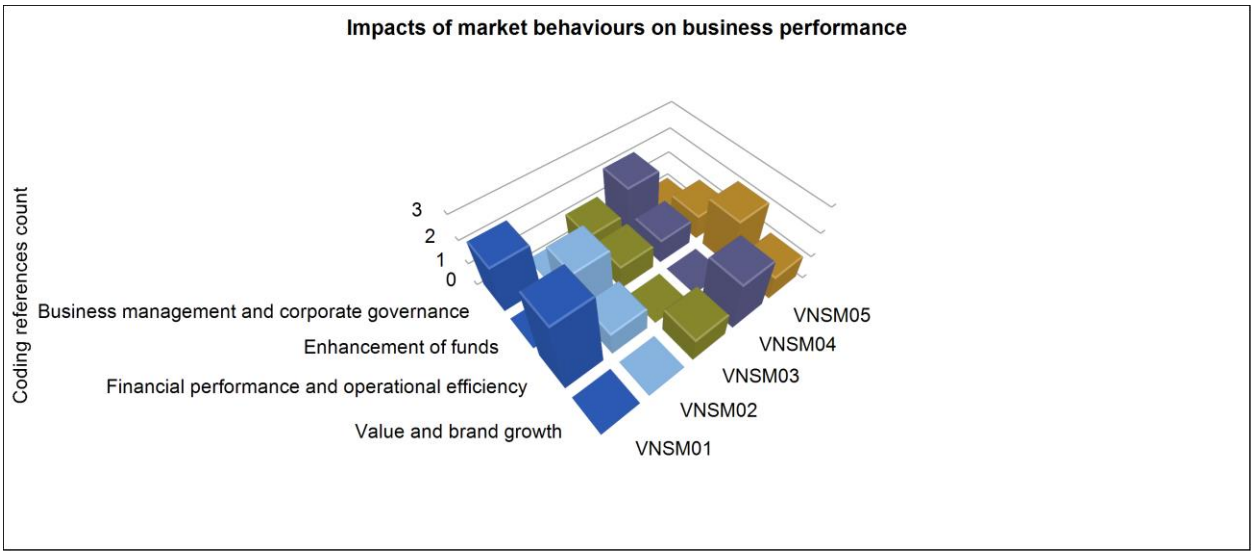

Figure 6.16: Matrix coding for impacts of market behaviours on business performance

Source: Outcome from NVivo 12.

According to the matrix coding query, four interviewees confirmed that there had been an enhancement of funds since listing on the stock exchange and especially in recent years. Additionally, three respondents expressed their opinions on the impacts of the stock market behaviours on business management and corporate governance. Financial performance and operational efficiency were mentioned by three managers. Value and brand growth was regarded as one of the influences of the market behaviours by three participants. Their responses are discussed in more detail in ***Appendix 6.7***.

6.4.4.1. Enhancement of funds

Four participants mainly stated that their capitals had increased by several times since listing on the Vietnamese stock market and especially in recent years. The finding was evident from the interview responses. In particular, the interviewee VNSM02, who is Chief of Supervisory Board of TA9 – the construction company newly listed on HNX, said:

> *"We have mobilised capital several times since listing on the stock exchange. It seems that we increased our charter capital. Our charter capital was 17 billion at the beginning, but we raised the capital and might sell securities out."*

Her statements are assured by the public information and annual reports announced by the stock exchange and the company ***(Appendix 6.7)***. Furthermore, it usually paid the dividends by cash and shares in every economic year in addition to share issuance (Thanh An 96 Installation

and Construction Joint Stock Company, 2021a). As a result, the current charter capital in 2020 was VND 124 billion.

Furthermore, the interviewee VNSM03, the manager of ACB – the bank listed on HNX, also indicated the growth in their capital, and his opinion is supported by the information from the annual reports of ACB and the relevant public announcements ***(Appendix 6.7)***. The amount of charter capital continuously grew every year through the payment of stock dividends to its shareholders, and there were four times that the bank raised its charter capital from 2017 to 2020 (Dong, 2020).

Additionally, the representatives of listed companies on HOSE consistently considered capital mobilisation as one of the positive effects of the market behaviours on the businesses. The interviewee VNSM04, Chief Executive Officer of DRC – the consumer discretionary company listed on HOSE, claimed:

> *"The increase is extremely massive. Since listing on the stock exchange, the capital has increased from over one hundred billion to one thousand and few hundred billion as I remember rightly."*

His statement is strongly supported by the information provided in the annual reports of DRC ***(Appendix 6.7)***. From 2016 to 2020, the total number of shares was 118,792,605 shares and the current charter capital was approximately VND 1,187.93 billion, which was nearly 12.9 times higher than that in 2006 and 1.3 times higher than that in 2015 (Danang Rubber Joint Stock Company, 2021).

On this subject, the interviewee VNSM05, a manager of VCB – the bank listed on HOSE, indicated an enhancement of its equity capital. stated that:

> *"The equity is increased by 100% compared to ten years ago."*

It is consistent with the data provided in the annual reports of VCB and other publications ***(Appendix 6.7)***. According to the annual reports, there was a constant growth in the shareholders' equity of VCB over the past ten years (Vietcombank, 2016; Vietcombank, 2021). Additionally, its charter capital massively increased over the years (Vietcombank, 2020). The capital growth contributed to the business development as well as a higher capital safety standard for VCB and resulted in an increase of VND 3,783 billion for the State budget (Vietcombank, 2020).

Vietnamese stock market is recognised as an effective and efficient channel for mobilising resources for the economy and facilitating the businesses to raise funds predominantly through equity.

6.4.4.2. Business management and corporate governance

Among the respondents, three interviewees indicated that the market behaviours contributed to the efficiency of business management and corporate governance in the listed companies. The interviewee VNSM01, Head of Finance – Accounting and the authorised person to disclose information of CDN – the transportation company listed on HNX, described the changes in his companies as follows:

> *"Firstly, the governance model was changed greatly. Even the operation also follows the securities regulations. The governance model must be constantly changed and innovated. Regarding reporting, transparent information, and operation, regulations of the State also guide the businesses to conduct more modern governance models and the control of public is also good. As a result, I think the business will be more civilised. Very good."*

Furthermore, listing and conforming to the current regulations in the stock market helped the managers of CDN understand its competitors and enhance its competitive advantages. The financial manager responded:

> *"We discover them, so that we would find the way to make us better."*

It is in alignment with the information given in the annual reports of CDN in recent years ***(Appendix 6.7)***. In recent years, building a corporate governance model, rearranging departments in an efficient manner, improving the operation and management methods, developing quality human resources, and strictly complying with the current laws and regulations in the securities market contribute to the business development (Danang Port Joint Stock Company, 2020).

Moreover, the interviewee VNSM03, the manager of the bank listed on HNX, claimed that the treasury stocks not only acted as incentives for the employees to work more devotedly but also encouraged their long-term commitment and inspired their intense loyalty ***(Appendix 6.7)***. As a result, they contributed to the growth of the company value and its stock price. The given opinion is consistent with the information provided in the annual reports and other publications of the company ***(Appendix 6.7)***. The bank provided specific benefits and incentives for managers,

such as transportation allowances, employee stock ownership plan stocks, annual health check-ups at high-quality clinics, and overseas holidays (Asia Commercial Bank, 2021).

In this regard, the interviewee VNSM04, Chief Executive Officer and the member of the board of directors of the consumer discretionary company listed on HOSE, absolutely agreed with the mentioned opinions, and it was evident from his response in ***Appendix 6.7***. Moreover, when it was asked whether the information on the stock exchange supported the decision-making of the managers or not, he strongly affirmed:

"Yes, it does. It is right."

The provided responses predominantly reveal that the business management and the corporate governance of the listed companies are substantially improved thanks to the impacts of the market behaviours. In addition, the information in the stock market helps them understand the competitors to find the way for further development as well as supports the decision-making process of the managers.

6.4.4.3. Financial performance and operational efficiency

The responses majorly manifest significant enlargement in the financial performance and the operational efficiency of the listed companies. In particular, the interviewee VNSM01, the financial manager of the newly listed company on HNX, stated:

"It is different. Greatly different. In 2014, before equitization, our revenue was around 478 billion and our profit was over 90 billion. After 5 years, our revenue is nearly 1000 billion and our profit is nearly 300 billion. In this year, our profit is about 260 billion."

Additionally, he claimed that there was a development in services of the company because it focused on the core services as well as adopted a vertical growth strategy ***(Appendix 6.7)***. His declarations are supported by the financial information in the annual reports from 2014 to 2020 ***(Appendix 6.7)***. The company started to be officially listed on HNX on 30 November 2016, and there was a gradual growth in its profit scale after listing in the stock market (Danang Port Joint Stock Company, 2018; Danang Port Joint Stock Company, 2021). The production and the services of the company were continuously developed, resulting in an enormous and constant growth of its financial performance from 2016 to 2020 (Danang Port Joint Stock Company, 2016; Danang Port Joint Stock Company, 2018; Danang Port Joint Stock Company, 2020; Danang Port Joint Stock Company, 2021).

Moreover, the interviewee VNSM02, the manager of the construction company newly listed on HNX, was of the same mind on this regard, and her declaration is supported by information from the annual reports of TA9 ***(Appendix 6.7)***. The company was listed on the HNX from 31 July 2015 (Thanh An 96 Installation and Construction Joint Stock Company, 2021b). There was a development of its financial performance and operating efficiency after listing on the stock exchange, and it gradually recovered even in such challenging stage of the construction sectors in recent years (Thanh An 96 Installation and Construction Joint Stock Company, 2021b).

In this regard, the interviewee VNSM05, the manager of the bank listed on HOSE, strongly went along with the mentioned opinion:

> *"In 2014, 2015, 2016, and 2017, our profit is much higher. Two levels. Our bank started listing on the stock exchange in 2010. In the year of 2016 or in 2015-2016, our level excelled after every five-year period."*

It was evident from his comprehensive explanation in ***Appendix 6.7***. He additionally explained that the success of VCB was attributed to the focus on the core business areas and compliance with the provisions of the law, and his responses are consistent with the financial data in the annual reports of his company ***(Appendix 6.7)***. Since 2015, the profit before tax, profit after tax, and net profit had risen significantly and gradually. In 2019, VCB continued to achieve impressive breakthroughs and new records, becoming the first Vietnamese bank to reach VND 23,122 billion (equivalent to USD 01 billion) in profit and to be listed in the Global Top 200 profitable financial and banking groups (Vietcombank, 2020). It was an increase of 26.56% over 2018, and approximately 3.4 times higher than the profit scale in 2015 (Vietcombank, 2020).

Overall, the responses definitively showed a massive development in the financial performance and operational efficiency of the listed companies. There is a development in the total production and the services as well as a growth in the net revenues and the profit scales of those companies. It is noticeable that mainly focusing on the core business activities contributes to their successes.

6.4.4.4. Value and brand growth

The value and brand growth are regarded a favourable impact of the market behaviours on the listed companies. The dominant point from the responses is that the values of the listed companies are enhanced as well as their brand awareness, recognition, and loyalty are raised thanks to listing on the stock exchange. As a result, they attract more investors and increase their

networks. Particularly, the interviewee VNSM03, the manager of ACB, affirmed that the listed companies had more advantages than the unlisted ones. He claimed:

> *"To compare listing on the stock exchange and not listing on the stock exchange, companies listing on the stock exchange easily obtain advantages. Because the companies listing on the stock exchange become public and more people are informed."*

His detailed opinion is supported by the information of the annual reports of ACB ***(Appendix 6.7)***. A continuous expansion of its market share and branch network in recent years substantially contributed towards accomplishment of its goals, especially growth of the balance sheet and value creation for its shareholders (Asia Commercial Bank, 2020). Thus, there have been constant and significant growth and expansion of this bank since listing on the stock market, especially in recent years.

Moreover, the interviewee VNSM04, Chief Executive Officer of DRC, strongly declared that the value of his consumer discretionary company was boosted thanks to the effects of the market behaviours, and it is in alignment with the given information from the annual reports of this listed company ***(Appendix 6.7)***. Brand promotion and development was properly invested and focused by the managers, so this company always strengthened and affirmed its position as one of the leading tire manufacturers in Vietnam (Danang Rubber Joint Stock Company, 2020). Moreover, the company always supervised and conducted the information disclosure publicly, transparently, and punctually in accordance with the Law on securities (Danang Rubber Joint Stock Company, 2021). Its positive results in recent years not only strengthened the confidence of shareholders, investors, and other stakeholders in the management and the leadership of DRC, but also contributed towards protecting and building its reputation in the market and worldwide (Danang Rubber Joint Stock Company, 2021).

Regarding the brand growth, the interviewee VNSM05, the manager of VCB, indicated the brand growth of his bank in recent years and it was evident from his explanation as follows:

> *"The first thing refers to automatically promoting the brand to expand the network. I think my network increased by 40%, around 30-40% in five years ago."*

His response is consistent with the information provided in the annual reports and other publications of VCB ***(Appendix 6.7)***. Thanks to sustained efforts, VCB's investor relations activities in recent years have achieved remarkable results, contributing towards enhancing the

value of VCB (Vietcombank, 2021). In the stock market, VCB became the champion of profit as well as Vietnam's largest bank by market capitalisation in 2020 (Vietcombank, 2021). Furthermore, the reputation and brand image of VCB were continuously enhanced, therefore the bank was given many prestigious awards by both domestic and international organisations (Vietcombank, 2020; Vietcombank, 2021). These recent successes boosted VCB to become one of Asia's 100 strongest banks and one of top 30 strongest bank in Asia Pacific in 2019 and 2020 (Vietcombank, 2020; Vietcombank, 2021).

Subsequently, the market behaviours of the Vietnamese stock market exert several positive impacts on the business performance of the listed companies. The companies from different sectors are dissimilarly impacted by the market behaviours. Firstly, the stock market is recognised as an effective and efficient channel for facilitating the businesses to attract capital as well as mobilising resources for the economy. Secondly, the business management and the corporate governance of the listed companies are substantially improved. Thirdly, there is a significant development in the financial performance and operational efficiency of the listed companies. Finally, the values and the brands of the listed companies are enhanced. Thanks to listing on the stock exchange, more domestical and foreign investors pay attention to these companies, hence their networks are expanded accordingly.

The findings are in agreement with the opinions of Ang, Goetzmann, & Schaefer (2011), Çal & Lambkin (2017), Long & Li (2010), Norman (2011), and Yang, Chou & Yang (2020). Çal & Lambkin (2017) and Norman (2011) regarded branding and marketing as the benefits of listing, trading and full compliance with the policies and regulations in the stock market in Tanzania, Turkey, and Ireland. Norman (2011) added that some further benefits would refer to raising capital, encouraging new investments and expansions, branding and marketing, as well as building the trust and confidence of the domestic and foreign investors. Additionally, Ang, Goetzmann, & Schaefer (2011) and Norman (2011) entirely agreed that listing, trading, and complying with the regulations in the stock market supported the decision-making process and the business management of the listed companies. Moreover, trading in the stock market has an extremely significant positive effect on earnings management (Long & Li, 2010). Furthermore, the research of Yang, Chou, & Yang (2020) in Taiwan indicated that information transparency could help the companies to enhance management efficiency and promote their corporate image.

6.4.5. Suggestions and resolutions

This part focuses on investigating the advice and suggestions of the market participants on improving the Vietnamese stock market efficiency as well as exerting more beneficial impacts on the listed companies, and the interview question is as follows:

- In your opinion, what do you suggest in order to improve the informational efficiency of the Vietnamese stock market and enhance the benefits for listed companies?

In this regard, there are various suggestions from the perspectives of the managers of the listed companies, the representative of HOSE, as well as experienced and professional experts in the Vietnamese stock market and the hierarchy for their advice is presented in ***Figure 6.17***. There are seven main points in their responses including controlling and improving information quality, enhancing information transparency, improving information disclosure requirements and awareness, improving systematicness, coherence and supervision, increasing self-cultivation of investors, providing better guidance and regulations, as well as strengthening deterrence and compliance.

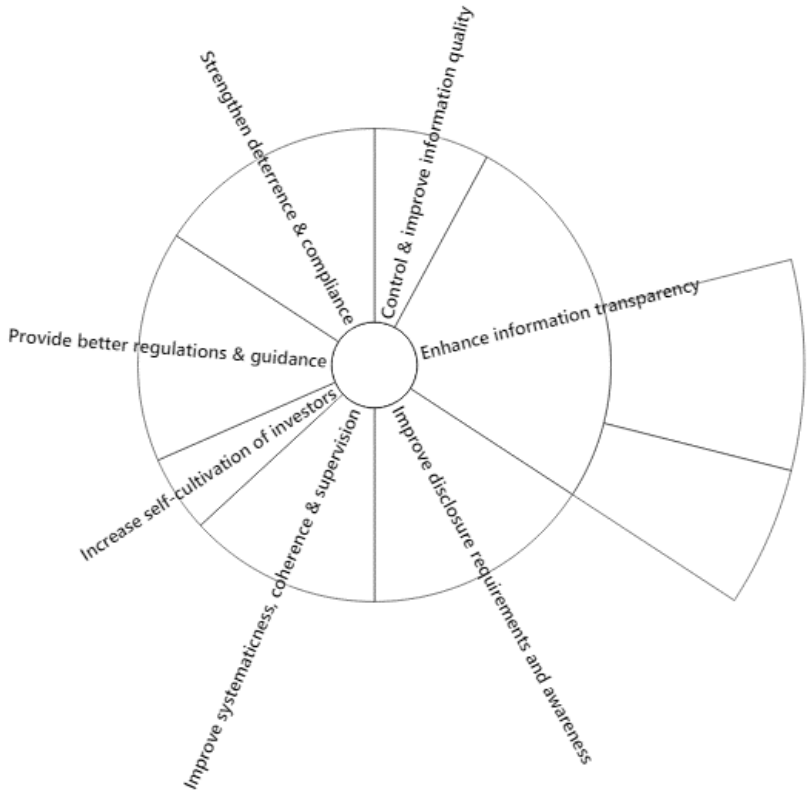

Figure 6.17: Hierarchy for the suggestions of the market participants

Source: Outcome from NVivo 12.

Table 6.12: Matrix coding for suggestions of the market participants

	A: Enhance information transparency	B: Improve disclosure requirements and awareness	C: Strengthen deterrence and compliance	D: Control and improve information quality	E: Improve systematicness, coherence and supervision	F: Provide better guidance and regulations	G: Increase self-cultivation of investors
1: VNSM01	1	0	0	0	0	2	0
2: VNSM02	0	1	0	0	2	0	0
3: VNSM03	1	0	0	0	1	2	0
4: VNSM04	1	0	0	0	0	0	0
5: VNSM05	0	0	3	1	2	0	2
6: VNSM06	0	2	1	1	0	0	0
7: VNSM07	1	1	0	0	0	0	0
8: VNSM08	0	0	0	1	0	0	0
9: VNSM09	0	1	1	0	0	2	0
10: VNSM10	1	1	1	0	0	0	0

Source: Outcome from NVivo 12.

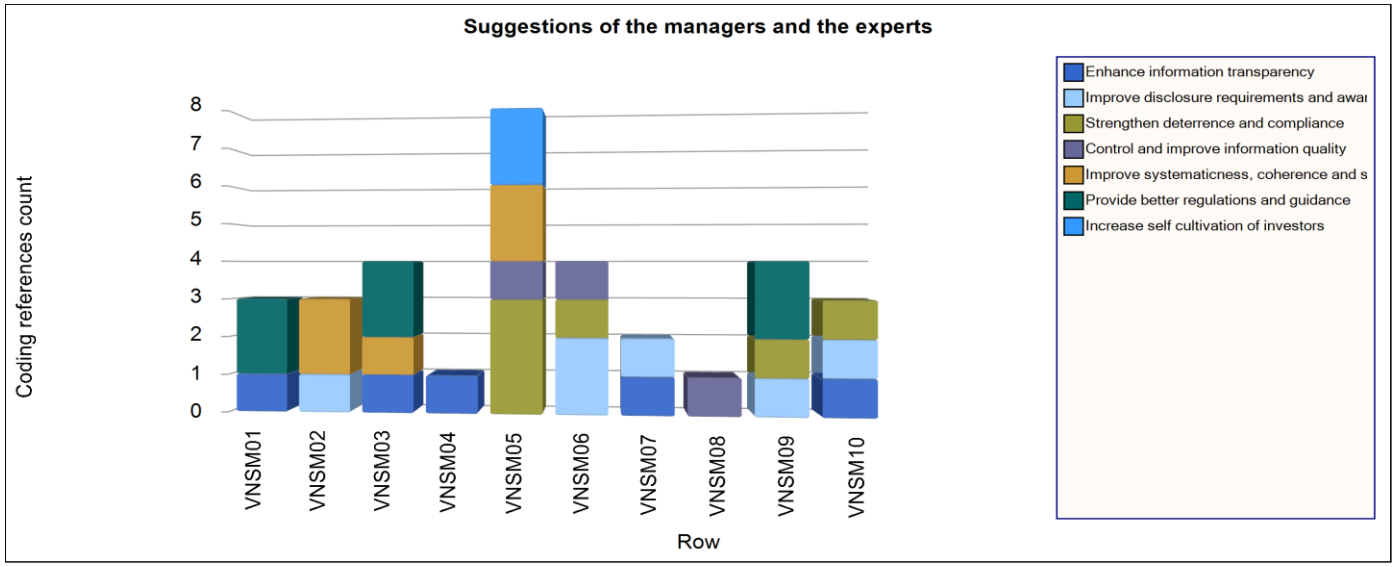

Figure 6.18: Matrix coding for suggestions of the market participants

Source: Outcome from NVivo 12.

Table 6.12 and ***Figure 6.18*** show matrix coding query results for advice and suggestions of the market participants. Among these respondents, five interviewees suggested enhancing the information transparency. Furthermore, five participants supported that it was necessary to improve the information disclosure requirements and awareness. Moreover, four respondents proposed strengthening deterrence and compliance. In addition, controlling and improving the information quality, improving the systematicness, coherence and supervision, as well as providing better guidance and regulations were equally mentioned by three interviewees. Furthermore, only one participant added that the self-cultivation of investors also played an important role. It is evident from their suggestions and recommendations in ***Appendix 6.8***.

- Firstly, five interviewees suggested enhancing the information transparency, which is evident from their responses. The interviewee VNSM04 and the interviewee VNSM10 advised imposing stricter requirements of the information transparency and strengthening the linkages between the listed companies and the stock exchanges ***(Appendix 6.8)***. Additionally, the interviewee VNSM01, the interviewee VNSM03 and the interviewee VNSM07 supported that good and transparent information disclosure contributed towards building a well-known brand, and gaining attention, trust and confidence of investors, customers, and stakeholders ***(Appendix 6.8)***.
- Secondly, the interviewee VNSM06, the interviewee VNSM09, the interviewee VNSM07, the interviewee VNSM10, and the interviewee VNSM02 strongly advised improving the information disclosure requirements and awareness. The Deputy Director of Transaction Supervision Department of HOSE suggested detailing the objects who were required to disclose the information, specifying the disclosed information as well as providing the information in various languages in a timely and transparent manner ***(Appendix 6.8)***. Moreover, the General Director of VDS – the newly listed company on HOSE, the branch director of Phu Hung Securities Corporation, and the senior broker of Mirae Asset Securities entirely suggested that the listed companies should actively raise their awareness and improve their information disclosure to develop the stock market and enhance the benefits for the listed companies ***(Appendix 6.8)***. In addition, the Chief of Supervisory Board of TA9 claimed that it would be better to slightly extend the deadline of submitting and disclosing the information ***(Appendix 6.8)***.
- Thirdly, the interviewee VNSM06, **t**he interviewee VNSM05, the interviewee VNSM09 and the interviewee VNSM10 greatly agreed that it was important to increase deterrence and compliance to motivate the listed companies to comply with the current laws and regulations ***(Appendix 6.8)***. The manager of HOSE suggested:

"Regulations on sanctioning must be deterrent to ensure that right people are punished for the right crime timely. Avoiding bad information and avoiding the phenomenon making investors distrust and losing investor confidence."

The manager of VCB and the General Director of VDS definitely adopted consistent perspective regarding the increase of deterrence and compliance ***(Appendix 6.8)***. Moreover, the senior broker of Mirae Asset Securities added that it was vital to impose severe and appropriate sanctions for illegally exploiting asymmetric information to make takeover bids or acquisitions in the stock market.

- Fourthly, the interviewee VNSM06, the interviewee VNSM05, and the interviewee VNSM08 stated that it was vital to control and improve the information quality as it made huge contributions to the Vietnamese stock market efficiency ***(Appendix 6.8)***. The manager of HOSE entirely was in alignment with the given opinion, and he added that the market would be efficient if the information quality were good. He claimed:

  "We can only improve the quality of the information. If the information quality is good, the informational efficiency will be good. If the quality is bad, the informational efficiency will be bad."

  Moreover, the interviewee VNSM08, who is a senior broker of Phu Hung Securities Corporation, suggested that the State must impose stringent regulations on controlling the information quality to disallow sensationalism of the popular press and the financial websites aiming to increase views and intentionally guide public opinions for their benefits ***(Appendix 6.8)***.

- Fifthly, the interviewee VNSM02, the interviewee VNSM03, and the interviewee VNSM05 advised enhancing systematicness and coherence, reducing laxity and improving supervision to promote the informational efficiency of the Vietnamese stock market ***(Appendix 6.8)***. Particularly, the Chief of Supervisory Board of TA9 suggested increasing the systematic interconnection among the agencies as well as reducing procedures ***(Appendix 6.8)***. Moreover, the manager of ACB suggested improving the supervising systems of the State authorities ***(Appendix 6.8)***. Further, the manager of VCB advised reducing the laxity as well as increasing the strict controlling, supervision, and inspection of the State authorities and agencies ***(Appendix 6.8)***.
- Sixthly, the interviewee VNSM01, the interviewee VNSM09, and the interviewee VNSM03 suggested providing closer, faster, and clearer policy orientation and guidance. The Head of Finance – Accounting of CDN and the General Director of VDS emphasises the needs of providing closer policy guidance and good practices for

businesses. In addition, the manager of ACB, which is the listed bank on HNX, suggested that the policies in the stock exchange market should be clearer and more transparent like the international regulations ***(Appendix 6.8)***.

- Finally, the manager of VCB advised that enhancing their self-cultivation of the investors plays a pivotal role in helping them make better decisions and more efficient investments in the stock market ***(Appendix 6.8)***.

The managers of listed companies, the representative of HOSE and the other market participants provide some valuable advice and suggestions. Regarding the State authorities and agencies, the dominant advice in the provided responses strongly encourage them to impose stricter requirements of information disclosure and transparency as well as promote propaganda and communications to raise the business awareness of the benefits and responsibilities in this regard. Moreover, controlling and improving the information quality would boost the market efficiency. Furthermore, it is essential to strengthen the linkages between the listed companies and the stock exchange, enhance systematicness and coherence, reduce laxity, as well as improve supervision. Additionally, it is suggested to not only provide better policy orientation and guidance but also strengthen deterrence and compliance to motivate the listed companies to comply with the current laws and regulations. Regarding the listed companies, it is advised to not only foster the awareness of disclosing the information in a transparent, accurate, and timely manner but also actively improve information transparency to enhance their brand values as well as gain trust and confidence of the investors, customers, and stakeholders. In addition, it is vital to promote self-cultivation of the investors to make more efficient decisions and investments in the stock market.

6.5. Discussion of results and conclusion

The qualitative data analysis starts with the applications of NVivo 12 software to review the data material, determine key themes and trends, and systematically organise and manage data. After that, it is based on the general directions and main points found in the preliminary analysis to carry out a further in-depth exploration and analysis of the Vietnamese stock market efficiency and its impacts on the business performance. The provided information of the interviewees is assured by their annual reports and the relevant information.

Firstly, the major factors of the Vietnamese stock market efficiency are information availability in the stock market, relationship between the information and the stock prices, as well as market valuation. Among these factors, the access to information and the market valuation are the two most important ones determining the market efficiency from the perspectives of the market participants. It is dominantly agreed that all relevant information

about the listed companies and the market is accessed and captured by the market to determine their stock prices. Furthermore, their market values are fair and reasonable from the perspectives of the market participants. The responses of experts who usually engage in HOSE and HNX consistently show that HOSE achieves better market efficiency than HNX. Additionally, the managers of HOSE and the listed companies on HOSE always provided positive perspectives, while the managers of the listed companies on HNX sometimes offered unfavourable or mixed views. It was in agreement with the quantitative results indicating that HOSE was weak form efficient while HNX was inefficient. Moreover, the provided responses strongly manifest an improvement of the market efficiency thanks to the current policies and regulations in the stock market. It is in alignment with the statistical results regarding the improvement in the market efficiency of HOSE from an inefficient level to an efficient one.

Secondly, listing, trading, and conforming to the current regulations in the stock market obviously exert several positive effects on the listed companies. The tremendous opportunities and advantages refer to enhancing their values and brands, contributing to their efficiency of business management, mobilising capital, extending benefits of the information transparency, as well as building trust and confidence of the investors. The current regulations better support the listed companies, provide more transparency to the market and the economy, as well as bring more freedom and fairness for the investors.

Thirdly, the managers of the listed companies on HOSE consistently votes for no challenges and limitations. Moreover, the current regulations in the market and especially on HOSE greatly encourage and support the listed companies. However, the crucial point from the responses of the experts and the managers of listed companies on HNX shows that three major challenges and disadvantages refer to information asymmetry, pressure from information disclosure, as well as young stock market and trickery.

Last but not least, the market behaviours have a plenty of beneficial impacts on the business performance of the listed companies. The stock market is an effective and efficient channel for capital mobilisation of the listed companies. Since listing on the stock market and especially in recent years, there has been a significant development in the financial performance and operational efficiency of the listed companies. Furthermore, their business management and corporate governance have substantially improved as well as their values and brands have been elevated.

CHAPTER 7: SUMMARY OF FINDINGS & IMPLICATIONS

7.1. Introduction

The central focus of this research is to examine the Vietnamese stock market efficiency and evaluate the impacts of market behaviours on listed companies due to listing, trading, and conforming to the current policies and regulations in the stock market. The methodology of this research is essentially determined by the research question and objectives. This final chapter firstly attempts to provide a summary of major findings and conclusions of this research. Additionally, this chapter identifies implications for financial policies and practice not only to improve the market efficiency but also to benefit the listed companies before acknowledging the limitations of this research.

7.2. Summary of findings

To accomplish the research question and objectives, this study combines qualitative and quantitative data with support from documentary data, as well as adopts the mixed method methodology. Evaluation of the market efficiency requires a positivist and a quantitative approach, whereas exploration of the impacts of market behaviours on the listed companies and the solution to improve efficiency needs interviews and a qualitative approach. A summary of key findings is derived from the data analysis in chapters 5 and 6. The structure of this section comprises three crucial points to meet the research requirements. It firstly presents the findings of the Vietnamese market efficiency and its improvement due to recent regulatory changes in the stock market. Following that, it not only explains the advantages and challenges to listed companies due to listing, trading, and complying with the current policies and regulations in the stock market but also explores the impact of the market behaviours on the business performance.

7.2.1. The Vietnamese market efficiency and its improvement due to recent regulatory changes in the stock market

It is essential to combine the quantitative and qualitative data collection and analysis to provide a thorough understanding of the Vietnamese market efficiency and its improvement due to recent regulatory changes in the stock market. In this research, the quantitative data collection and analysis are the foundation for building the interview questions, choosing the potential interviewees, and doing the interviews, and the in-depth interviews are conducted to check, reassure, and support the quantitative findings.

The empirical evidence of the quantitative analysis in chapter 5 (page 165) indicates that the data of VN Index and the listed companies on HOSE satisfies the requirements of weak form efficiency along the lines of RW3. The RW3 is the weakest form of random walk model, which shows that the increments are uncorrelated, but they are clearly neither independent nor identically distributed because their squared increments are correlated. It shows that the stock market index and companies' stock prices on HOSE are firmly random during the studied period. In addition, the chart of VN Index's daily prices and the distributions of its daily rates of return in the graphical analysis manifest the random movement of this market index without being affected by past trends, and the absolute values of the magnitudes of its rates of return are mainly below 5% (Chapter 5, page 162). Therefore, HOSE is reaching a state of being weak form efficient. It implicates that it is unable to accurately predict and signal the price movement of VN Index and the chosen listed companies' stocks on HOSE to earn consistent excess returns over a sustained period based on their historical price changes. After that, the tests of the semi-strong efficiency are conducted and the evidence from the event study demonstrates that HOSE is not semi-strong efficient.

On the other hand, the output related to HNX Index and the listed companies on HNX in chapter 5 (page 187) provides a less positive overview than the results of VN Index and these chosen listed stocks on HOSE. The predominant findings on HNX reflect that the homoscedastic random walk hypothesis, the conditional heteroscedastic random walk hypothesis, and the null hypothesis of a random walk in Wright's rank variance ratio tests are all rejected. In other words, the empirical evidence of HNX and some of the chosen companies on HNX shows that their data is neither independently and identically distributed nor martingale differences. As a result, HNX does not follow a random walk process and not hold a weak form, hence it is possible to study past trends in share prices on HNX to come up with future stock price predictability and make consistent abnormal excess returns.

The qualitative findings are in alignment with the quantitative analysis. It is evident from the responses of the interviewees that the key factors of the Vietnamese stock market efficiency are the information availability in this market, the relationship between the information and the stock prices, and the market valuation (Chapter 6, page 217). The two important elements of the information availability in the stock market are the amount and the variety as well as the quality and the transparency of the information. The relationship between the information and the stock prices refers to the access to the information and the reflections of the information on the stock prices. In these mentioned factors, the access to the information and the market valuation are the two most crucial ones determining the market efficiency from the viewpoint of the managers of the listed companies, the officer of HOSE, and the experts

in this field. Furthermore, the responses dominantly support that all relevant information about the listed companies and the market is accessed and captured by the market to determine the stock price and the market value of the listed companies (Chapter 6, page 225). Additionally, the market value of the listed companies is fair and reasonable from their perspectives because the market price is based on the market supply and demand (Chapter 6, page 227-229). Therefore, the responses of the participants strongly show that the Vietnamese stock market is relatively efficient.

With regard to this subject, the responses of the experts who usually engage in HOSE and HNX consistently agree that HOSE has better market efficiency than HNX for some reasons (Chapter 6, page 230-233). Firstly, the performance on HOSE is more vibrant and better than that on HNX. Secondly, there are better and stricter regulations and listing conditions on HOSE. Thirdly, all the listed companies on HOSE are large companies, and they aim to bring benefits for their shareholders, so they have better performance and information disclosure. Thus, HOSE significantly attracts more concerns and participation of listed companies and investors than HNX does. Furthermore, the managers of HOSE and the listed companies on this stock exchange always provided the positive perspectives, while those on HNX sometimes offered unfavourable or mixed views (Chapter 6, page 223-225, 228, & 236). Therefore, the qualitative findings are in harmony with the quantitative analysis, reassuring that HOSE is weak form efficient while HNX is inefficient.

The findings of HOSE's market efficiency from this research disagree with those from the studies of Dong Loc, Lanjouw, & Lensink (2010), Do, Le, & Nguyen (2015), Guidi & Gupta (2013), Luu, Pham, & Pham (2016), and Shaik & Maheswaran (2017). These authors carried out investigations on VN Index and companies listed on HOSE to conclude that the Vietnamese stock market or HOSE was inefficient in weak form hypothesis (Dong Loc, Lanjouw, & Lensink, 2010; Do, Le, & Nguyen, 2015; Guidi & Gupta, 2013; Luu, Pham, & Pham, 2016; Shaik & Maheswaran, 2017). In comparison with the existing studies of Dong Loc, Lanjouw, & Lensink (2010), Do, Le, & Nguyen (2015), Guidi & Gupta (2013), Luu, Pham, & Pham (2016), and Shaik & Maheswaran (2017), it is found that there has been an improvement in the market efficiency of HOSE from the inefficient level to the weak form efficient level. Moreover, from the perspectives of the manager of HOSE, the listed companies' managers, as well as specialists in this field, the regulatory changes in the stock market have resulted in improvement and enhancement of the information availability and transparency in recent years (Chapter 6, page 222-223, 239, & 241). The information in the stock market becomes increasingly abundant, diversified, sufficient, sensitive, and comprehensive thanks to the current strict regulations in the Vietnamese stock market (Chapter 6, page 222-223). As

a result, the current policies and regulations in the Vietnamese stock market not only contribute towards the improvement of the market efficiency but also positively encourage and support the listed companies. The findings significantly show that recent regulatory changes designed to improve the operations and boost the efficiency of the Vietnamese market have indeed been effective (Chapter 5, page 174-175; Chapter 6, page 222-223, 239, & 241). The improvement of its market efficiency is also consistent with the research of Phan & Zhou (2014) and Gupta, Yang, & Basu (2014). Furthermore, it is in harmony with the research in Nordic and Baltic stock markets of Hellström, Liu, & Sjögren (2018), Indonesian stock market of Yang & Pangastuti (2016), and the Shanghai stock market of Li & Zhang (2011). On the other hand, the outcomes of HNX's market efficiency are in agreement with the investigations of Do, Le, & Nguyen (2015) and Guidi & Gupta (2013). The studies found a lack of random walk features, so HNX was not weak form efficient (Do, Le, & Nguyen, 2015; Guidi & Gupta, 2013).

7.2.2. Advantages and challenges to listed companies due to participation in the stock market

The responses in the interviews reveal that listing, trading, and conforming to the current regulations in the stock market obviously offer a plenty of tremendous opportunities and advantages to the listed companies. Firstly, the listed companies could obtain huge opportunities and advantages with respect to their brand promotion thanks to listing, trading, and complying with the regulations in the stock market (Chapter 6, page 236). In addition, the engagement in the Vietnamese stock market could help to improve their professionalism and efficiency of management and stimulate their business development (Chapter 6, page 237). Furthermore, the listed companies grasp considerable opportunities for raising capital (Chapter 6, page 238). The capital mobilisation of the listed companies is much more advantageous than that of the unlisted companies. The listed companies could attract more investors and shareholders thanks to listing, trading, and abiding by the current policies and regulations in the stock market (Chapter 6, page 239-240). Moreover, recent changes in the stock market better support the listed companies, provide more information transparency to the market and the economy, as well as bring more freedom and fairness for the investors (Chapter 6, page 239).

The findings of this research are consistent with the opinions of Ang, Goetzmann, & Schaefer (2011), Çal & Lambkin (2017), Norman (2011), and Yang, Chou & Yang (2020). Çal & Lambkin (2017), and Norman (2011) regarded branding and promotion as the advantages and opportunities of listing on the stock exchanges in Tanzania, Turkey, and Ireland. Norman

(2011) claimed that raising capital, encouraging investment and expansion, and enhancing the confidence of the domestic and foreign investors are some further merits. In addition, Ang, Goetzmann, & Schaefer (2011) and Norman (2011) absolutely agreed that supports in decision-making process and business management of the listed companies were regarded as other vantage points. The study of Yang, Chou, & Yang (2020) in Taiwan proved that good compliance with the regulations of information transparency could provide great opportunities to improve management efficiency and positively impact their corporate image (Yang, Chou, & Yang, 2020).

Regarding the challenges and limitations due to listing, trading, and complying with the current policies and regulations in the stock market, the managers of the listed companies on HOSE consistently recognise no obstacles and drawbacks (Chapter 6, page 241). Moreover, the current regulations in the market and especially on HOSE is extremely beneficial to the listed companies (Chapter 6, page 242). From the perspectives of the other interviewees, the pressure from information disclosure is voted as one of the most dominant challenges and disadvantages for the listed companies (Chapter 6, page 243-244). The listed companies are under enormous pressure due to huge workload and various requirements for information disclosure as well as impact of negative information on their businesses. Although being a later stock market seems to be advantageous because the Vietnamese stock market could learn from other countries and limit several issues, the listed companies in the young market do not attract significant attention as well as efforts from all managers (Chapter 6, page 244-45). Additionally, it is impossible to entirely solve all trickeries even when the regulations in the stock market are efficient, and information asymmetry is minorly considered as a challenge (Chapter 6, page 245).

7.2.3. Impacts of market behaviours on the business performance

The market behaviours of the Vietnamese stock market exert a plenty of favourable effects on the business performance of the listed companies. The provided statements of the participants are strongly supported by their annual reports and the relevant information.

Firstly, the Vietnamese stock market is recognised as an effective and efficient channel for mobilizing resources for the economy and facilitating the businesses to raise funds predominantly through equity (Chapter 6, page 248-250). The capital of the chosen listed companies has increased by several times since listing on the Vietnamese stock market and especially in recent years. Their capital has grown exponentially through the share issuance as well as the payment of stock dividends to its shareholders over the past years.

Secondly, the business management and the corporate governance of the listed companies are substantially improved thanks to the impacts of the market behaviours (Chapter 6, page 250-251). The businesses enhance the efficacy of their corporate governance by conducting more modern governance models as well as ensure greater transparency. The treasury stocks act as powerful incentives for the managers and the employees to be more diligent, make their long-term commitment, and pledge their tremendous loyalty. Furthermore, the information in the stock market helps them understand the competitors to gain competitive advantages as well as support their decision-making process.

Thirdly, the responses and the documentary data consistently reveal an enormous and constant growth in the financial performance and the operational efficiency of the listed companies (Chapter 6, page 251-252). Their total production rises, and their services become more efficient thanks to focusing on the core business areas and comforting to the provisions of the law. The mentioned results lead to a massive increase in the net revenues and the profit scales of the listed companies.

Finally, the values and the brands of the listed companies are substantially enhanced thanks to listing, trading, and well conforming to the current policies and regulations in the stock market (Chapter 6, page 252-254). Their brand awareness, recognition, and loyalty are raised, their distribution and operation networks are enormously expanded, as well as their investor relations activities are effectively stimulated. The positive results not only strengthen the trust and confidence of shareholders, investors, and other stakeholders in the management and the leadership of the businesses, but also play vital roles in improving their image and reputation in both domestic and global markets. As a result, they contribute to the value creation and enhancement of the listed companies.

Therefore, there has been a considerable development in the performance of the listed companies since listing on the stock market and especially in recent years. The market behaviours of the Vietnamese stock market bring valuable benefits for the business growth and expansion. The findings are in harmony with the studies of Ang, Goetzmann, & Schaefer (2011), Çal & Lambkin (2017), Long & Li (2010), Norman (2011), and Yang, Chou & Yang (2020). Çal & Lambkin (2017) and Norman (2011) acknowledged branding and marketing as the considerable benefits of listing and fully complying with the policies and regulations in the stock market in Tanzania, Turkey, and Ireland. Norman (2011) added that some further benefits would refer to raising capital, encouraging new investments and expansions, branding and marketing, as well as building trust and confidence of the domestic and foreign investors.

In addition, Ang, Goetzmann, & Schaefer (2011) and Norman (2011) completely agreed that active participation in the stock market supported the decision-making process and the business management of the listed companies. Furthermore, the study of Long & Li (2010) in the Chinese stock market proved that trading in the stock market had an extremely significant positive effect on earnings management. Moreover, the work of Yang, Chou, & Yang (2020) in Taiwan indicated that information transparency could help the companies enhance management efficiency and promote their corporate image.

7.3. Implications for practice and policy

This research contributes a profound insight of the Vietnamese stock market efficiency and its impacts on the business performance to the policymakers, authorities, agencies, and managers by simultaneously investigating the level of market and studying the reflections of the market participants. The findings and conclusions of this research have crucial implications for policy formation and management practice.

7.3.1. Policies, regulations, and guidance

Based on the research findings, the current policies and regulations in the stock market not only contribute towards the improvement of the market efficiency but also greatly encourage and support the listed companies. In addition, there is a vital linkage between stock market efficiency and business performance in this Asian emerging stock market. To further improve the stock market efficiency and enhance the benefits of the listed companies, there are five major implications which are beneficial to making policies as well as improving regulations and legal guidance.

Firstly, the evidence of this research suggests strengthening the requirements for disclosure and transparency of the information to ensure fairness in the market (Chapter 5, page 198; Chapter 6, page 257; ***Appendix 6.8***, page 464-465). The more detailed, more comprehensive, and timelier the information is, the better the informational efficiency is. It is necessary to encourage the participation of small and independent shareholders to increase independence and transparency (***Appendix 6.8***, page 465). Furthermore, it is mandatory to specify the types of information required to be disclosed as well as issue mandatory requirements of clarifying objects who invest and gain benefits from the listed companies as well as objects who need to disclose information for the purpose of ensuring the clarity and fairness (***Appendix 6.8***, page 465). The Vietnamese stock market increasingly attracts foreign investors and international funds, so it is recommended to compel the listed companies to

publish the information in various languages such as English, French, Chinese, and Korean besides Vietnamese (***Appendix 6.8***, page 465).

In addition, it is crucial to enhance systematicness and coherence, reduce laxity, as well as improve supervision to boost the informational efficiency of the Vietnamese stock market. According to the provided responses, the listed companies are currently required to submit their reports to SSC, Vietnam Securities Depository, and the stock exchanges on which they are listed but their requirements are inconsistent (Chapter 6, page 258; ***Appendix 6.8***, page 469-470). It leads to the fact that the companies, especially the listed companies on HNX, are under enormous pressures of disclosing the information. Therefore, the evidence from this study suggests ensuring the consistency and linkages in the criteria, requirements, and procedures of these mentioned authorities. Furthermore, the agencies for controlling, supervision and inspection as well as the law enforcement officers should implement and act in accordance with the law seriously, thoroughly, and fiercely to make the market more stable (Chapter 6, page 258). It is also important to actively continue and strongly promote the consolidation into one stock exchange based on the Law on Securities No. 54/2019/QH14 to foster the developments and benefits of the stock market efficiency (Chapter 6, page 244). Additionally, the findings of this research show that HOSE is more efficient than HNX partly because of stricter listing conditions and more stringent information disclosure requirements on HOSE (Chapter 6, page 231-232). To enhance the market efficiency of HNX and further facilitate the merger of the two stock exchanges, it is suggested to tighten the standards and requirements in HNX to follow the international regulations and European practices like the current regulations on HOSE (Chapter 6, page 258-259).

A further implication of the study refers to legislating closer regulatory orientation and guidance for listed companies. The field of finance and the stock market are extremely dynamic and constantly changing, so it is important to update the orientation and the guidance on enforcement of regulations more regularly and faster (Chapter 6, page 258). In particular, the Ministry of Finance, SSC, Vietnam Securities Depository, and the stock exchanges should provide more detailed guidelines as well as good practices for the businesses to dutifully follow and effectively implement the policies and the regulations.

Based on the evidence of this research as well as the researcher's experience as being shareholders of some listed companies, another suggestion is to control and improve the information quality because the informational efficiency will be great if the quality of the information is good (Chapter 6, page 258). It is crucial to impose more stringent regulations to

disallow sensationalism of the popular press and the financial websites aiming to increase views and intentionally guide public opinions for their benefits (Chapter 6, page 258).

Furthermore, the findings of this research indicate that the legal corridors, statutes, and regulations are good, abundant, and sufficient, but the compliance and the deterrent are not high (Chapter 6, page 257-258). The evidence from this study suggests enforcing more stringent regulations on sanctions and deterrence to not only timely ensure punishment for the right people with the right offence but also avoid bad information and phenomenon causing the distrust and weakening the confidence of investors (Chapter 6, page 258). It is necessary to treat and handle companies and individuals who do not sufficiently, timely, and accurately disclose the required information with the full rigour of the law and regulations. Additionally, the authorities should impose severe and powerful sanctions for the illegal and unfair exploitation of the asymmetric information and the legal loopholes in order to prevent the market takeover and acquisitions based on the information asymmetry as well as the back-door listing (Chapter 6, page 245 & 258).

7.3.2. Management practice

This thesis is a good reference to explore the impacts of the market behaviours on the business performance. The worthy results and findings from this research provide some implications for management to not only improve the market efficiency but also develop business performance, enhance company values, as well as build trust and confidence of the investors and other stakeholders.

The findings of this research show a crucial linkage between stock market efficiency and business performance in the emerging country. It is important to publish the information regularly and fully as well as actively improve their information transparency to the investors and the other stakeholders (Chapter 6, page 257). The transparent, accurate and timely information disclosure would not only enhance the market efficiency but also help the businesses gain trust and confidence of their investors, customers, and other stakeholders (Chapter 6, page 239 & 257). Furthermore, the findings of this research indicate that the legal corridors, statutes, and regulations are good, abundant, and sufficient, but the compliance with policies and regulations in the market of the listed companies are not strict (Chapter 6, page 257). This study raises the awareness of the informational efficiency as well as the information disclosure and transparency of the listed companies (Chapter 6, page 223, 239, & 257-258). It is essential to have effective communication and connections between the stock exchanges and the listed companies, so the businesses can be fully aware of the benefits and responsibilities of the information disclosure and transparency (Chapter 6, page 258). The

business managers should understand that good information disclosure and transparency as well as full compliance with the current policies and regulations in the stock market are not only their duties and responsibilities but also their rights and benefits. Therefore, the strict conformity to the current regulations and requirements of the information disclosure and transparency in the stock market plays a vital role in enhancing their values as well as fostering their brand awareness, recognition, and loyalty.

Additionally, this research offers valuable evidence for the managers with regard to the acknowledgement of some key opportunities and benefits from listing, trading, and complying with the current regulations in the stock market (Chapter 6, page 235 & 256). Firstly, the stock market is recognised as an effective and efficient channel for mobilizing resources for the economy and facilitating the listed companies to raise capital dominantly through the issuance of shares (Chapter 6, page 238 & 248-250). Listing and trading on this emerging stock market allows the businesses to attract both domestic and international investors through their trading activities as well as their shareholder meetings (Chapter 6, page 238). Moreover, this research suggests that the managers should utilise the information in the stock market as frequent reference sources to gain competitive advantages over their rivals and improve their business management (Chapter 6, page 237 & 250-251). The participation in the stock market helps the listed companies comprehend their competitors, support their decision-making process, as well as enhance the professionalism and quality of their management and corporate governance. Listing, trading, and fully complying with the regulations in the stock market also facilitate a development in the total production and the services as well as stimulate a growth in the net revenues and the profit scales of the business (Chapter 6, page 251-252). Furthermore, the values of the listed companies could be enhanced, as well as their brand awareness, recognition, and loyalty could be raised thanks to listing on the stock exchange (Chapter 6, page 236-237 & 252-254). Thus, this study strongly encourages the managers of unlisted companies to take a stock exchange listing into consideration as well as provide the managers of listed companies with useful guidelines to develop their business performance by seizing the marvellous opportunities and benefits from their participation in the stock market.

Another implication of this research refers to identifying some challenges and limitations of the listed companies from listing, trading, and complying with the regulations in the stock market. Three major challenges and disadvantages refer to information asymmetry, pressure from information disclosure, as well as young stock market and trickery (Chapter 6, page 242-246). Thanks to these findings, the managers could better understand the situation, overcome

the challenges and limitations acknowledged in this research, and enhance the efficiency of their business performance and legal compliance.

In summary, building an efficient and vibrant stock market not only supports the business development and improves capital allocation in the market but also stimulates the long-term economic growth of the emerging economy. The key findings of this research study offer valuable suggestions to the policymakers, the managers, and the practitioners who intend to develop the Vietnamese stock market efficiency as well as enhance the benefits for the listed companies. Furthermore, this research provides implications for management practice in the Vietnamese context and other emerging stock markets.

7.4. Limitations of this research

Due to a variety of reasons, any research might have its own limitations. Although this research has been successful in achieving valuable results and findings, the researcher has experienced some challenges when conducting this research. Some limitations of this research are as follows:

- Firstly, this research investigates the Vietnamese stock market efficiency and the effects of the market behaviours on the listed companies. The interviews in this study were carried out with the managers as well as the professional and experienced specialists in Vietnam. Thus, the information sheets, consent forms and key interview questions were given in both Vietnamese and English to offer the participants an overview of the research and the interviews as well as prevent and reduce any misunderstandings. The interviews were conducted in Vietnamese language – the native language of both the interviewer and the interviewees. Moreover, NVivo 12 software did not cover Vietnamese language, so this tool could not be deployed for transcribing the content of the interviews. It means that the interviewing contents in Vietnamese language had to be transcribed by the researcher. Making and going through these transcripts brought the investigator closer to the raw data but it was labour intensive and time consuming. After that, the transcripts were translated into English language since the research study had to be in English. Utilising these two languages in this research required additional time for the discussed procedures.
- Secondly, the pilot study and the interviews were originally planned to be conducted in the total time frame of four months, but the researcher was forced to extend it to six months due to the negative impacts of the COVID. The field work was deployed during the period from October 2020 to March 2021. In particular, the researcher went back home in July 2020 and had to be quarantined for two weeks in Thai Binh before

going back to Da Nang – the researcher's hometown. Unfortunately, Da Nang was in lockdown from the end of July to September 2020. After that, several cities and provinces also imposed social distancing and lockdown measures from December 2020 to March 2021 due to the spread of the new COVID variants. From April to September 2021, Vietnamese authorities announced the new and hard lockdown measures in Hanoi, Ha Tinh, Hai Duong, Khanh Hoa, Lao Cai, Ninh Binh, Bac Ninh, Thanh Hoa, Quang Ninh, Da Nang, Quang Nam, Hue, Ho Chi Minh City, and 18 southern cities and provinces. In the ongoing pandemic situation, national and local transportations were considerably reduced and suspended. As a result, it was challenging to book appointments for the face-to-face conversations with the unfamiliar interviewees. Therefore, the researcher collected information of potential participants via various sources, utilised networking to contact super connectors and connect with target interviewees as well as made plans well in advance. The interviews were flexibly undertaken as soon as the social distancing measures were eased, and the interviewees provided their consent to participate in them. Although these factors did not greatly affect the actual quality of the collected data, they certainly caused the delays and the increase in total costs of the fieldwork.

The challenges in this study dominantly refer to the time frame of the qualitative data collection and scheduling of the interviews due to effects of the COVID pandemic. Despite all these mentioned limitations, the researcher successfully conducted the fieldwork and gathered very adequate and comprehensive information which enabled the completion of this research.

7.5. Conclusions

This research strives to investigate and assess the responses of the Vietnamese stock market efficiency to the strategic restructuring of the stock exchange market in recent years. The findings of this study address the research question and accomplish the research objectives. The findings and contributions of this thesis identify implications for financial policies and practice not only to improve the market efficiency but also to benefit the listed companies. Despite some aforementioned limitations, the researcher successfully carried out the fieldwork and obtained valuable and extensive data which enabled the successful completion of this research.

CHAPTER 8: CONCLUSIONS

8.1. Concluding remarks

This study carries out an investigation taking a case study of Vietnam as an example and provides a comprehensive view of the Vietnamese market efficiency due to the regulatory changes in the stock market. The gaps found in the existing literature and recent changes in the policies and regulations in this stock market have opened up formulation of the research question and objectives in this thesis. The key research question of the research is: How efficient is the Vietnamese stock market, and how have listed companies been impacted by market behaviours?

The research question requires testing market efficiency in terms of quantitative and qualitative perspectives and is achieved by the corresponding research objectives as follows:

(1) Evaluate and determine the efficient form of the Vietnamese stock market by testing historical data.

(2) Examine the current market efficiency and its improvements due to recent policies and regulations related to the stock market.

(3) Examine advantages and challenges to listed companies due to listing, trading, and complying with the current policies and regulations in the stock market considered by listed companies and stakeholders.

(4) Evaluate impacts of market behaviours on the business performance of listed companies.

The conduct of this research addresses the research questions and achieve the research objectives. Thanks to this, it helps to bridge the existing gaps in the literature on market efficiency and its potential benefits to listed companies in stock exchange markets as well as the impact of recent policies and regulations in the stock market on the market efficiency. This chapter provides the original contributions of this research to academic literature as well as discusses avenues for future research. The journey for this research project was definitely challenging and interesting, and the progress to date is provided in the Gantt chart of detailed time plan to completion in **Appendix 8.1**.

8.2. Original contributions to academic literature

This research offers two general contributions that could be applied in not only Vietnam but also other countries and one specific contribution that focuses on the case study of Vietnam as follows:

- Firstly, the current empirical studies on efficient market hypothesis in the emerging stock markets evaluate the market efficiency by only looking at the level of market and mainly using quantitative methods (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran, Nguyen, & Pham, 2016). Thus, research makes original contributions to the literature by providing a theoretical framework to examine the efficient forms of the stock market as well as evaluate its impacts and implications on the business performance. The undertaking of this research addresses the existing gaps of the insufficient literature on market efficiency and its potential benefits to the listed companies in the stock exchange markets. This thesis simultaneously investigates at the level of market and obtains the reflection of market participants to provide a profound understanding of the nature of linkages of market efficiency and business performance in emerging markets. In particular, this research performs statistical analysis on the market indices and the chosen listed companies' stocks as well as carries out interviews with a manager of HOSE, managers of listed companies, and professional and experienced experts in the field of finance and the stock market. The study uses various sources of data, including quantitative data, qualitative data, and documentary data, to investigate the context. From now on, the other authors could follow up and apply this theoretical framework in not only Vietnam but also other countries.

- Secondly, there is insufficient evidence concerning the impact of recent regulatory changes in the emerging stock market on the market efficiency (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Phan & Zhou, 2014; Shaik & Maheswaran, 2017; Tran, Nguyen, & Pham, 2016). Additionally, restructuring of the securities market has been the primary strategic project in Vietnam – one of the best-performing Asian emerging stock markets – since 2012 (The Prime Minister, 2012b). Reforming the two current stock exchanges has been one of the essential strategic activities, and several regulatory changes have been made to enhance the market stability and efficiency as well as stimulate its sustainable development (The Prime Minister, 2012b). Hence, the original contributions of this research refer to assessing the current market efficiency and its improvement due to recent policies and regulations in the emerging stock exchange markets by taking the case study of Vietnam as an example. The research methodological design of this research could be deployed in not only Vietnam but also other emerging markets to investigate the responses of the stock market efficiency to crucial regulatory changes in the stock exchange markets.

- Thirdly, most of the existing studies in the Vietnamese stock market efficiency conduct tests based on only market indices or the five oldest listed shares (Dong Loc, Lanjouw, & Lensink, 2010; Gupta, Yang, & Basu, 2014; Nghia & Blokhina, 2020; Phan & Zhou, 2014; Shaik & Maheswaran, 2017). Nonetheless, market indices in emerging countries are not the criteria fully and accurately reflecting characteristics of all stocks listed and traded in the emerging market, so examination by applying only market indices could lead to distorted outcomes. In addition, companies with dissimilar firm sizes from different sectors have diversified behaviours and achieve various impacts through listing, trading, and complying with the current regulations in the stock market due to some unique attributes and characteristics (Dahoei & ParvizSaídi 2012; Duy & Phuoc, 2016; Handayani et al., 2018; Mulyono, Suprapto, & Prihandoko, 2018; Ul Haq & Rashid, 2014). Thus, this research analyses data of different sizes of the listed companies in various sectors in addition to the market indices to ensure the reliability and the validity of the examination of the Vietnamese stock market efficiency.

8.3. Suggestions for future research

There were various points and areas of topics that emerged from this investigation, which could be the promising avenues for future research. The suggestions for further studies include:

- The major theoretical contribution of this research referred to examining the stock market efficiency and its linkage with business performance by performing statistical analysis on the market indices and the chosen listed companies' stocks as well as conducting interviews with managers and experts in this field. This study could be useful reference and guidance for further research on the market efficiency and its benefits on the business performance of listed companies in the other stock market. The repetition of the research methodology of this research as well as the use of similar interview questions could be deployed in other markets to discover any differences and similarities in outcomes of different countries.
- This research study evaluated the improvement of the stock market efficiency due to restructuring the stock exchanges. The similarities in emerging and frontier stock exchanges facilitate the findings of this research to be possibly used as a guidance in other emerging markets such as Indonesia and Malaysia. Thus, it is suggested to replicate this research study in other countries to investigate comparative studies between the case study of Vietnam and other markets as well as recognise how this research would contribute.

- This research methodology could pave the way for yielding insights into the role of the informational efficiency of the stock market in the decision-making process and the value maximisation of the investors in the stock market by repeating the methods and slightly modifying the interview questions.
- It would be interesting to examine the challenges and the barriers as well as the opportunities and the advantages of the listed companies on UPCOM and HNX when all listed shares are forced to transfer their listing into HOSE in the future. The research methodology and the interview questions of this research should be used as essential reference sources.

It is hoped that other researchers could use this research as reference sources and guidance to conduct future research.

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APPENDICES

Appendix 3.1: 31 mergers of stock exchanges on the level of efficiency

Date announced	Date effective	Target name	Acquirer name	Target nation	Acquirer nation	Target industry	Acquirer industry
			Between domestic stock exchanges				
8 April 2010	9 September 2011	RTS	MICEX	Russian Fed	Russian Fed	Stock exchange	Stock exchange
22 December 2009	25 May 2010	Nasdaq Dubai Ltd	Dubai Financial Market PJSC	United Arab Emirates	United Arab Emirates	Stock exchange	Stock exchange
21 December 2009	18 February 2010	Turquoise Trading Ltd	Baikal Global Ltd	UK	UK	Stock exchange	Stock exchange
17 January 2008	1 October 2008	American Stock Exchange Inc	NYSE Euronext Inc	US	US	Stock exchange	Stock exchange
7 November 2007	24 July 2008	Philadelphia Stock Exchange	Nasdaq Stock Market Inc	US	US	Stock exchange	Stock exchange
21 December 2006	31 January 2007	Varazdinska burza dd	Zagrebacka burza dd	Croatia	Croatia	Stock exchange	Stock exchange
9 December 2004	12 April 2005	Bendigo Stock Exchange	Newcastle Stock Exchange	Australia	Australia	Stock exchange	Stock exchange
22 March 2001	1 August 2001	Canadian Venture Exchange	Toronto Stock Exchange	Canada	Canada	Stock exchange	Stock exchange
23 June 2000	31 March 2001	Kyoto Stock Exchange	Osaka Securities Exchange	Japan	Japan	Stock exchange	Stock exchange
26 April 1999	29 November 1999	Vancouver Stock Exchange	Alberta Stock Exchange	Canada	Canada	Stock exchange	Stock exchange
13 March 1998	2 November 1998	American Stock Exchange	Nasdaq Stock Market	US	US	Stock exchange	Stock exchange
			Between cross-border stock exchanges				
4 March 2010	30 May 2011	Bolsa de Valores de Colombia	Bolsa de Comercio de Santiago	Colombia	Chile	Stock exchange	Stock exchange
4 March 2010	30 May 2011	Bolsa de Valores de Lima SA	Bolsa de Comercio de Santiago	Peru	Chile	Stock exchange	Stock exchange
20 June 2007	1 October 2007	Borsa Italiana SA	London Stock Exchange PLC	Italy	UK	Stock exchange	Stock exchange
22 May 2006	4 April 2007	Euronext NV	NYSE Group Inc	Europe	US	Stock exchange	Stock exchange
14 June 2001	6 February 2002	Bolsa de Valores de Lisboa	Euronext NV	Portugal	Europe	Stock exchange	Stock exchange
20 March 2000	22 September 2000	Amsterdam Stock Exchange	Paris Stock Exchange	Netherlands	France	Stock exchange	Stock exchange
			Between a stock exchange and a commodity exchange (domestic)				
27 October 2008	1 July 2009	BESA	JSE Ltd	South Africa	South Africa	Commodity exchange	Stock exchange
22 August 2008	23 December 2008	ISE Stock Exchange LLC	Direct Edge Holdings LLC	US	US	Commodity exchange	Stock exchange
27 February 2008	1 July 2008	Singapore Commodity Exchange	Singapore Exchange Ltd	Singapore	Singapore	Commodity exchange	Stock exchange
10 December 2007	1 May 2008	Bourse de Montreal Inc	TSX Group Inc	Canada	Canada	Commodity exchange	Stock exchange
10 July 2007	22 October 2007	Waterexchange Pty Ltd	NSX Ltd	Australia	Australia	Commodity exchange	Stock exchange
27 March 2006	7 July 2006	SFE Corp Ltd	Australian Stock Exchange Ltd	Australia	Australia	Commodity exchange	Stock exchange
20 December 2005	24 November 2006	Athens Derivatives Exchange SA	Greek Stock Exchange Holdings	Greece	Greece	Commodity exchange	Stock exchange
10 April 2002	28 May 2002	BVRJ	BBM	Brazil	Brazil	Stock exchange	Commodity exchange
4 March 1999	6 March 2000	Hong Kong Futures Exchange	Stock Exchange of Hongkong	Hong Kong	Hong Kong	Commodity exchange	Stock exchange
3 July 1998	6 January 1999	Kloffe Capital Sdn Bhd	Kuala Lumpur Stock Exchange	Malaysia	Malaysia	Commodity exchange	Stock exchange
6 October 1995	20 January 1997	European Options Exchange	Amsterdam Stock Exchange	Netherlands	Netherlands	Commodities exchange	Stock exchange
			Between a stock exchange and a provider of services (domestic)				
1 June 2009	1 June 2009	BMIS Sdn Bhd	Bursa Malaysia Bhd	Malaysia	Malaysia	Provider of stock Exchange services	Stock exchange
20 April 2005	7 March 2006	New York Stock Exchange	Archipelago Holdings Inc	US	US	Stock exchange	Provider of electronic Communications Network services
			Between a stock exchanges and a commodity exchange (cross-border)				
7 December 2007	31 January 2008	Powernext SA-Powernext Carbon	NYSE Euronext Inc	France	US	Provider of risk Management tools	Stock exchange

Source: Charles et al., 2016.

Appendix 4.1: Ethical application and approval letter

Downloaded: 18/09/2021
Approved: 18/02/2019

Nguyen Tran
Sunderland Business School
Programme: PhD Research Business and Management

Dear Nguyen

PROJECT TITLE: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam
APPLICATION: Reference Number 003546

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 18/02/2019 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 003546 (form submission date: 22/01/2019); (expected project end date: 20/02/2021).
- Participant information sheet 1007155 version 1 (18/01/2019).
- Participant consent form 1007156 version 1 (18/01/2019).

If during the course of the project you need to deviate significantly from the above-approved documentation please email ethics.review@sunderland.ac.uk

For more information please visit: https://www.sunderland.ac.uk/research/governance/researchethics/

Yours sincerely

Callum Williams
Ethics Administrator
University of Sunderland

Appendix 4.2: Newly listed companies on HOSE from 2015 to 2019

No.	Listed code	Issuers	Industry	Listing date	Large Companies/SMEs
1	NHH	Hanoi Plastics Joint Stock Company	Materials	12/12/2019	LARGE
2	GEG	Gia Lai Electricity Joint Stock Company	Utilities	19/09/2019	LARGE
3	DBC	DABACO Group	Consumer Staples	07/08/2019	LARGE
4	KOS	Kosy Joint Stock Company	Real Estate	22/07/2019	LARGE
5	GAB	FLC Mining Investment & Asset Management Joint Stock Company	Materials	11/07/2019	LARGE
6	TV2	Power Engineering Consulting Joint Stock Company 2	Industrials	06/06/2019	LARGE
7	ILB	ICD Tan Cang - Long Binh Joint Stock Company	Industrials	07/05/2019	LARGE
8	TV2	Power Engineering Consulting Joint Stock Company 2	Industrials	22/04/2019	LARGE
9	HVN	Viet Nam Airlines Joint Stock Company	Industrials	11/04/2019	LARGE
10	SZC	Sonadezi Chau Duc Shareholding Company	Industrials	18/12/2018	LARGE
11	POW	PetroVietnam Power Corporation	Utilities	17/12/2018	LARGE
12	TTE	Truong Thinh Energy Investment Joint Stock Company	Utilities	26/11/2018	LARGE
13	HVH	HVC Investment and Technology Joint Stock Company	Industrials	20/11/2018	LARGE
14	MSH	Song Hong Garment Joint Stock Company	Consumer Discretionary	20/11/2018	LARGE
15	HTN	Hung Thinh Incons Joint Stock Company	Real Estate	24/10/2018	LARGE
16	TDM	Thu Dau Mot Water Joint Stock Company	Utilities	05/10/2018	LARGE
17	LMH	Landmark Holding Joint Stock Company	Materials	02/10/2018	LARGE
18	PHC	Phuc Hung Holdings Construction Joint Stock Company	Industrials	12/09/2018	LARGE
19	CRE	Century Land Joint Stock Company	Real Estate	10/08/2018	LARGE
20	CRC	Create Capital Viet Nam Joint Stock Company Limited	Materials	07/08/2018	LARGE
21	TTB	Tien Bo Joint Stock Company	Materials	26/07/2018	LARGE

22	SGN	Sai Gon Ground Services Joint Stock Company	Industrials	04/07/2018	LARGE
23	HPX	Hai Phat Investment Joint Stock Company	Real Estate	02/07/2018	LARGE
24	SMB	Sai Gon - Mien Trung Beer Joint Stock Company	Consumer Staples	27/06/2018	LARGE
25	SCS	Sai Gon Cargo Service	Industrials	26/06/2018	LARGE
26	YEG	Yeah1 Group Corporation	Communication Services	19/06/2018	LARGE
27	TVB	Tri Viet Securities Joint Stock Company	Financial	13/06/2018	LARGE
28	VPI	Van Phu - Invest Investment Joint Stock Company	Real Estate	31/05/2018	LARGE
29	DBD	Binh Dinh Pharmaceutical and Medical Equipment Joint Stock Company	Health care	24/05/2018	LARGE
30	TCB	Vietnam Technological and Commercial Joint Stock Bank	Financial	22/05/2018	LARGE
31	DPG	Dat Phuong Joint Stock Company	Industrials	09/05/2018	LARGE
32	TGG	Truong Giang Investment and Construction Joint Stock Company	Industrials	09/05/2018	LARGE
33	VHM	Vinhomes Joint Stock Company	Real Estate	07/05/2018	LARGE
34	FRT	FPT Digital Retail Joint Stock Company	Consumer Discretionary	17/04/2018	LARGE
35	TPB	Tien Phong Commercial Joint Stock Bank	Financial	22/03/2018	LARGE
36	GEX	Viet Nam Electrical Equipment Joint Stock Corporation	Industrials	28/12/2017	LARGE
37	TEG	Truong Thanh Real Estate and Construction Joint Stock Company	Real Estate	28/12/2017	LARGE
38	VPG	Viet Phat Import Export Trading Investment Joint Stock Company	Industrials	27/12/2017	LARGE
39	AST	Taseco Air Services Joint Stock Company	Consumer Discretionary	26/12/2017	LARGE
40	HDB	Ho Chi Minh City Development Joint Stock Commercial Bank	Financial	25/12/2017	LARGE
41	VPD	Viet Nam Power Development Joint Stock Company	Utilities	25/12/2017	LARGE
42	SGR	Saigon Real – Estate Joint Stock Company	Real Estate	21/12/2017	LARGE
43	IBC	Apax Holdings Joint Stock Company	Consumer Discretionary	06/12/2017	LARGE

44	TLD	Thang Long Urban Development and Construction Investment Joint Stock Company	Materials	29/11/2017	LARGE
45	PME	Pymepharco Joint Stock Company	Health care	30/10/2017	LARGE
46	VRE	Vincom Retail Joint Stock Company	Real Estate	25/10/2017	LARGE
47	CVT	CMC Joint Stock Company	Materials	25/09/2017	LARGE
48	PLP	Pha Le Plastics Manufacturing and Technology Joint Stock Company	Materials	11/08/2017	LARGE
49	VND	VNDIRECT Securities Corporation	Financial	10/08/2017	LARGE
50	VPB	VietNam Prosperity Joint Stock Commercial Bank	Financial	08/08/2017	LARGE
51	VDP	Vidipha Central Pharmaceutical Joint - Stock Company	Health care	27/07/2017	LARGE
52	BWE	Binh Duong Water Environment Joint Stock Company	Utilities	05/07/2017	LARGE
53	VCI	Viet Capital Securities Joint Stock Company	Financial	30/06/2017	LARGE
54	VDS	Viet Dragon Securities Corporation	Financial	29/06/2017	LARGE
55	HTT	Ha Tay Trading Joint Stock Company	Real Estate	27/06/2017	LARGE
56	TVT	Viet Thang Corporation	Consumer Discretionary	27/06/2017	LARGE
57	SJF	Sunstar Investment Joint Stock Company	Consumer Staples	19/06/2017	LARGE
58	HII	An Tien Industries Joint Stock Company	Materials	14/06/2017	LARGE
59	CTS	Vietnam Bank for Industry and Trade Securities Joint Stock Company	Financial	13/06/2017	LARGE
60	LEC	Central Power Real Estate Joint Stock Company	Real Estate	05/06/2017	LARGE
61	EVG	Everland Investment Joint Stock Company	Industrials	26/05/2017	LARGE
62	TCD	Transport and Industry Development Investment Joint Stock Company	Industrials	17/05/2017	LARGE
63	CTF	City Auto Corporation	Consumer Discretionary	11/05/2017	LARGE
64	CEE	CII Engineering and Construction Joint Stock Company	Industrials	08/05/2017	LARGE
65	SBV	Siam Brothers Vietnam Joint Stock Company	Consumer Discretionary	03/05/2017	LARGE

66	THI	Electrical Equipment Joint Stock Company	Industrials	14/04/2017	LARGE
67	PLX	Viet Nam National Petroleum Group	Energy	14/04/2017	LARGE
68	VJC	VietJet Aviation Joint Stock Company	Industrials	06/02/2017	LARGE
69	FTM	Duc Quan Investment and Development Joint Stock Company	Consumer Discretionary	16/01/2017	LARGE
70	FTS	FPT Securities Joint Stock Company	Financial	05/01/2017	LARGE
71	BHN	Hanoi Beer Alcohol and Beverage Joint Stock Corporation	Consumer Staples	30/12/2016	LARGE
72	NVL	No Va Land Investment Group Corporation	Real Estate	19/12/2016	LARGE
73	SAB	Saigon Beer – Alcohol – Beverage Corporation	Consumer Staples	25/11/2016	LARGE
74	PC1	Power Construction Joint Stock Company	Industrials	09/11/2016	LARGE
75	AAA	An Phat Bioplastics Joint Stock Company	Materials	06/10/2016	LARGE
76	SCR	Sai Gon Thuong Tin Real Estate Joint Stock Company	Real Estate	06/10/2016	LARGE
77	DAH	Dong A Hotel Group Joint Stock Company	Consumer Discretionary	30/09/2016	LARGE
78	SHA	Son Ha Sai Gon Joint Stock Company	Industrials	27/09/2016	LARGE
79	APG	APG Securities Joint Stock Company	Financial	23/09/2016	LARGE
80	TCH	Hoang Huy Investment Financial Services Joint Stock Company	Industrials	15/09/2016	LARGE
81	ROS	FLC FAROS Construction Joint Stock Company	Industrials	24/08/2016	LARGE
82	ATG	An Truong An Joint Stock Company	Materials	10/08/2016	LARGE
83	CHP	Central Hydropower Joint Stock Company	Utilities	10/08/2016	LARGE
84	HCD	HCD Investment Producing and Trading Joint Stock Company	Industrials	27/06/2016	LARGE
85	HID	Halcom VietNam Joint Stock Company	Industrials	22/06/2016	LARGE
86	ADS	Damsan Joint Stock Company	Consumer Discretionary	22/06/2016	LARGE
87	S4A	Sesan 4A Hydroelectric Joint Stock Company	Utilities	26/04/2016	LARGE
88	TIP	Tin Nghia Industrial Park Development Joint Stock Company	Industrials	09/03/2016	LARGE

89	KPF	Hoang Minh Finance Investment Joint Stock Company	Materials	18/02/2016	LARGE
90	TCT	Tay Ninh Cable Car Tour Company	Consumer Discretionary	14/01/2016	LARGE
91	DAT	Travel Investment and Seafood Development Corporation	Consumer Staples	06/10/2015	LARGE
92	NAF	Nafoods Group Joint Stock Company	Consumer Staples	28/09/2015	LARGE
93	STK	Century Synthetic Fibre Corporation	Consumer Discretionary	10/09/2015	LARGE
94	BFC	Binh Dien Fertiliser Joint Stock Company	Materials	27/08/2015	LARGE
95	FIT	F.I.T Group Joint Stock Company	Financial	07/08/2015	LARGE
96	LDG	LDG Investment Joint Stock Company	Real Estate	05/08/2015	LARGE
97	VPS	Vietnam Pesticide Joint Stock Company	Materials	04/08/2015	LARGE
98	DGW	Digiworld Corp	Information Technology	24/07/2015	LARGE
99	HNG	Hoang Anh Gia Lai Agricultural Joint Stock Company	Consumer Staples	10/07/2015	LARGE
100	BCG	Bamboo Capital Joint Stock Company	Industrials	08/07/2015	LARGE
101	AMD	FLC Stone Mining and Investment Joint Stock Company	Industrials	08/06/2015	LARGE
102	NT2	PetroVietnam Power Nhon Trach 2 Joint Stock Company	Utilities	02/06/2015	LARGE
103	VAF	Van Dien Fused Magnesium Phosphate Fertiliser Joint Stock Company	Materials	21/05/2015	LARGE
104	DCM	PetroVietnam Ca Mau Fertiliser Joint Stock Company	Materials	20/03/2015	LARGE
105	CSV	South Basic Chemicals Joint Stock Company	Materials	24/02/2015	LARGE
106	HAH	Hai An Transport and Stevedoring Joint Stock Company	Industrials	21/01/2015	LARGE

Source: Compiled by author.

Appendix 4.3: Newly listed companies on HNX from 2015 to 2019

No.	Listed code	Issuers	Industry	Listing date	Large Companies/SMEs
1	SZB	Sonadezi Long Binh Shareholding Company	Real estate activities	20/12/2019	LARGE
2	IDC	IDICO Corporation - Joint Stock Company	Construction	10/12/2019	LARGE
3	PIA	Petrolimex Information Technology and Telecommunication Joint Stock Company	Information, communication, and other activities	06/09/2019	LARGE
4	PGN	Plastic Additives Joint Stock Company	Manufacture	04/07/2019	MEDIUM
5	EVS	Everest Securities Joint Stock Company	Finance	26/06/2019	LARGE
6	NTH	Nuoc trong Hydro-Power Joint Stock Company	Manufacture	19/06/2019	LARGE
7	TAR	Trung An Hi-Tech Farming Joint Stock Company	Agriculture, forestry, and fishing	20/02/2019	LARGE
8	SHE	Son Ha Development of Renewable Energy Joint Stock Company	Manufacture	25/01/2019	MEDIUM
9	VHE	Vinaherbfoods Joint Stock Company	Manufacture	14/01/2019	LARGE
10	GDW	Gia Dinh Water supply Joint Stock Company	Manufacture	18/12/2018	LARGE
11	ART	BOS Securities Joint Stock Company	Finance	28/09/2018	LARGE
12	HHP	Hai Phong Hoang Ha Paper Joint Stock Company	Manufacture	08/08/2018	LARGE
13	TDT	TDT Investment and Development Joint Stock Company	Manufacture	18/07/2018	LARGE
14	AAV	Viet Tien Son Real Estate Holding Company	Real estate activities	25/06/2018	LARGE
15	NRC	NETLAND Real Estate Joint Stock Company	Real estate activities	05/04/2018	LARGE
16	NAP	Nghetinh Port Joint Stock Company	Transportation and storage	27/03/2018	LARGE
17	X20	X20 Joint Stock Company	Manufacture	05/02/2018	LARGE
18	TTL	Thang Long Joint Stock Corporation	Construction	18/01/2018	LARGE
19	KHS	Kien Hung Joint Stock Company	Agriculture, forestry, and fishing	26/12/2017	LARGE
20	CAG	An Giang Port Joint Stock Company	Transportation and storage	04/12/2017	LARGE
21	CIA	Cam Ranh International Airport Services Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	29/11/2017	LARGE

22	DTD	Thanh Dat Investment Development Joint Stock Company	Construction	16/11/2017	LARGE
23	BTW	Ben Thanh Water Supply Joint Stock Company	Manufacture	14/11/2017	LARGE
24	NBW	Nha Be Water Supply Joint Stock Company	Manufacture	14/11/2017	LARGE
25	MEL	Me Lin Steel Joint Stock Company	Manufacture	27/09/2017	LARGE
26	DS3	Riverway Management Joint Stock No.3	Wholesale and retail trade, accommodation, and food service activities	21/08/2017	LARGE
27	NSH	Song Hong Aluminium Joint Stock Company	Manufacture	31/07/2017	LARGE
28	CET	Tech - Vina Joint Stock Company	Manufacture	28/07/2017	MEDIUM
29	GKM	Khang Minh Group Joint Stock Company	Manufacture	17/07/2017	LARGE
30	VSM	Central Container Joint Stock Company	Transportation and storage	17/07/2017	MEDIUM
31	TTT	Tay Ninh Tourist - Trading Joint Stock Company	Transportation and storage	02/06/2017	LARGE
32	VTJ	Vi Na Ta Ba Trading & Investment Joint Stock Company	Manufacture	26/04/2017	LARGE
33	C69	1369 Construction Joint Stock Company	Construction	21/04/2017	LARGE
34	BAX	Thong Nhat Joint Stock Company	Real estate activities	24/03/2017	LARGE
35	MSC	Phu Nhuan Service Joint Stock Company	Manufacture	08/02/2017	LARGE
36	TMB	Vinacomin – Northern Coal Trading Joint Stock Company	Mining and quarrying, oil, and gas	16/01/2017	LARGE
37	HKT	Hiep Khanh Tea Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	12/01/2017	MEDIUM
38	PIC	PC3 Investment Joint Stock Company	Construction	09/01/2017	LARGE
39	CDN	Danang port Joint Stock Company	Transportation and storage	30/11/2016	LARGE
40	TTH	Tien Thanh Service and Trading Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	26/10/2016	LARGE
41	CTP	Thuong Phu Coffee Joint Stock Company	Manufacture	28/07/2016	LARGE
42	CLH	La Hien Cement Joint Stock Company	Manufacture	07/06/2016	LARGE
43	MST	MST Investment Joint Stock Company	Construction	10/05/2016	LARGE
44	CLM	Vinacomin - Coal Import Export Joint Stock Company	Mining and quarrying, oil, and gas	15/04/2016	LARGE

45	ATS	Atesco Industrial Cartering Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	29/03/2016	MEDIUM
46	KDM	HP Vietnam Investment Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	29/03/2016	MEDIUM
47	MBS	MB Securities Joint Stock Company	Finance	28/03/2016	LARGE
48	PPY	PetroVietnam Oil Phu Yen Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	02/03/2016	LARGE
49	HPM	Hoang Phuc Mineral Trading and Construction Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	18/01/2016	MEDIUM
50	MPT	Truong Tien Group Joint Stock Company	Manufacture	15/01/2016	LARGE
51	SCI	SCI E&C Joint Stock Company	Construction	05/01/2016	LARGE
52	VSA	Vietnam Ocean Shipping Agency Corporation	Transportation and storage	22/12/2015	LARGE
53	SGO	Sai Gon Vegetable Oil Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	16/12/2015	LARGE
54	TFC	Trang Corporation Joint Stock Company	Manufacture	03/12/2015	LARGE
55	MBG	Viet Nam Trading and Construction Development Investment Joint Stock Company	Manufacture	26/11/2015	LARGE
56	PTD	Phuc Thinh Design Construction Trading Corporation	Construction	10/11/2015	LARGE
57	VMS	Vietnam Maritime Development Joint Stock Company	Transportation and storage	20/10/2015	LARGE
58	PMB	North Petro Vietnam Fertiliser & Chemicals Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	07/10/2015	LARGE
59	PMP	Dam Phu My Packaging Joint Stock Company	Manufacture	22/09/2015	LARGE
60	PHP	Port of Hai Phong Joint Stock Company	Transportation and storage	12/08/2015	LARGE
61	PDB	Pacific Dinco Corporation	Manufacture	03/08/2015	LARGE
62	TA9	Thanh An 96 Installation and Construction Joint Stock Company	Construction	31/07/2015	LARGE
63	HVA	HVA Investment Joint Stock Company	Professional, scientific, and technical activities; administrative and support service activities and education	30/07/2015	MEDIUM

64	PCE	Central PetroVietnam Fertiliser and Chemicals Joint Stock Company	Manufacture	23/07/2015	LARGE
65	ACM	A Cuong Mineral Group Joint Stock Company	Mining and quarrying, oil, and gas	23/07/2015	LARGE
66	PSW	South – West PetroVietnam Fertiliser and Chemicals Joint Stock Company	Manufacture	21/07/2015	LARGE
67	CTT	Vinacomin - Machinery Joint Stock Company	Manufacture	17/07/2015	LARGE
68	DP3	Central Pharmaceutical Joint Stock Company No3	Health care	17/07/2015	LARGE
69	SMN	SOUTH BOOKS & EDUCATIONAL EQUIPMENT Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	14/07/2015	MEDIUM
70	FID	Vietnam Enterprise Investment and Development Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	20/05/2015	LARGE
71	DPS	Soc Son Development Investment Joint Stock Company	Wholesale and retail trade, accommodation, and food service activities	06/05/2015	LARGE
72	KVC	Kim Vi Inox Import Export Production Joint Stock Company	Manufacture	14/04/2015	LARGE
73	HKB	Ha Noi - Kinh Bac Agriculture and Food Joint Stock Company	Manufacture	08/04/2015	LARGE
74	PSE	South-East PetroVietnam Fertiliser and Chemicals Joint Stock Company	Manufacture	18/03/2015	LARGE
75	NHP	NHP Production Import-Export Joint Stock Company	Manufacture	11/03/2015	LARGE
76	PBP	PetroVietnam Packaging Joint Stock Company	Manufacture	27/01/2015	LARGE

Source: Compiled by author.

Appendix 5.1: Data and sign of daily returns (VN Index)

No	Date	Pt	Pt-1	Return	Sign	No	Date	Pt	Pt-1	Return	Sign
1	20180102	995.77	984.24	0.01171	+	66	20180412	1173.02	1167.11	0.00506	+
2	20180103	1005.67	995.77	0.00994	+	67	20180413	1157.14	1173.02	-0.01354	-
3	20180104	1019.75	1005.67	0.01400	+	68	20180416	1148.49	1157.14	-0.00748	-
4	20180105	1012.65	1019.75	-0.00696	-	69	20180417	1153.28	1148.49	0.00417	+
5	20180108	1022.9	1012.65	0.01012	+	70	20180418	1138.53	1153.28	-0.01279	-
6	20180109	1033.56	1022.9	0.01042	+	71	20180419	1094.63	1138.53	-0.03856	-
7	20180110	1038.11	1033.56	0.00440	+	72	20180420	1119.86	1094.63	0.02305	+
8	20180111	1048.17	1038.11	0.00969	+	73	20180423	1076.78	1119.86	-0.03847	-
9	20180112	1050.11	1048.17	0.00185	+	74	20180424	1080.74	1076.78	0.00368	+
10	20180115	1063.47	1050.11	0.01272	+	75	20180426	1044.86	1080.74	-0.03320	-
11	20180116	1062.96	1063.47	-0.00048	-	76	20180427	1050.26	1044.86	0.00517	+
12	20180117	1034.69	1062.96	-0.02660	-	77	20180502	1029.08	1050.26	-0.02017	-
13	20180118	1050.25	1034.69	0.01504	+	78	20180503	1026.46	1029.08	-0.00255	-
14	20180119	1062.07	1050.25	0.01125	+	79	20180504	1026.8	1026.46	0.00033	+
15	20180122	1087.42	1062.07	0.02387	+	80	20180507	1062.26	1026.8	0.03453	+
16	20180125	1104.57	1087.42	0.01577	+	81	20180508	1060.45	1062.26	-0.00170	-
17	20180126	1115.64	1104.57	0.01002	+	82	20180509	1056.97	1060.45	-0.00328	-
18	20180129	1109.8	1115.64	-0.00523	-	83	20180510	1028.87	1056.97	-0.02659	-
19	20180130	1110.56	1109.8	0.00068	+	84	20180511	1044.85	1028.87	0.01553	+
20	20180131	1110.36	1110.56	-0.00018	-	85	20180514	1066.98	1044.85	0.02118	+
21	20180201	1099.67	1110.36	-0.00963	-	86	20180515	1073.5	1066.98	0.00611	+
22	20180202	1105.04	1099.67	0.00488	+	87	20180516	1054.62	1073.5	-0.01759	-
23	20180205	1048.71	1105.04	-0.05098	-	88	20180517	1030.64	1054.62	-0.02274	-
24	20180206	1011.6	1048.71	-0.03539	-	89	20180518	1040.54	1030.64	0.00961	+
25	20180207	1040.55	1011.6	0.02862	+	90	20180521	1014.98	1040.54	-0.02456	-
26	20180208	1023.25	1040.55	-0.01663	-	91	20180522	985.91	1014.98	-0.02864	-
27	20180209	1003.94	1023.25	-0.01887	-	92	20180523	988.94	985.91	0.00307	+
28	20180212	1041.79	1003.94	0.03770	+	93	20180524	985.92	988.94	-0.00305	-
29	20180213	1059.73	1041.79	0.01722	+	94	20180525	963.9	985.92	-0.02233	-
30	20180221	1087.15	1059.73	0.02587	+	95	20180528	931.75	963.9	-0.03335	-
31	20180222	1076.03	1087.15	-0.01023	-	96	20180529	952.18	931.75	0.02193	+
32	20180223	1102.85	1076.03	0.02492	+	97	20180530	948.5	952.18	-0.00386	-
33	20180226	1114.53	1102.85	0.01059	+	98	20180531	971.25	948.5	0.02399	+
34	20180227	1119.61	1114.53	0.00456	+	99	20180601	992.87	971.25	0.02226	+
35	20180228	1121.54	1119.61	0.00172	+	100	20180604	1013.78	992.87	0.02106	+
36	20180301	1115.79	1121.54	-0.00513	-	101	20180605	1022.74	1013.78	0.00884	+
37	20180302	1121.21	1115.79	0.00486	+	102	20180606	1034.5	1022.74	0.01150	+
38	20180305	1093.48	1121.21	-0.02473	-	103	20180607	1036.69	1034.5	0.00212	+
39	20180306	1120.29	1093.48	0.02452	+	104	20180608	1039.01	1036.69	0.00224	+
40	20180307	1112.26	1120.29	-0.00717	-	105	20180611	1039.02	1039.01	0.00001	+
41	20180308	1124.15	1112.26	0.01069	+	106	20180612	1020.76	1039.02	-0.01757	-
42	20180309	1123.41	1124.15	-0.00066	-	107	20180613	1030.53	1020.76	0.00957	+
43	20180312	1126.29	1123.41	0.00256	+	108	20180614	1015.72	1030.53	-0.01437	-
44	20180313	1133.31	1126.29	0.00623	+	109	20180615	1016.51	1015.72	0.00078	+
45	20180314	1138.09	1133.31	0.00422	+	110	20180618	987.34	1016.51	-0.02870	-
46	20180315	1138.76	1138.09	0.00059	+	111	20180619	962.16	987.34	-0.02550	-
47	20180316	1150.19	1138.76	0.01004	+	112	20180620	980.95	962.16	0.01953	+
48	20180319	1159.22	1150.19	0.00785	+	113	20180621	969.4	980.95	-0.01177	-
49	20180320	1159.39	1159.22	0.00015	+	114	20180622	983.17	969.4	0.01420	+
50	20180321	1169.36	1159.39	0.00860	+	115	20180625	990.52	983.17	0.00748	+
51	20180322	1172.36	1169.36	0.00257	+	116	20180626	983.02	990.52	-0.00757	-
52	20180323	1153.59	1172.36	-0.01601	-	117	20180627	968.91	983.02	-0.01435	-
53	20180326	1171.22	1153.59	0.01528	+	118	20180628	957.35	968.91	-0.01193	-
54	20180327	1171.73	1171.22	0.00044	+	119	20180629	960.78	957.35	0.00358	+
55	20180328	1172.24	1171.73	0.00044	+	120	20180702	947.15	960.78	-0.01419	-
56	20180329	1167.03	1172.24	-0.00444	-	121	20180703	906.01	947.15	-0.04344	-
57	20180330	1174.46	1167.03	0.00637	+	122	20180704	914.99	906.01	0.00991	+
58	20180402	1196.61	1174.46	0.01886	+	123	20180705	899.4	914.99	-0.01704	-
59	20180403	1188.29	1196.61	-0.00695	-	124	20180706	917.51	899.4	0.02014	+
60	20180404	1191.54	1188.29	0.00274	+	125	20180709	915.12	917.51	-0.00260	-
61	20180405	1193.17	1191.54	0.00137	+	126	20180710	911.12	915.12	-0.00437	-
62	20180406	1199.96	1193.17	0.00569	+	127	20180711	893.16	911.12	-0.01971	-
63	20180409	1204.33	1199.96	0.00364	+	128	20180712	898.51	893.16	0.00599	+
64	20180410	1198.12	1204.33	-0.00516	-	129	20180713	909.72	898.51	0.01248	+
65	20180411	1167.11	1198.12	-0.02588	-	130	20180716	911.11	909.72	0.00153	+

No	Date	Pt	Pt-1	Return	Sign	No	Date	Pt	Pt-1	Return	Sign
131	20180717	921.27	911.11	0.01115	+	196	20181017	971.6	963.37	0.00854	+
132	20180718	942.39	921.27	0.02292	+	197	20181018	963.47	971.6	-0.00837	-
133	20180719	943.97	942.39	0.00168	+	198	20181019	958.36	963.47	-0.00530	-
134	20180720	933.39	943.97	-0.01121	-	199	20181022	953.51	958.36	-0.00506	-
135	20180723	936.74	933.39	0.00359	+	200	20181023	939.68	953.51	-0.01450	-
136	20180724	934.08	936.74	-0.00284	-	201	20181024	922.73	939.68	-0.01804	-
137	20180725	927.58	934.08	-0.00696	-	202	20181025	910.17	922.73	-0.01361	-
138	20180726	930.16	927.58	0.00278	+	203	20181026	900.82	910.17	-0.01027	-
139	20180727	935.52	930.16	0.00576	+	204	20181029	888.82	900.82	-0.01332	-
140	20180730	949.73	935.52	0.01519	+	205	20181030	888.69	888.82	-0.00015	-
141	20180731	956.39	949.73	0.00701	+	206	20181031	914.76	888.69	0.02934	+
142	20180801	952.77	956.39	-0.00379	-	207	20181101	907.96	914.76	-0.00743	-
143	20180802	953.55	952.77	0.00082	+	208	20181102	924.86	907.96	0.01861	+
144	20180803	959.6	953.55	0.00634	+	209	20181105	925.53	924.86	0.00072	+
145	20180806	960.23	959.6	0.00066	+	210	20181106	922.05	925.53	-0.00376	-
146	20180807	956.79	960.23	-0.00358	-	211	20181107	922.16	922.05	0.00012	+
147	20180808	966.27	956.79	0.00991	+	212	20181108	926.28	922.16	0.00447	+
148	20180809	963.5	966.27	-0.00287	-	213	20181109	914.29	926.28	-0.01294	-
149	20180810	968.47	963.5	0.00516	+	214	20181112	918.12	914.29	0.00419	+
150	20180813	978.04	968.47	0.00988	+	215	20181113	905.38	918.12	-0.01388	-
151	20180814	978.27	978.04	0.00024	+	216	20181114	900.93	905.38	-0.00492	-
152	20180815	961.37	978.27	-0.01728	-	217	20181115	897.15	900.93	-0.00420	-
153	20180816	964.28	961.37	0.00303	+	218	20181116	898.19	897.15	0.00116	+
154	20180817	968.88	964.28	0.00477	+	219	20181119	916.06	898.19	0.01990	+
155	20180820	969.62	968.88	0.00076	+	220	20181120	919.02	916.06	0.00323	+
156	20180821	979.21	969.62	0.00989	+	221	20181121	922.56	919.02	0.00385	+
157	20180822	982.15	979.21	0.00300	+	222	20181122	924.42	922.56	0.00202	+
158	20180823	987.36	982.15	0.00530	+	223	20181123	917.97	924.42	-0.00698	-
159	20180824	987.05	987.36	-0.00031	-	224	20181126	921.03	917.97	0.00333	+
160	20180827	991.92	987.05	0.00493	+	225	20181127	923.12	921.03	0.00227	+
161	20180828	995.19	991.92	0.00330	+	226	20181128	930.2	923.12	0.00767	+
162	20180829	988.17	995.19	-0.00705	-	227	20181129	926.79	930.2	-0.00367	-
163	20180830	998.07	988.17	0.01002	+	228	20181130	926.54	926.79	-0.00027	-
164	20180831	989.54	998.07	-0.00855	-	229	20181203	951.59	926.54	0.02704	+
165	20180904	975.94	989.54	-0.01374	-	230	20181204	958.84	951.59	0.00762	+
166	20180905	968.44	975.94	-0.00768	-	231	20181205	957.14	958.84	-0.00177	-
167	20180906	958.19	968.44	-0.01058	-	232	20181206	954.82	957.14	-0.00242	-
168	20180907	968.9	958.19	0.01118	+	233	20181207	958.59	954.82	0.00395	+
169	20180910	970.34	968.9	0.00149	+	234	20181210	955.89	958.59	-0.00282	-
170	20180911	985.06	970.34	0.01517	+	235	20181211	954.58	955.89	-0.00137	-
171	20180912	987.01	985.06	0.00198	+	236	20181212	961.28	954.58	0.00702	+
172	20180913	987.95	987.01	0.00095	+	237	20181213	960.25	961.28	-0.00107	-
173	20180914	991.34	987.95	0.00343	+	238	20181214	952.04	960.25	-0.00855	-
174	20180917	987.61	991.34	-0.00376	-	239	20181217	933.65	952.04	-0.01932	-
175	20180918	993.49	987.61	0.00595	+	240	20181218	927.25	933.65	-0.00685	-
176	20180919	995.54	993.49	0.00206	+	241	20181219	919.24	927.25	-0.00864	-
177	20180920	1004.74	995.54	0.00924	+	242	20181220	918.24	919.24	-0.00109	-
178	20180921	1002.97	1004.74	-0.00176	-	243	20181221	912.26	918.24	-0.00651	-
179	20180924	1011.29	1002.97	0.00830	+	244	20181224	908.56	912.26	-0.00406	-
180	20180925	1010.74	1011.29	-0.00054	-	245	20181225	897.94	908.56	-0.01169	-
181	20180926	1009.61	1010.74	-0.00112	-	246	20181226	891.75	897.94	-0.00689	-
182	20180927	1015.37	1009.61	0.00571	+	247	20181227	900.81	891.75	0.01016	+
183	20180928	1017.13	1015.37	0.00173	+	248	20181228	892.54	900.81	-0.00918	-
184	20181001	1012.88	1017.13	-0.00418	-	249	20190102	891.75	892.54	-0.00089	-
185	20181002	1018.79	1012.88	0.00583	+	250	20190103	878.22	891.75	-0.01517	-
186	20181003	1020.4	1018.79	0.00158	+	251	20190104	880.9	878.22	0.00305	+
187	20181004	1023.62	1020.4	0.00316	+	252	20190107	889.64	880.9	0.00992	+
188	20181005	1008.39	1023.62	-0.01488	-						
189	20181008	996.12	1008.39	-0.01217	-						
190	20181009	996.19	996.12	0.00007	+						
191	20181010	993.96	996.19	-0.00224	-						
192	20181011	945.89	993.96	-0.04836	-						
193	20181012	970.08	945.89	0.02557	+						
194	20181015	951.64	970.08	-0.01901	-						
195	20181016	963.37	951.64	0.01233	+						

Source: Compiled by author.

Appendix 5.2: Statistical results from 02 January 2018 to 07 January 2019

I. Listed companies on HOSE

1. AAA

According to the joint tests in ***Table A5.1***, Chow & Denning's maximum $|z|$statistic of HNX Index is 1.320434 and its corresponding p-value is 0.6441, so the joint null hypothesis could not be rejected. Additionally, all individual statistics could not reject the individual null hypothesis because all the variance ratio statistics are close to 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. As a result, the null hypothesis of a random walk is not rejected based on the Chow-Denning and Lo-MacKinlay tests. It is supported by the statistic result of the Wald-type test. The Wald-type statistic result of 4.077156 belongs to accepted region (0.83; 12.83) at the degree of freedom of 5 and significant level of 5%, and its p-value of 0.6986 is greater than 0.05

Table A5.1: Variance ratio test under homoscedasticity (AAA)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	1.320434	251	0.6441
Wald (Chi-Square)	4.077156	5	0.5384

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.989969	0.063119	-0.158914	0.8737
5	0.817400	0.138288	-1.320434	0.1867
10	0.761146	0.213116	-1.120769	0.2624
20	0.684627	0.313698	-1.005339	0.3147
30	0.565123	0.389208	-1.117338	0.2638

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.0032857511488)

Period	Variance	Var. Ratio	Obs.
1	0.00077	--	251
2	0.00076	0.98997	250
5	0.00063	0.81740	247
10	0.00058	0.76115	242
20	0.00052	0.68463	232
30	0.00043	0.56512	222

Source: Outcome from EViews 10.

In ***Table A5.2***, the Chow & Denning's maximum $|z|$statistic of 1.103773 has a bootstrap p-value of 0.7923. In other words, the maximum $|z|$statistic is less than the critical value of

1.96 and the p-value is more than the significance level of 0.05, so the joint null hypothesis of a martingale could not be refuted. Further, all individual statistics could not reject the individual null hypothesis of a martingale because all the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. Thus, it is unable to reject the null hypothesis of a martingale based on the Chow-Denning and Lo-MacKinlay tests.

Table A5.2: Variance ratio test under heteroscedasticity (AAA)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	1.103773	251	0.7923

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.989969	0.077628	-0.129212	0.8972
5	0.817400	0.165432	-1.103773	0.2697
10	0.761146	0.264201	-0.904062	0.3660
20	0.684627	0.365073	-0.863861	0.3877
30	0.565123	0.427652	-1.016895	0.3092

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.0032857511488)

Period	Variance	Var. Ratio	Obs.
1	0.00077	--	251
2	0.00076	0.98997	250
5	0.00063	0.81740	247
10	0.00058	0.76115	242
20	0.00052	0.68463	232
30	0.00043	0.56512	222

Source: Outcome from EViews 10.

In the Wright's rank variance ratio test in ***Table A5.3***, the Chow & Denning's maximum $|z|$statistic of 1.335044 is smaller than 1.96, and the corresponding p-value of 0.4502 is more than 0.05. Hence, there is no evidence to refute the joint null hypothesis of a random walk. All the values of z-statistics belong to (-1.96; 1.96), and their p-values are higher than 0.05, so individual statistics could not reject the individual null hypothesis of a random walk. It is supported by the statistic result of the Wald-type test.

Table A5.3: Rank variance ratio test (AAA)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 30)	1.335044	251	0.4502
Wald (Chi-Square)	3.941815	5	0.5756

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.985561	0.063119	-0.228753	0.8208
5	0.829207	0.138288	-1.235054	0.2278
10	0.768275	0.213116	-1.087322	0.3100
20	0.583422	0.313698	-1.327958	0.2060
30	0.480390	0.389208	-1.335044	0.1988

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	0.98556	0.98556	250
5	0.82921	0.82921	247
10	0.76827	0.76827	242
20	0.58342	0.58342	232
30	0.48039	0.48039	222

Source: Outcome from EViews 10.

2. BWE

In ***Table A5.4***, the Chow & Denning's maximum $|z|$statistic is 1.253687 and its corresponding p-value is 0.6922. Moreover, all the values of z-statistics in the individual statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. Thus, the joint and individual null hypotheses of a random walk could not be rejected based on these decisive tests. It is supported by the statistic result of the Wald-type test.

Table A5.4: Variance ratio test under homoscedasticity (BWE)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.253687	251	0.6922
Wald (Chi-Square)	5.258795	5	0.3851

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.995072	0.063119	-0.078081	0.9378
5	0.957588	0.138288	-0.306696	0.7591
10	0.959686	0.213116	-0.189163	0.8500
20	1.197694	0.313698	0.630204	0.5286
30	1.487945	0.389208	1.253687	0.2100

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 8.57710502431e-06)

Period	Variance	Var. Ratio	Obs.
1	0.00042	--	251
2	0.00042	0.99507	250
5	0.00040	0.95759	247
10	0.00041	0.95969	242
20	0.00051	1.19769	232
30	0.00063	1.48795	222

Source: Outcome from EViews 10.

According to ***Table A5.5***, the Chow & Denning's maximum $|z|$statistic of 1.308467 has a p-value of 0.6529, meaning that the Chow & Denning's maximum $|z|$statistic is not more than the critical value of 1.96, and the p-value is not less than 0.05. Additionally, the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Thus, the joint and individual null hypotheses of a martingale could not be rejected.

Table A5.5: Variance ratio test under heteroscedasticity (BWE)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.308467	251	0.6529

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.995072	0.050638	-0.097326	0.9225
5	0.957588	0.131653	-0.322152	0.7473
10	0.959686	0.207152	-0.194609	0.8457
20	1.197694	0.301730	0.655201	0.5123
30	1.487945	0.372914	1.308467	0.1907

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 8.57710502431e-06)

Period	Variance	Var. Ratio	Obs.
1	0.00042	--	251
2	0.00042	0.99507	250
5	0.00040	0.95759	247
10	0.00041	0.95969	242
20	0.00051	1.19769	232
30	0.00063	1.48795	222

Source: Outcome from EViews 10.

As can be seen from ***Table A5.6***, the Chow & Denning's maximum $|z|$statistic of 1.491423 is associated with the period 30 individual test, and its bootstrap p-value is 0.3260. All the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. Furthermore, in the Wald-type test, the statistic result of 6.871651 belongs to the accepted region of (0.83; 12.83), and its p-value of 0.2150 is more than 0.05. Hence, there is no evidence to reject the joint and individual null hypotheses of a random walk.

Table A5.6: Rank variance ratio test (BWE)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap:
reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 30)	1.491423	251	0.3260
Wald (Chi-Square)	6.871651	5	0.2150

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.962130	0.063119	-0.599966	0.5400
5	0.910027	0.138288	-0.650618	0.5224
10	0.981912	0.213116	-0.084874	0.9412
20	1.253194	0.313698	0.807127	0.4700
30	1.580474	0.389208	1.491423	0.1258

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	0.96213	0.96213	250
5	0.91003	0.91003	247
10	0.98191	0.98191	242
20	1.25319	1.25319	232
30	1.58047	1.58047	222

Source: Outcome from EViews 10.

3. DAG

Table A5.7 indicates that the Chow & Denning's maximum $|z|$statistic is 1.076361, and its corresponding p-value is 0.8089. All the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Hence, the statistics could not reject the joint and individual null hypotheses of a random walk. Moreover, the Wald-type statistic result is 3.00925, and its p-value of 0.6986 is greater than 0.05, so the joint null hypothesis is not rejected based on this supplementary test.

Table A5.7: Variance ratio test under homoscedasticity (DAG)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.076361	251	0.8089
Wald (Chi-Square)	3.009254	5	0.6986

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.026247	0.063119	0.415826	0.6775
5	1.061505	0.138288	0.444761	0.6565
10	0.933895	0.213116	-0.310183	0.7564
20	0.731338	0.313698	-0.856437	0.3918
30	0.581072	0.389208	-1.076361	0.2818

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00121325146497)

Period	Variance	Var. Ratio	Obs.
1	0.00046	--	251
2	0.00047	1.02625	250
5	0.00048	1.06150	247
10	0.00043	0.93390	242
20	0.00033	0.73134	232
30	0.00027	0.58107	222

Source: Outcome from EViews 10.

In ***Table A5.8***, the Chow & Denning's maximum $|z|$statistic of 1.024227 has a bootstrap p-value of 0.8387. It means that the Chow & Denning's maximum $|z|$statistic in this case is smaller than the critical value of 1.96, and the p-value is higher than 0.05. Moreover, the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Subsequently, there is a lack of evidence to reject the joint and individual null hypotheses of a martingale.

Table A5.8: Variance ratio test under heteroscedasticity (DAG)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.024227	251	0.8387

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.026247	0.074535	0.352137	0.7247
5	1.061505	0.167221	0.367806	0.7130
10	0.933895	0.246365	-0.268321	0.7885
20	0.731338	0.338250	-0.794272	0.4270
30	0.581072	0.409019	-1.024227	0.3057

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00121325146497)

Period	Variance	Var. Ratio	Obs.
1	0.00046	--	251
2	0.00047	1.02625	250
5	0.00048	1.06150	247
10	0.00043	0.93390	242
20	0.00033	0.73134	232
30	0.00027	0.58107	222

Source: Outcome from EViews 10.

Table A5.9 shows that the Chow & Denning's maximum $|z|$statistic is 1.320799, and its corresponding p-value is 0.4586. In the individual statistic tests, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Additionally, the statistic result of the Wald-type test for the joint hypotheses is 5.046908, and its p-value of 0.4176 is more than 0.05. Thus, it intimates that the joint and individual null hypotheses of a random walk could not be rejected based on these tests.

Table A5.9: Rank variance ratio test (DAG)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 30)	1.320799	251	0.4586
Wald (Chi-Square)	5.046908	5	0.4176

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.066837	0.063119	1.058901	0.3010
5	1.072115	0.138288	0.521482	0.6080
10	1.000643	0.213116	0.003016	0.9982
20	0.723528	0.313698	-0.881331	0.4370
30	0.485934	0.389208	-1.320799	0.2162

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	1.06684	1.06684	250
5	1.07211	1.07211	247
10	1.00064	1.00064	242
20	0.72353	0.72353	232
30	0.48593	0.48593	222

Source: Outcome from EViews 10.

4. DBD

According to the joint tests in ***Table A5.10***, the Chow & Denning's maximum $|z|$statistic of DBD is 0.867583, and its corresponding p-value is 0.9125. In addition, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Moreover, the statistic result of the Wald-type test for the joint hypotheses is 0.9125, and its p-value of 0.8723 is greater than 0.05. Thus, the joint and individual null hypotheses of a random walk could not be rejected in these mentioned tests.

Table A5.10: Variance ratio test under homoscedasticity (DBD)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 20) *	0.867583	251	0.9125
Wald (Chi-Square)	1.828717	5	0.8723

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.027896	0.063119	0.441963	0.6585
5	0.934949	0.138288	-0.470406	0.6381
10	0.840302	0.213116	-0.749348	0.4536
20	0.727841	0.313698	-0.867583	0.3856
30	0.677940	0.389208	-0.827476	0.4080

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00101713154428)

Period	Variance	Var. Ratio	Obs.
1	0.00021	--	251

2	0.00022	1.02790	250
5	0.00020	0.93495	247
10	0.00018	0.84030	242
20	0.00015	0.72784	232
30	0.00014	0.67794	222

Source: Outcome from EViews 10.

In ***Table A5.11***, the Chow & Denning's maximum $|z|$statistic of 0.718641 has a corresponding p-value of 0.9591. In other words, the maximum $|z|$statistic in this case is not more than the critical value of 1.96, and the p-value is higher than 0.05. Moreover, the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Subsequently, the results of these main tests provide sufficient data to fail to reject the joint and individual null hypotheses of a martingale.

Table A5.11: Variance ratio test under heteroscedasticity (DBD)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	0.718641	251	0.9591

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.027896	0.110871	0.251611	0.8013
5	0.934949	0.216641	-0.300273	0.7640
10	0.840302	0.299636	-0.532972	0.5941
20	0.727841	0.391342	-0.695450	0.4868
30	0.677940	0.448152	-0.718641	0.4724

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00101713154428)

Period	Variance	Var. Ratio	Obs.
1	0.00021	--	251
2	0.00022	1.02790	250
5	0.00020	0.93495	247
10	0.00018	0.84030	242
20	0.00015	0.72784	232
30	0.00014	0.67794	222

Source: Outcome from EViews 10.

Table A5.12 manifests that the Chow & Denning's maximum $|z|$statistic of 0.986921 has a bootstrap p-value of 0.6954. Furthermore, all the individual statistic tests indicate that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Moreover, the statistic result of the Wald-type test for the joint hypotheses of 1.500091 belongs to (0.83;12.83), and its p-value of 0.9256 is more than 0.05. As a result, there is a lack of

evidence to reject the joint and individual null hypotheses of a random walk based on these tests.

Table A5.12: Rank variance ratio test (DBD)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap:
reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	0.986921	251	0.6954
Wald (Chi-Square)	1.500091	5	0.9256

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.937706	0.063119	-0.986921	0.3264
5	0.884414	0.138288	-0.835839	0.4068
10	0.861438	0.213116	-0.650172	0.5414
20	0.753786	0.313698	-0.784875	0.4938
30	0.710331	0.389208	-0.744252	0.5576

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	0.93771	0.93771	250
5	0.88441	0.88441	247
10	0.86144	0.86144	242
20	0.75379	0.75379	232
30	0.71033	0.71033	222

Source: Outcome from EViews 10.

5. DGW

According to ***Table A5.13***, the joint null hypothesis could not be rejected because the Chow & Denning's maximum statistic of 0.687615 does not exceed the critical value of 1.96, and its bootstrap p-value of 0.9661 is significantly more than the significance level of 0.05. In the Lo-MacKinlay test, all z-statistic values belonging to (-1.96;1.96), and their appropriate bootstrap p-values are significantly greater than 0.05. Besides that, the Wald-type statistic result is 1.270915, and its p-value of 0.9379 is much greater than 0.05. Therefore, there is insufficient evidence to reject the joint and individual null hypotheses of a random walk.

Table A5.13: Variance ratio test under homoscedasticity (DGW)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	0.687615	251	0.9661
Wald (Chi-Square)	1.270915	5	0.9379

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.999097	0.063119	-0.014306	0.9886
5	1.032170	0.138288	0.232630	0.8160
10	0.962461	0.213116	-0.176144	0.8602
20	0.831018	0.313698	-0.538679	0.5901
30	0.732375	0.389208	-0.687615	0.4917

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.000275505847889)

Period	Variance	Var. Ratio	Obs.
1	0.00049	--	251
2	0.00049	0.99910	250
5	0.00051	1.03217	247
10	0.00047	0.96246	242
20	0.00041	0.83102	232
30	0.00036	0.73237	222

Source: Outcome from EViews 10.

The joint tests in ***Table A5.14*** show that the Chow & Denning's maximum $|z|$statistic is 0.567438 and its appropriate bootstrap p-value of 0.9854. In the individual tests, all the individual variance ratio statistics are close to 1, absolute values of z-statistic are all less than 1.96, and their appropriate bootstrap p-values are all significantly greater than 0.05. Therefore, the joint and null hypotheses of a martingale are strongly accepted in the case of DGW based on these major tests.

Table A5.14: Variance ratio test under heteroscedasticity (DGW)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	0.567438	251	0.9854

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.999097	0.088840	-0.010164	0.9919
5	1.032170	0.189186	0.170044	0.8650

10	0.962461	0.274821	-0.136595	0.8914
20	0.831018	0.388629	-0.434816	0.6637
30	0.732375	0.471638	-0.567438	0.5704

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.000275505847889)

Period	Variance	Var. Ratio	Obs.
1	0.00049	--	251
2	0.00049	0.99910	250
5	0.00051	1.03217	247
10	0.00047	0.96246	242
20	0.00041	0.83102	232
30	0.00036	0.73237	222

Source: Outcome from EViews 10.

Table A5.15 manifests that the Chow & Denning's maximum $|z|$statistic of 0.712624 has p-value of 0.8744. All the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are much greater than 0.05. As a result, there is a lack of evidence to reject the joint and individual null hypotheses of a random walk. Further, the Wald-type result of 2.248989 belongs to the accepted region, and its p-value of 0.8360 is more than 0.05. Hence, the joint null hypothesis of a random walk is not rejected based on these mentioned tests.

Table A5.15: Rank variance ratio test (DGW)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 20)	0.712624	251	0.8744
Wald (Chi-Square)	2.248989	5	0.8360

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.004682	0.063119	0.074182	0.9392
5	1.012878	0.138288	0.093125	0.9286
10	0.866337	0.213116	-0.627185	0.5566
20	0.776451	0.313698	-0.712624	0.5314
30	0.771595	0.389208	-0.586846	0.6556

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	1.00468	1.00468	250
5	1.01288	1.01288	247
10	0.86634	0.86634	242

20	0.77645	0.77645	232
30	0.77159	0.77159	222

Source: Outcome from EViews 10.

6. DRC

In the joint tests in ***Table A5.16***, the Chow & Denning's maximum $|z|$statistic of 1.202203 is less than the critical value of 1.96, and its corresponding p-value of 0.6922 is more than the significance level of 0.05. Furthermore, the individual variance ratio statistics are all close to 1, absolute values of z-statistic are all smaller than 1.96, and their appropriate bootstrap p-values are more than 0.05. Moreover, the Wald-type value is 3.640313, and its p-value of 0.6023 is greater than 0.05. Thus, it is unable to reject the joint and individual null hypotheses of a random walk.

Table A5.16: Variance ratio test under homoscedasticity (DRC)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.202203	251	0.7281
Wald (Chi-Square)	3.640313	5	0.6023

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.924118	0.063119	-1.202203	0.2293
5	0.992742	0.138288	-0.052483	0.9581
10	1.006039	0.213116	0.028335	0.9774
20	1.017078	0.313698	0.054441	0.9566
30	0.944061	0.389208	-0.143724	0.8857

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00068218303046)

Period	Variance	Var. Ratio	Obs.
1	0.00065	--	251
2	0.00060	0.92412	250
5	0.00065	0.99274	247
10	0.00066	1.00604	242
20	0.00066	1.01708	232
30	0.00061	0.94406	222

Source: Outcome from EViews 10.

The results of the joint tests in ***Table A5.17*** show that the Chow & Denning's maximum $|z|$statistic is 1.169928 and its p-value is 0.7498. Additionally, the individual variance ratio statistics are all close to 1, absolute values of z-statistic are all smaller than the critical value of 1.96, and their appropriate bootstrap p-values are all more than the significance level of

0.05. Therefore, the joint and individual null hypotheses of a martingale could not be rejected.

Table A5.17: Variance ratio test under heteroscedasticity (DRC)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.169928	251	0.7498

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.924118	0.064861	-1.169928	0.2420
5	0.992742	0.146732	-0.049463	0.9606
10	1.006039	0.227816	0.026506	0.9789
20	1.017078	0.331948	0.051448	0.9590
30	0.944061	0.406951	-0.137458	0.8907

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00068218303046)

Period	Variance	Var. Ratio	Obs.
1	0.00065	--	251
2	0.00060	0.92412	250
5	0.00065	0.99274	247
10	0.00066	1.00604	242
20	0.00066	1.01708	232
30	0.00061	0.94406	222

Source: Outcome from EViews 10.

The joint tests in ***Table A5.18*** manifest that the maximum $|z|$statistic of 1.130753 has a bootstrap p-value is 0.5854. The individual variance ratio statistics are all close to 1, absolute values of z-statistic are all smaller than the critical value of 1.96, and their appropriate bootstrap p-values are all more than the significance level of 0.05. Therefore, the statistics do not reject the joint and individual null hypotheses of a random walk based on the Chow-Denning and Lo-MacKinlay tests. In addition, the Wald-type result of 2.960597 does not belong to the rejection region, and its p-value of 0.7182 is much greater than 0.05.

Table A5.18: Rank variance ratio test (DRC)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.130753	251	0.5854
Wald (Chi-Square)	2.960597	5	0.7182

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.928628	0.063119	-1.130753	0.2536
5	0.949895	0.138288	-0.362326	0.7254
10	0.882571	0.213116	-0.551011	0.6204
20	0.832333	0.313698	-0.534486	0.6618
30	0.748295	0.389208	-0.646711	0.6178

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	0.92863	0.92863	250
5	0.94989	0.94989	247
10	0.88257	0.88257	242
20	0.83233	0.83233	232
30	0.74829	0.74829	222

Source: Outcome from EViews 10.

7. PLX

In the joint tests in ***Table A5.19***, the Chow & Denning's maximum $|z|$statistic of 1.190022 is more than the critical value of 1.96, and its corresponding p-value of 0.6441 is greater than the significance level of 0.05. The Lo & MacKinlay's individual variance ratio statistics are all close to 1, absolute values of z-statistic are all smaller than the critical value, and their appropriate bootstrap p-values are all more than the significance level. Therefore, results strongly support the joint and individual null hypotheses of a random walk. Moreover, the Wald-type statistic result is 5.417670, and its p-value of 0.3671 is more than 0.05. It does not offer evidence against the null hypothesis.

Table A5.19: Variance ratio test under homoscedasticity (PLX)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 20) *	1.190022	251	0.7363
Wald (Chi-Square)	5.417670	5	0.3671

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.036586	0.063119	0.579639	0.5622
5	1.059695	0.138288	0.431670	0.6660
10	0.838362	0.213116	-0.758450	0.4482
20	0.626693	0.313698	-1.190022	0.2340
30	0.538817	0.389208	-1.184925	0.2360

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00137949501385)

Period	Variance	Var. Ratio	Obs.
1	0.00107	--	251
2	0.00111	1.03659	250
5	0.00114	1.05969	247
10	0.00090	0.83836	242
20	0.00067	0.62669	232
30	0.00058	0.53882	222

Source: Outcome from EViews 10.

It can be seen from ***Table A5.20*** that the maximum $|z|$statistic of 1.043855 has a corresponding p-value of 0.8278. In addition, the individual variance ratio statistics are close to 1, absolute values of z-scores are all less than 1.96, and their bootstrap p-values are all significantly greater than 0.05. As a result, these major tests totally support the joint and individual null hypotheses of a martingale.

Table A5.20: Variance ratio test under heteroscedasticity (PLX)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.043855	251	0.8278

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.036586	0.072374	0.505518	0.6132

5	1.059695	0.174526	0.342040	0.7323
10	0.838362	0.263591	-0.613214	0.5397
20	0.626693	0.361049	-1.033954	0.3012
30	0.538817	0.441807	-1.043855	0.2966

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00137949501385)

Period	Variance	Var. Ratio	Obs.
1	0.00107	--	251
2	0.00111	1.03659	250
5	0.00114	1.05969	247
10	0.00090	0.83836	242
20	0.00067	0.62669	232
30	0.00058	0.53882	222

Source: Outcome from EViews 10.

In the joint variance ratio tests in ***Table A5.21***, the Chow & Denning's maximum statistic of 0.975795 is not more than 1.96, and its p-value of 0.7056 is greater than 0.05. Additionally, all the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. It implies that the results of these major tests strongly support the joint and individual null hypotheses of a random walk. The Richardson & Smith's Wald-Type result of 2.702319 does not belong to the rejection region, and its p-value is more than 0.05. It does not go against the joint null hypothesis of a random walk.

Table A5.21: Rank variance ratio test (PLX)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 20)	0.975795	251	0.7056
Wald (Chi-Square)	2.702319	5	0.7686

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.946556	0.063119	-0.846717	0.3968
5	0.948549	0.138288	-0.372057	0.7154
10	0.870501	0.213116	-0.607647	0.5712
20	0.693895	0.313698	-0.975795	0.3884
30	0.682565	0.389208	-0.815593	0.5154

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	0.94656	0.94656	250

5	0.94855	0.94855	247
10	0.87050	0.87050	242
20	0.69390	0.69390	232
30	0.68256	0.68256	222

Source: Outcome from EViews 10.

8. SAB

According to the joint tests in ***Table A5.22***, the Chow & Denning's maximum $|z|$statistic of 1.006794 is lower than the critical value of 1.96, and its corresponding p-value of 0.8481 is greater than the significance level of 0.05. The individual variance ratio statistics are all close to 1, absolute values of z-statistic are all smaller than 1.96, and their appropriate bootstrap p-values are all more than 0.05. Moreover, the Wald-type statistic value of 1.646222 belongs to the accepted region, and its p-value of 0.8956 is greater than 0.05. The results of these mentioned tests do not reject the joint and individual null hypotheses of a random walk in the case of SAB.

Table A5.22: Variance ratio test under homoscedasticity (SAB)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 20) *	1.006794	251	0.8481
Wald (Chi-Square)	1.646222	5	0.8956

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.943412	0.063119	-0.896530	0.3700
5	0.901136	0.138288	-0.714913	0.4747
10	0.838256	0.213116	-0.758951	0.4479
20	0.684171	0.313698	-1.006794	0.3140
30	0.619360	0.389208	-0.977987	0.3281

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000133269443641)

Period	Variance	Var. Ratio	Obs.
1	0.00032	--	251
2	0.00030	0.94341	250
5	0.00029	0.90114	247
10	0.00027	0.83826	242
20	0.00022	0.68417	232
30	0.00020	0.61936	222

Source: Outcome from EViews 10.

Table A5.23 indicates that the maximum $|z|$statistic of 0.953931 is associated with the period 30 individual test, and its bootstrap p-value is 0.8749. Besides that, in the individual

statistics, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. As a result, the joint and individual null hypotheses of a martingale could not be rejected in this case based on the Chow-Denning and Lo-MacKinlay tests.

Table A5.23: Variance ratio test under heteroscedasticity (SAB)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 20) *	0.953931	251	0.8749

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.943412	0.098512	-0.574432	0.5657
5	0.901136	0.176170	-0.561183	0.5747
10	0.838256	0.237090	-0.682207	0.4951
20	0.684171	0.331082	-0.953931	0.3401
30	0.619360	0.405317	-0.939117	0.3477

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000133269443641)

Period	Variance	Var. Ratio	Obs.
1	0.00032	--	251
2	0.00030	0.94341	250
5	0.00029	0.90114	247
10	0.00027	0.83826	242
20	0.00022	0.68417	232
30	0.00020	0.61936	222

Source: Outcome from EViews 10.

As can be seen from ***Table A5.24***, the maximum $|z|$ statistic of 2.024427 is more than 1.96 though its p-value of 0.095 is greater than 0.05. Moreover, the individual statistical results in the period 5 individual test do not accept the null hypothesis because the absolute value of z-statistic is more than 1.96, and its p-value of 0.0418 is lower than 0.05. Therefore, the joint and individual null hypotheses of a random walk are firmly rejected based on these mentioned tests. It means that the data of SAB does not meet the necessary conditions to accept the null hypothesis of a random walk.

Table A5.24: Rank variance ratio test (SAB)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	2.024427	251	0.0950
Wald (Chi-Square)	4.899507	5	0.4350

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.117996	0.063119	1.869405	0.0616
5	1.279954	0.138288	2.024427	0.0418
10	1.317627	0.213116	1.490399	0.1354
20	1.337013	0.313698	1.074325	0.3188
30	1.405931	0.389208	1.042967	0.3620

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	1.11800	1.11800	250
5	1.27995	1.27995	247
10	1.31763	1.31763	242
20	1.33701	1.33701	232
30	1.40593	1.40593	222

Source: Outcome from EViews 10.

9. SCR

According to ***Table A5.25***, the Chow & Denning's maximum $|z|$statistic is 1.448142, and its corresponding p-value is 0.5499. Additionally, in the individual tests of Lo & MacKinlay, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Hence, the statistical results from these tests significantly support the joint and individual null hypotheses of a random walk. Besides that, the statistic result of the Wald-type test for the joint hypotheses is 9.286596, and its p-value of 0.0982 is more than 0.05. Thus, the result does not go against the null hypothesis.

Table A5.25: Variance ratio test under homoscedasticity (SCR)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.448142	251	0.5499
Wald (Chi-Square)	9.286596	5	0.0982

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.908594	0.063119	-1.448142	0.1476
5	1.028119	0.138288	0.203340	0.8389
10	0.913337	0.213116	-0.406646	0.6843
20	0.771118	0.313698	-0.729625	0.4656
30	0.746688	0.389208	-0.650838	0.5152

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00106119244216)

Period	Variance	Var. Ratio	Obs.
1	0.00076	--	251
2	0.00069	0.90859	250
5	0.00078	1.02812	247
10	0.00069	0.91334	242
20	0.00058	0.77112	232
30	0.00057	0.74669	222

Source: Outcome from EViews 10.

In ***Table A5.26***, the Chow & Denning's maximum $|z|$statistic of 1.217853 has a bootstrap p-value of 0.7173. In other words, the maximum $|z|$statistic of SCR is lower than the critical value of 1.96, and the p-value is higher than 0.05. Further, all individual statistics show that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. Therefore, there is insufficient evidence to reject the joint and individual null hypotheses of a martingale.

Table A5.26: Variance ratio test under heteroscedasticity (SCR)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.217853	251	0.7173

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.908594	0.075055	-1.217853	0.2233
5	1.028119	0.158079	0.177882	0.8588
10	0.913337	0.238618	-0.363186	0.7165
20	0.771118	0.338973	-0.675221	0.4995
30	0.746688	0.411615	-0.615409	0.5383

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00106119244216)

Period	Variance	Var. Ratio	Obs.
1	0.00076	--	251

2	0.00069	0.90859	250
5	0.00078	1.02812	247
10	0.00069	0.91334	242
20	0.00058	0.77112	232
30	0.00057	0.74669	222

Source: Outcome from EViews 10.

It can be seen from ***Table A5.27*** that the Chow & Denning's maximum $|z|$statistic of 0.987598 is not greater than 1.96, and the p-value of 0.7028 is more than 0.05. Furthermore, all individual statistics indicate that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are higher than 0.05. The statistic result of the Wald-type test is 5.449250, and its p-value of 0.3742 is more than 0.05. Subsequently, there is not enough evidence to reject the joint and individual null hypotheses of a random walk.

Table A5.27: Rank variance ratio test (SCR)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 20)	0.987598	251	0.7028
Wald (Chi-Square)	5.449250	5	0.3742

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.942865	0.063119	-0.905190	0.3790
5	1.008563	0.138288	0.061922	0.9510
10	0.867946	0.213116	-0.619634	0.5776
20	0.690193	0.313698	-0.987598	0.3718
30	0.644947	0.389208	-0.912243	0.4392

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	0.94286	0.94286	250
5	1.00856	1.00856	247
10	0.86795	0.86795	242
20	0.69019	0.69019	232
30	0.64495	0.64495	222

Source: Outcome from EViews 10.

10. VCB

In the joint tests with the joint null hypothesis in ***Table A5.28***, the Chow & Denning's maximum $|z|$statistic of 1.056919 is not greater than the critical value of 1.96, and its corresponding p-value of 0.8203 is higher than the significance level of 0.05. In addition, the

Lo & MacKinlay's individual variance ratio statistics show that absolute values of z-statistic are all less than 1.96, and their appropriate bootstrap p-values are all more than 0.05. The Wald-type statistic result is 7.500282, and its p-value of 0.1860 is more than 0.05. As a result, the statistics of these major and supporting tests significantly support the joint and individual null hypotheses of a random walk in the case of VCB during the selected period.

Table A5.28: Variance ratio test under homoscedasticity (VCB)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.056919	251	0.8203
Wald (Chi-Square)	7.500282	5	0.1860

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.933288	0.063119	-1.056919	0.2905
5	1.036737	0.138288	0.265655	0.7905
10	0.904396	0.213116	-0.448601	0.6537
20	0.773821	0.313698	-0.721011	0.4709
30	0.778292	0.389208	-0.569638	0.5689

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 2.1985511379e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00062	--	251
2	0.00058	0.93329	250
5	0.00064	1.03674	247
10	0.00056	0.90440	242
20	0.00048	0.77382	232
30	0.00048	0.77829	222

Source: Outcome from EViews 10.

The results of the joint tests in ***Table A5.29*** express that the Chow & Denning's maximum $|z|$ statistic of 0.819122 is lower than 1.96, and its bootstrap p-value of 0.9301 is much higher than 0.05. Moreover, in the individual tests, absolute values of z-scores are all less than 1.96, and their appropriate bootstrap p-values are all significantly greater than 0.05. Therefore, the joint and individual null hypotheses could not be rejected according to the statistics of these decisive tests.

Table A5.29: Variance ratio test under heteroscedasticity (VCB)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	0.819122	251	0.9301

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.933288	0.081443	-0.819122	0.4127
5	1.036737	0.173801	0.211374	0.8326
10	0.904396	0.256575	-0.372616	0.7094
20	0.773821	0.359716	-0.628772	0.5295
30	0.778292	0.435470	-0.509123	0.6107

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 2.1985511379e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00062	--	251
2	0.00058	0.93329	250
5	0.00064	1.03674	247
10	0.00056	0.90440	242
20	0.00048	0.77382	232
30	0.00048	0.77829	222

Source: Outcome from EViews 10.

According to the rank variance ratio test in ***Table A5.30***, the Chow & Denning's maximum $|z|$ statistic of 1.706266 is lower than the critical value of 1.96, and its p-value of 0.2160 is greater than 0.05. All the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. Moreover, the Richardson & Smith's Wald-Type result of 3.539287 does not belong to the rejection region, and its p-value is more than 0.05. Therefore, it is unable to reject the joint and individual null hypotheses of a random walk based on these tests.

Table A5.30: Rank variance ratio test (VCB)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 251 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap:
reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.448214	251	0.3728
Wald (Chi-Square)	7.443981	5	0.1890

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.908590	0.063119	-1.448214	0.1548
5	0.995211	0.138288	-0.034634	0.9724
10	0.879299	0.213116	-0.566362	0.6152
20	0.787596	0.313698	-0.677098	0.5718
30	0.782744	0.389208	-0.558201	0.6798

Test Details (Mean = 0)			
Period	Variance	Var. Ratio	Obs.
1	1.00000	--	251
2	0.90859	0.90859	250
5	0.99521	0.99521	247
10	0.87930	0.87930	242
20	0.78760	0.78760	232
30	0.78274	0.78274	222

Source: Outcome from EViews 10.

11. YEG

The joint tests in ***Table A5.31*** manifest that the Chow & Denning's maximum $|z|$statistic of 1.014972 is less than the critical value of 0.96, and its bootstrap p-value of 0.8437 is more than the significance level of 0.05. Additionally, all individual statistics in the Lo & MacKinlay's test show that all the variance ratio statistics are close to 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are higher than 0.05. The Wald-type result is 3.760387, and its p-value of 0.5844 is greater than 0.05. Therefore, the statistical results from these tests could not reject the joint and individual null hypotheses of a random walk based on these decisive and supplementary tests.

Table A5.31: Variance ratio test under homoscedasticity (YEG)

Null Hypothesis: Log PT is a random walk
Sample: 6/26/2018 1/07/2019
Included observations: 136 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.014972	136	0.8437
Wald (Chi-Square)	3.760387	5	0.5844

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.087033	0.085749	1.014972	0.3101
5	1.034100	0.187867	0.181509	0.8560
10	0.859964	0.289523	-0.483680	0.6286
20	0.933491	0.426166	-0.156064	0.8760
30	0.981001	0.528749	-0.035932	0.9713

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00179556588612)

Period	Variance	Var. Ratio	Obs.
1	0.00134	--	136
2	0.00145	1.08703	135
5	0.00138	1.03410	132
10	0.00115	0.85996	127
20	0.00125	0.93349	117
30	0.00131	0.98100	107

Source: Outcome from EViews 10.

In ***Table A5.32***, the Chow & Denning's maximum $|z|$statistic of 0.711141 has a bootstrap p-value of 0.9609, and it is associated with the period 2 individual test. In other words, the maximum $|z|$statistic is less than 1.96, and the p-value is greater than 0.05. Further, all individual statistics indicate that all the variance ratio statistics are close to 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are greater than 0.05. Hence, the joint and individual null hypotheses of a martingale could be rejected.

Table A5.32: Variance ratio test under heteroscedasticity (YEG)

Null Hypothesis: Log PT is a martingale
Sample: 6/26/2018 1/07/2019
Included observations: 136 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	0.711141	136	0.9609

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.087033	0.122385	0.711141	0.4770
5	1.034100	0.254844	0.133805	0.8936
10	0.859964	0.363157	-0.385609	0.6998
20	0.933491	0.479216	-0.138787	0.8896
30	0.981001	0.564952	-0.033629	0.9732

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00179556588612)

Period	Variance	Var. Ratio	Obs.
1	0.00134	--	136
2	0.00145	1.08703	135
5	0.00138	1.03410	132
10	0.00115	0.85996	127
20	0.00125	0.93349	117
30	0.00131	0.98100	107

Source: Outcome from EViews 10.

In the joint tests in ***Table A5.33***, the Chow & Denning's maximum $|z|$statistic of 0.775276

is lower than the critical value, and the p-value of 0.8586 is higher that the significance level. Besides that, all individual statistics provide that all the variance ratio statistics are close to 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. The Wald-type statistic value is 2.011191, and its p-value of 0.8798 is more than 0.05. Therefore, it does not offer evidence against the individual and joint null hypotheses of a random walk based on the Chow-Denning, Lo-MacKinlay tests, and Richardson-Smith Wald test.

Table A5.33: Rank variance ratio test (YEG)

Null Hypothesis: Log PT is a random walk
Sample: 6/26/2018 1/07/2019
Included observations: 136 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	0.775276	136	0.8646
Wald (Chi-Square)	2.011191	5	0.8836

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.066479	0.085749	0.775276	0.4534
5	1.047808	0.187867	0.254480	0.8140
10	0.966856	0.289523	-0.114477	0.9246
20	1.095017	0.426166	0.222957	0.8762
30	1.160603	0.528749	0.303742	0.8692

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	136
2	1.06648	1.06648	135
5	1.04781	1.04781	132
10	0.96686	0.96686	127
20	1.09502	1.09502	117
30	1.16060	1.16060	107

Source: Outcome from EViews 10.

II. Listed companies on HNX

1. ACB

In ***Table A5.34***, the Chow & Denning's maximum statistic of 2.336909 is much greater than the critical value of 1.96 although its bootstrap p-value of 0.0935 is more than the significance level of 0.05. In the period 2 individual test, absolute value of z-statistic exceeds 1.96, and its p-values are less than 0.05. In addition, in the statistic result of the Wald-type test for the joint hypotheses, its p-value of 0.0260 is smaller than 0.05. Therefore, the joint and individual null hypotheses of a random walk are firmly rejected in these tests.

Table A5.34: Variance ratio test under homoscedasticity (ACB)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	2.336909	253	0.0935
Wald (Chi-Square)	12.73411	5	0.0260

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.853080	0.062869	-2.336909	0.0194
5	0.957845	0.137740	-0.306049	0.7596
10	0.866480	0.212272	-0.629004	0.5293
20	0.826232	0.312456	-0.556135	0.5781
30	0.846441	0.387667	-0.396110	0.6920

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000262662724284)

Period	Variance	Var. Ratio	Obs.
1	0.00066	--	253
2	0.00056	0.85308	252
5	0.00063	0.95784	249
10	0.00057	0.86648	244
20	0.00055	0.82623	234
30	0.00056	0.84644	224

Source: Outcome from EViews 10.

The output of the joint tests in ***Table A5.53*** manifests that the Chow & Denning's maximum $|z|$statistic of 1.618233 does not exceed 1.96, and its bootstrap p-value of 0.4277 is more than 0.05. Moreover, all absolute values of z-statistic are less than 1.96, and their p-values are higher than 0.05. Therefore, it is unable to refuse to accept the joint and individual null hypotheses of a martingale based on the statistical results of these tests.

Table A5.35: Variance ratio test under heteroscedasticity (ACB)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.618233	253	0.4277

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.853080	0.090791	-1.618233	0.1056
5	0.957845	0.189899	-0.221988	0.8243
10	0.866480	0.275596	-0.484477	0.6280
20	0.826232	0.376097	-0.462029	0.6441
30	0.846441	0.450340	-0.340984	0.7331

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000262662724284)

Period	Variance	Var. Ratio	Obs.
1	0.00066	--	253
2	0.00056	0.85308	252
5	0.00063	0.95784	249
10	0.00057	0.86648	244
20	0.00055	0.82623	234
30	0.00056	0.84644	224

Source: Outcome from EViews 10.

Table A5.36 shows that the Chow & Denning's maximum $|z|$statistic of 0.735519 has a corresponding bootstrap p-value of 0.8530. Besides that, all individual test has absolute z-statistic value less than 1.96, and their p-values are more than 0.05. Furthermore, the Wald-type result of 3.890164 does not fall in the rejection region, and its p-value is 0.5604. Therefore, there is not sufficient evidence to refuse to accept the joint and individual null hypotheses of a random walk based on the Chow-Denning and Lo-MacKinlay tests as well as Richardson-Smith test.

Table A5.36: Rank variance ratio test (ACB)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap:
reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	0.735519	253	0.8530
Wald (Chi-Square)	3.890164	5	0.5604

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.953758	0.062869	-0.735519	0.4546
5	1.049077	0.137740	0.356303	0.7382
10	0.992652	0.212272	-0.034618	0.9734
20	0.987117	0.312456	-0.041233	0.9754
30	1.036076	0.387667	0.093060	0.9450

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.95376	0.95376	252
5	1.04908	1.04908	249
10	0.99265	0.99265	244
20	0.98712	0.98712	234
30	1.03608	1.03608	224

Source: Outcome from EViews 10.

2. AMC

In ***Table A5.37***, the Chow & Denning's maximum statistic of 2.826031 is much higher than the critical value and its bootstrap p-value of 0.0233 is lower than the significance level. The statistical results of the period 2, 5, and 10 individual tests strongly reject the null hypothesis because their absolute values of z-statistic exceed 1.96, and their p-values are less than 0.05. To sum up, the joint and individual null hypotheses of a random walk are significantly rejected based on the results of these decisive tests.

Table A5.37: Variance ratio test under homoscedasticity (AMC)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	2.826031	253	0.0233
Wald (Chi-Square)	9.370802	5	0.0952

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.858248	0.062869	-2.254705	0.0242
5	0.610742	0.137740	-2.826031	0.0047
10	0.561116	0.212272	-2.067556	0.0387
20	0.537387	0.312456	-1.480572	0.1387
30	0.432426	0.387667	-1.464077	0.1432

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00149128154601)

Period	Variance	Var. Ratio	Obs.
1	0.00113	--	253
2	0.00097	0.85825	252
5	0.00069	0.61074	249
10	0.00064	0.56112	244
20	0.00061	0.53739	234
30	0.00049	0.43243	224

Source: Outcome from EViews 10.

Table A5.38 presents that the Chow & Denning's maximum $|z|$statistic of 2.029568 is larger than 1.96 though its bootstrap p-value of 0.1948 is greater than 0.05. In the period 5 individual test, the value of z-statistic falls in the regions beyond the critical values, and its p-value is lower than 0.05. Therefore, the joint and individual null hypotheses of a martingale is strongly rejected.

Table A5.38: Variance ratio test under heteroscedasticity (AMC)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	2.029568	253	0.1948

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.858248	0.081441	-1.740542	0.0818
5	0.610742	0.191793	-2.029568	0.0424
10	0.561116	0.289685	-1.515038	0.1298
20	0.537387	0.403718	-1.145881	0.2518
30	0.432426	0.480884	-1.180272	0.2379

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00149128154601)

Period	Variance	Var. Ratio	Obs.
1	0.00113	--	253
2	0.00097	0.85825	252
5	0.00069	0.61074	249
10	0.00064	0.56112	244
20	0.00061	0.53739	234
30	0.00049	0.43243	224

Source: Outcome from EViews 10.

The joint tests in ***Table A5.39*** show that the Chow & Denning's maximum $|z|$statistic of 1.774899 has a bootstrap p-value of 0.1750. Moreover, all the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96) and their p-values are much higher than 0.05. The Wald-type result of 5.418463 belongs to the accepted region, and its p-value is 0.3730. Thus, there is a lack of evidence against the joint and individual null hypotheses of

a random walk.

Table A5.39: Rank variance ratio test (AMC)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	1.774899	253	0.1750
Wald (Chi-Square)	5.418463	5	0.3730

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.933095	0.062869	-1.064190	0.2898
5	0.755525	0.137740	-1.774899	0.0760
10	0.727534	0.212272	-1.283573	0.2106
20	0.629347	0.312456	-1.186260	0.2564
30	0.459465	0.387667	-1.394329	0.1688

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.93309	0.93309	252
5	0.75553	0.75553	249
10	0.72753	0.72753	244
20	0.62935	0.62935	234
30	0.45947	0.45947	224

Source: Outcome from EViews 10.

3. CDN

According to ***Table A5.40***, the Chow & Denning's maximum statistic of 3.485803 exceeds the critical value, and its bootstrap p-value of 0.0025 is lower than the level of significance. Additionally, it is found from the individual tests that absolute values of z-statistic in the period 2, 5, 10 and 20 individual tests exceed the critical value, and their p-values are lower than the level of significance. Moreover, in the statistic result of the Wald-type test for the joint hypotheses under homoscedasticity, and its p-value of 0.0262 is less than 0.05. Therefore, there is powerful evidence to reject the joint and individual null hypotheses of a random walk.

Table A5.40: Variance ratio test under homoscedasticity (CDN)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	3.485803	253	0.0025
Wald (Chi-Square)	12.71081	5	0.0262

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.826660	0.062869	-2.757148	0.0058
5	0.519865	0.137740	-3.485803	0.0005
10	0.348621	0.212272	-3.068609	0.0022
20	0.297286	0.312456	-2.249004	0.0245
30	0.229273	0.387667	-1.988117	0.0468

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000833250165292)

Period	Variance	Var. Ratio	Obs.
1	0.00093	--	253
2	0.00077	0.82666	252
5	0.00048	0.51987	249
10	0.00033	0.34862	244
20	0.00028	0.29729	234
30	0.00021	0.22927	224

Source: Outcome from EViews 10.

Table A5.41 provides that the Chow & Denning's maximum $|z|$statistic of 3.131352 has a bootstrap p-value of 0.0087. In other words, the maximum $|z|$statistic in this case is over the critical value, and the p-value is lower than the level of significance. Further, the individual statistic tests show that absolute values of z-statistic in all individual periods fall in the rejection regions, and their p-values not higher than 0.05. As a result, the joint and individual null hypotheses of a martingale could be decisively rejected.

Table A5.41: Variance ratio test under heteroscedasticity (CDN)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	3.131352	253	0.0087

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.826660	0.074890	-2.314585	0.0206
5	0.519865	0.153331	-3.131352	0.0017
10	0.348621	0.221966	-2.934592	0.0033
20	0.297286	0.317736	-2.211628	0.0270
30	0.229273	0.386680	-1.993190	0.0462

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000833250165292)

Period	Variance	Var. Ratio	Obs.
1	0.00093	--	253
2	0.00077	0.82666	252
5	0.00048	0.51987	249
10	0.00033	0.34862	244
20	0.00028	0.29729	234
30	0.00021	0.22927	224

Source: Outcome from EViews 10.

Table A5.42 indicates that the Chow & Denning's maximum $|z|$statistic of 2.388084 has a bootstrap p-value of 0.0372. In the period 5 and 10 individual tests, absolute values of z-statistic exceed the critical value of 1.96, and their p-values are not higher than the significance level of 0.05. Thus, the findings from these statistical tests go against the joint and individual null hypotheses of a random walk.

Table A5.42: Rank variance ratio test (CDN)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 10)	2.388084	253	0.0372
Wald (Chi-Square)	6.842897	5	0.2242

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.890697	0.062869	-1.738576	0.0904
5	0.691767	0.137740	-2.237788	0.0226
10	0.493077	0.212272	-2.388084	0.0104
20	0.459313	0.312456	-1.730445	0.0672
30	0.408664	0.387667	-1.525373	0.1156

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.89070	0.89070	252
5	0.69177	0.69177	249
10	0.49308	0.49308	244
20	0.45931	0.45931	234
30	0.40866	0.40866	224

Source: Outcome from EViews 10.

4. CET

In ***Table A5.43***, the Chow & Denning's maximum statistic of 2.357060 is more than 1.96 although its bootstrap p-value of 0.0888 is higher than 0.05. In the period 5, 10, 20 and 30 individual tests, absolute values of z-statistic exceed 1.96, and their p-values are lower than 0.05. Therefore, there is a lack of evidence to support the joint and individual null hypotheses of a random walk based on the findings from these statistical tests.

Table A5.43: Variance ratio test under homoscedasticity (CET)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	2.357060	253	0.0888
Wald (Chi-Square)	6.492350	5	0.2612

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.880794	0.062869	-1.896093	0.0579
5	0.710556	0.137740	-2.101380	0.0356
10	0.499663	0.212272	-2.357060	0.0184
20	0.310163	0.312456	-2.207792	0.0273
30	0.213524	0.387667	-2.028743	0.0425

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00173662711377)

Period	Variance	Var. Ratio	Obs.
1	0.00195	--	253
2	0.00172	0.88079	252
5	0.00139	0.71056	249
10	0.00098	0.49966	244
20	0.00061	0.31016	234
30	0.00042	0.21352	224

Source: Outcome from EViews 10.

It is found from the joint tests in ***Table A5.44*** that the maximum $|z|$statistic of 2.161079 falls in regions beyond the critical values though its bootstrap p-value of 0.1443 is more than

the significance level of 0.05. In the period 10 and 20 individual tests, absolute values of z-statistic fall in the rejection region, and their p-values are lower than 0.05. Hence, it causes the rejection of the joint and individual null hypotheses of a martingale.

Table A5.44: Variance ratio test under heteroscedasticity (CET)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	2.161079	253	0.1443

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.880794	0.073269	-1.626960	0.1037
5	0.710556	0.152051	-1.903599	0.0570
10	0.499663	0.231522	-2.161079	0.0307
20	0.310163	0.327731	-2.104889	0.0353
30	0.213524	0.397645	-1.977836	0.0479

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00173662711377)

Period	Variance	Var. Ratio	Obs.
1	0.00195	--	253
2	0.00172	0.88079	252
5	0.00139	0.71056	249
10	0.00098	0.49966	244
20	0.00061	0.31016	234
30	0.00042	0.21352	224

Source: Outcome from EViews 10.

The results of the joint tests in ***Table A5.45*** unfold that the Chow & Denning's maximum $|z|$statistic of 2.041272 is much higher than the critical value although its bootstrap p-value is 0.0930. In the period 2 and 10 individual tests, absolute value of z-statistic is over the critical value of 1.96, and their p-values are smaller than 0.05. Therefore, it leads to the rejection of the joint and individual null hypotheses of a random walk.

Table A5.45: Rank variance ratio test (CET)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 10)	2.041272	253	0.0930
Wald (Chi-Square)	5.605064	5	0.3456

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.876331	0.062869	-1.967079	0.0494
5	0.740724	0.137740	-1.882360	0.0572
10	0.566696	0.212272	-2.041272	0.0320
20	0.412959	0.312456	-1.878800	0.0404
30	0.351788	0.387667	-1.672086	0.0670

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.87633	0.87633	252
5	0.74072	0.74072	249
10	0.56670	0.56670	244
20	0.41296	0.41296	234
30	0.35179	0.35179	224

Source: Outcome from EViews 10.

5. KHS

In ***Table A5.46***, the Chow & Denning's maximum statistic of 3.437311 is more than 1.96 although its bootstrap p-value of 0.0029 is smaller than 0.05. The individual variance ratio statistical results show that absolute values of z-statistic are all greater than 1.96, and their appropriate p-values are all less than 0.05. The result of the Wald-type test show that its statistic value of 14.04965 falls to the rejection regions, and its p-value is not over 0.05. Thus, the findings from these tests reject the joint and individual null hypotheses of a random walk.

Table A5.46: Variance ratio test under homoscedasticity (KHS)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	3.437311	253	0.0029
Wald (Chi-Square)	14.04965	5	0.0153

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.831364	0.062869	-2.682320	0.0073
5	0.558670	0.137740	-3.204077	0.0014
10	0.270356	0.212272	-3.437311	0.0006
20	0.201944	0.312456	-2.554143	0.0106
30	0.144154	0.387667	-2.207685	0.0273

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00162374395521)

Period	Variance	Var. Ratio	Obs.
1	0.00077	--	253
2	0.00064	0.83136	252
5	0.00043	0.55867	249
10	0.00021	0.27036	244
20	0.00016	0.20194	234
30	0.00011	0.14415	224

Source: Outcome from EViews 10.

It is found from the joint tests in ***Table A5.47*** that the Chow & Denning's maximum $|z|$statistic of 2.606237 exceeds the critical value of 1.96, and its bootstrap p-value of 0.0449 is lower than the significance level of 0.05. In the period 5, 10, and 20 individual tests, absolute values of z-statistic are more than 1.96, and their p-values are less than 0.05. Therefore, the joint and individual null hypotheses of a martingale are all rejected.

Table A5.47: Variance ratio test under heteroscedasticity (KHS)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	2.606237	253	0.0449

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.831364	0.088647	-1.902327	0.0571
5	0.558670	0.198056	-2.228306	0.0259
10	0.270356	0.279961	-2.606237	0.0092
20	0.201944	0.371381	-2.148886	0.0316
30	0.144154	0.441581	-1.938141	0.0526

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00162374395521)

Period	Variance	Var. Ratio	Obs.
1	0.00077	--	253
2	0.00064	0.83136	252
5	0.00043	0.55867	249
10	0.00021	0.27036	244

20	0.00016	0.20194	234
30	0.00011	0.14415	224

Source: Outcome from EViews 10.

Table A5.48 manifests that the Chow & Denning's maximum $|z|$statistic of 2.618766 is more than 1.96, and its bootstrap p-value of 0.0234 is smaller than 0.05. In the period 2, 5, and 10 individual tests, absolute values of z-statistic fall in the regions are over the critical values, and their p-values does not exceed the level of significance. Moreover, in the Wald-type statistic test, its corresponding p-value of 0.04 is less than 0.05. Subsequently, the joint and individual null hypotheses of a random walk are firmly rejected.

Table A5.48: Rank variance ratio test (KHS)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 10)	2.618766	253	0.0234
Wald (Chi-Square)	12.04229	5	0.0400

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.838498	0.062869	-2.568841	0.0130
5	0.684432	0.137740	-2.291038	0.0204
10	0.444110	0.212272	-2.618766	0.0054
20	0.457297	0.312456	-1.736898	0.0660
30	0.449546	0.387667	-1.419917	0.1554

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.83850	0.83850	252
5	0.68443	0.68443	249
10	0.44411	0.44411	244
20	0.45730	0.45730	234
30	0.44955	0.44955	224

Source: Outcome from EViews 10.

6. LDP

According to ***Table A5.49***, the Chow & Denning's maximum statistic of 2.874419 is more than 1.96, and its bootstrap p-value of 0.0201 does not exceed 0.05. Moreover, it is found from the individual tests that absolute values of z-statistic in the period 2, 5, 10 and 20 individual tests fall in the rejection regions. Therefore, these tests entirely reject the joint and individual null hypotheses of a random walk based on these major and decisive tests.

Table A5.49: Variance ratio test under homoscedasticity (LDP)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	2.874419	253	0.0201
Wald (Chi-Square)	8.602040	5	0.1260

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.856056	0.062869	-2.289565	0.0220
5	0.604077	0.137740	-2.874419	0.0040
10	0.437527	0.212272	-2.649778	0.0081
20	0.362481	0.312456	-2.040350	0.0413
30	0.317124	0.387667	-1.761502	0.0782

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000756501395255)

Period	Variance	Var. Ratio	Obs.
1	0.00181	--	253
2	0.00155	0.85606	252
5	0.00109	0.60408	249
10	0.00079	0.43753	244
20	0.00066	0.36248	234
30	0.00057	0.31712	224

Source: Outcome from EViews 10.

It can be observed from ***Table A5.50*** that the Chow & Denning's maximum $|z|$statistic of 2.382483 has a p-value of 0.0831. In other words, the maximum $|z|$statistic exceeds 1.96. Further, the individual statistic tests show that absolute values of z-statistic in the period 5 and 10 individual tests are over the critical value, and their p-values are smaller than 0.05, hence the joint and individual null hypotheses of a martingale are completely unacceptable.

Table A5.50: Variance ratio test under heteroscedasticity (LDP)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	2.382483	253	0.0831

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.856056	0.078284	-1.838734	0.0660
5	0.604077	0.166181	-2.382483	0.0172
10	0.437527	0.254460	-2.210458	0.0271
20	0.362481	0.362974	-1.756375	0.0790
30	0.317124	0.436832	-1.563245	0.1180

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000756501395255)

Period	Variance	Var. Ratio	Obs.
1	0.00181	--	253
2	0.00155	0.85606	252
5	0.00109	0.60408	249
10	0.00079	0.43753	244
20	0.00066	0.36248	234
30	0.00057	0.31712	224

Source: Outcome from EViews 10.

The output of the joint tests in ***Table A5.51*** demonstrates that the Chow & Denning's maximum $|z|$statistic of 2.257842 falls in regions beyond the critical values though its bootstrap p-value is 0.0516. In the period 2, 5, and 10 individual tests, absolute values of z-statistic are more than 1.96, and their p-values does not exceed 0.05. Therefore, the findings from these tests go against the joint and individual null hypotheses of a random walk.

Table A5.51: Rank variance ratio test (LDP)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	2.257842	253	0.0516
Wald (Chi-Square)	7.055224	5	0.2112

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.858620	0.062869	-2.248781	0.0258
5	0.689005	0.137740	-2.257842	0.0182
10	0.540979	0.212272	-2.162423	0.0228
20	0.556378	0.312456	-1.419793	0.1622
30	0.564414	0.387667	-1.123610	0.3078

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253

2	0.85862	0.85862	252
5	0.68900	0.68900	249
10	0.54098	0.54098	244
20	0.55638	0.55638	234
30	0.56441	0.56441	224

Source: Outcome from EViews 10.

7. MAS

According to the joint tests in ***Table A5.52***, the Chow & Denning's maximum $|z|$statistic in the case of MAS is 1.388788, and its corresponding p-value is 0.5938. All individual statistics indicate that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are larger than 0.05. Therefore, the findings fail to reject the joint and individual hypotheses of a random walk in this case based on these major tests. Furthermore, the output of the Wald-type test does not go against the joint null hypothesis due to that the statistic value of 2.601770 falls in the accepted region, and its p-value of 0.7611 is more than 0.05.

Table A5.52: Variance ratio test under homoscedasticity (MAS)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	1.388788	253	0.5938
Wald (Chi-Square)	2.601770	5	0.7611

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.976782	0.062869	-0.369311	0.7119
5	0.868697	0.137740	-0.953265	0.3405
10	0.705200	0.212272	-1.388788	0.1649
20	0.652813	0.312456	-1.111156	0.2665
30	0.696260	0.387667	-0.783507	0.4333

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00251885167572)

Period	Variance	Var. Ratio	Obs.
1	0.00110	--	253
2	0.00107	0.97678	252
5	0.00096	0.86870	249
10	0.00078	0.70520	244
20	0.00072	0.65281	234
30	0.00077	0.69626	224

Source: Outcome from EViews 10.

In ***Table A5.53***, the Chow & Denning's maximum $|z|$statistic of 1.074222 has a corresponding p-value of 0.8101. In other words, the maximum $|z|$statistic in this case does

not exceed the critical value, and the p-value is higher than the level of significance. Moreover, the individual tests provide that all the values of z-statistics in the individual statistic tests belong to (-1.96; 1.96), and their p-values are more than 0.05. Therefore, it is unable to refuse to accept the joint and individual null hypotheses of a martingale.

Table A5.53: Variance ratio test under heteroscedasticity (MAS)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	1.074222	253	0.8101

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.976782	0.100191	-0.231741	0.8167
5	0.868697	0.197556	-0.664637	0.5063
10	0.705200	0.274432	-1.074222	0.2827
20	0.652813	0.377851	-0.918846	0.3582
30	0.696260	0.452293	-0.671556	0.5019

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00251885167572)

Period	Variance	Var. Ratio	Obs.
1	0.00110	--	253
2	0.00107	0.97678	252
5	0.00096	0.86870	249
10	0.00078	0.70520	244
20	0.00072	0.65281	234
30	0.00077	0.69626	224

Source: Outcome from EViews 10.

The joint tests in ***Table A5.54*** show that the Chow & Denning's maximum $|z|$statistic of 0.792180 has a bootstrap p-value of 0.8140. All the values of z-statistics in the individual statistic tests belong to (-1.96; 1.96), and their p-values are over 0.05. Thus, there is insufficient evidence to refute the joint and individual null hypotheses of a random walk. Moreover, the statistic value of the Wald-type test for the joint hypothesis is 2.554440, and its p-value of 0.7838 is more than 0.05.

Table A5.54: Rank variance ratio test (MAS)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	0.792180	253	0.8140
Wald (Chi-Square)	2.554440	5	0.7838

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.950196	0.062869	-0.792180	0.4204
5	0.939695	0.137740	-0.437814	0.6720
10	0.949966	0.212272	-0.235708	0.8328
20	1.063842	0.312456	0.204325	0.8712
30	1.243739	0.387667	0.628733	0.6212

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.95020	0.95020	252
5	0.93970	0.93970	249
10	0.94997	0.94997	244
20	1.06384	1.06384	234
30	1.24374	1.24374	224

Source: Outcome from EViews 10.

8. NDN

According to the joint tests in ***Table A5.55***, the Chow & Denning's maximum $|z|$statistic is 1.480210, and its corresponding p-value is 0.5263. All individual statistics indicate that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are higher than 0.05. Subsequently, it is unable to refute the joint and individual null hypotheses of a random walk based on these decisive tests. Furthermore, the statistic result from the Wald-type test of 4.542485 does not exceed the critical value, and its p-value of 0.4742 is over the level of significance, so the joint null hypothesis could not be rejected based on this supporting test.

Table A5.55: Variance ratio test under homoscedasticity (NDN)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.480210	253	0.5263
Wald (Chi-Square)	4.542485	5	0.4742

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.906940	0.062869	-1.480210	0.1388
5	0.934689	0.137740	-0.474163	0.6354
10	0.991530	0.212272	-0.039901	0.9682
20	1.115750	0.312456	0.370453	0.7110
30	1.068941	0.387667	0.177836	0.8589

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00124612659672)

Period	Variance	Var. Ratio	Obs.
1	0.00104	--	253
2	0.00094	0.90694	252
5	0.00097	0.93469	249
10	0.00103	0.99153	244
20	0.00116	1.11575	234
30	0.00111	1.06894	224

Source: Outcome from EViews 10.

In ***Table A5.56***, the Chow & Denning's maximum $|z|$ statistic of 1.055163 has a corresponding p-value of 0.8213. In other words, the maximum $|z|$ statistic is smaller than 1.96, and the p-value is over 0.05. Moreover, all the values of z-statistics in the individual statistic tests belong to (-1.96; 1.96), and their p-values are more than 0.05. Hence, the statistical results could not lead to the rejection of the joint and individual null hypotheses of a martingale.

Table A5.56: Variance ratio test under heteroscedasticity (NDN)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.055163	253	0.8213

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.906940	0.088195	-1.055163	0.2914
5	0.934689	0.182490	-0.357890	0.7204
10	0.991530	0.271592	-0.031186	0.9751
20	1.115750	0.385263	0.300444	0.7638
30	1.068941	0.470820	0.146428	0.8836

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00124612659672)

Period	Variance	Var. Ratio	Obs.
1	0.00104	--	253
2	0.00094	0.90694	252
5	0.00097	0.93469	249

10	0.00103	0.99153	244
20	0.00116	1.11575	234
30	0.00111	1.06894	224

Source: Outcome from EViews 10.

The joint tests in ***Table A5.57*** indicate that the Chow & Denning's maximum $|z|$statistic of 1.454916 has a bootstrap p-value of 0.3614. Moreover, all the individual statistic tests reveal that all the variance ratio statistics are around 1, all the values of z-statistics belong to (-1.96; 1.96), and their p-values are more than 0.05. As a result, the joint and individual null hypotheses of a random walk could not be refuted based on these major tests. In addition, the Wald-type statistic value of 3.482831 is less than the critical value, and its p-value of 0.6562 is over 0.05, hence the joint null hypothesis is not refused.

Table A5.57: Rank variance ratio test (NDN)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap:
reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.454916	253	0.3614
Wald (Chi-Square)	3.482831	5	0.6562

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.908530	0.062869	-1.454916	0.1478
5	0.846882	0.137740	-1.111643	0.2810
10	0.849345	0.212272	-0.709727	0.5176
20	0.969751	0.312456	-0.096810	0.9408
30	0.952015	0.387667	-0.123778	0.9312

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.90853	0.90853	252
5	0.84688	0.84688	249
10	0.84934	0.84934	244
20	0.96975	0.96975	234
30	0.95202	0.95202	224

Source: Outcome from EViews 10.

9. TA9

According to the joint tests in ***Table A5.58***, the Chow & Denning's maximum $|z|$statistic is 1.870570, and its corresponding p-value is 0.2716. All individual statistics manifest that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are larger than 0.05. Thus, the findings from these statistical tests do not lead to the rejection of the joint and individual

null hypotheses of a random walk. Additionally, the Wald-type statistic value of 4.548775 is less than the critical value, and its p-value of 0.4734 is more than 0.05. It indicates that the Wald-type result does not go against the null hypothesis.

Table A5.58: Variance ratio test under homoscedasticity (TA9)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.870570	253	0.2716
Wald (Chi-Square)	4.548775	5	0.4734

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.943173	0.062869	-0.903883	0.3661
5	0.875168	0.137740	-0.906289	0.3648
10	0.750045	0.212272	-1.177523	0.2390
20	0.519850	0.312456	-1.536699	0.1244
30	0.274842	0.387667	-1.870570	0.0614

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000712432365974)

Period	Variance	Var. Ratio	Obs.
1	0.00130	--	253
2	0.00123	0.94317	252
5	0.00114	0.87517	249
10	0.00098	0.75005	244
20	0.00068	0.51985	234
30	0.00036	0.27484	224

Source: Outcome from EViews 10.

According to ***Table A5.59***, the Chow & Denning's maximum $|z|$statistic of 1.850724 has a p-value of 0.2824. In other words, the maximum $|z|$statistic does not exceed the critical value of 1.96, and the p-value is larger than 0.05. Further, all the values of z-statistics in the individual statistic tests belong to (-1.96; 1.96), and their p-values are more than 0.05. Therefore, these tests provide insufficient data to refuse to accept the individual null hypotheses of a martingale.

Table A5.59: Variance ratio test under heteroscedasticity (TA9)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.850724	253	0.2824

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.943173	0.077270	-0.735427	0.4621
5	0.875168	0.158869	-0.785759	0.4320
10	0.750045	0.232022	-1.077291	0.2814
20	0.519850	0.323741	-1.483130	0.1380
30	0.274842	0.391824	-1.850724	0.0642

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000712432365974)

Period	Variance	Var. Ratio	Obs.
1	0.00130	--	253
2	0.00123	0.94317	252
5	0.00114	0.87517	249
10	0.00098	0.75005	244
20	0.00068	0.51985	234
30	0.00036	0.27484	224

Source: Outcome from EViews 10.

As can be seen from ***Table A5.60***, the Chow & Denning's maximum $|z|$statistic of 1.910451 has a bootstrap p-value of 0.1388. All individual statistics present that all the values of z-statistics belong to (-1.96; 1.96), and their p-values exceed 0.05. Thus, it is unable to reject the joint and individual null hypotheses of a random walk based on these major tests. Further, the statistic result of the Wald-type test of 5.120807 belongs to the accepted region, and its p-value of 0.4064 is more than 0.05. It does not give evidence against the joint null hypothesis.

Table A5.60: Rank variance ratio test (TA9)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap:
reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 30)	1.910451	253	0.1388
Wald (Chi-Square)	5.120807	5	0.4064

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.950541	0.062869	-0.786690	0.4594
5	0.823124	0.137740	-1.284125	0.2228
10	0.692416	0.212272	-1.449010	0.1604
20	0.507696	0.312456	-1.575598	0.1168
30	0.259382	0.387667	-1.910451	0.0230

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.95054	0.95054	252
5	0.82312	0.82312	249
10	0.69242	0.69242	244
20	0.50770	0.50770	234
30	0.25938	0.25938	224

Source: Outcome from EViews 10.

10. TVC

Table A5.61 shows that the Chow & Denning's maximum statistic of 2.608231 significantly exceeds 1.96, and its bootstrap p-value of 0.0447 is lower than 0.05. In addition, the individual statistical results provide that the absolute value of z-statistic in the period 2 individual test is 2.608231, and its p-value is 0.0091. The joint and individual null hypotheses of a random walk could be firmly rejected in these decisive tests.

Table A5.61: Variance ratio test under homoscedasticity (TVC)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	2.608231	253	0.0447
Wald (Chi-Square)	12.78058	5	0.0255

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.163978	0.062869	2.608231	0.0091
5	1.033027	0.137740	0.239778	0.8105
10	0.938240	0.212272	-0.290950	0.7711
20	0.879236	0.312456	-0.386498	0.6991
30	0.839427	0.387667	-0.414203	0.6787

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00166962318744)

Period	Variance	Var. Ratio	Obs.
1	0.00041	--	253
2	0.00048	1.16398	252
5	0.00042	1.03303	249
10	0.00038	0.93824	244
20	0.00036	0.87924	234
30	0.00034	0.83943	224

Source: Outcome from EViews 10.

The joint tests in ***Table A5.62*** indicate that the Chow & Denning's maximum $|z|$ statistic of 1.252949 is lower than the critical value of 1.96. Its bootstrap p-value of 0.6927 is much higher than the significance level of 0.05. The Lo & MacKinlay's individual variance ratio statistics are close to 1, absolute values of z-scores are all lower than 1.96, and their appropriate bootstrap p-values are all significantly higher than the significance level of 0.05. Hence, the joint and individual null hypotheses of a martingale could not be refused to accept.

Table A5.62: Variance ratio test under heteroscedasticity (TVC)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.252949	253	0.6927

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.163978	0.130874	1.252949	0.2102
5	1.033027	0.253180	0.130449	0.8962
10	0.938240	0.332215	-0.185905	0.8525
20	0.879236	0.418384	-0.288643	0.7729
30	0.839427	0.497216	-0.322943	0.7467

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00166962318744)

Period	Variance	Var. Ratio	Obs.
1	0.00041	--	253
2	0.00048	1.16398	252
5	0.00042	1.03303	249
10	0.00038	0.93824	244
20	0.00036	0.87924	234
30	0.00034	0.83943	224

Source: Outcome from EViews 10.

Table A5.63 manifests that the Chow & Denning's maximum $|z|$statistic of 1.796217 has a bootstrap p-value of 0.1672. In addition, absolute values of z-statistic in the individual tests are all smaller than 1.96, and their appropriate bootstrap p-values all significantly exceed 0.05. Hence, the joint and individual null hypotheses of a random walk are not rejected. However,

the Wald-type result of 10.72614 does not fall in the rejection region, and its p-value is 0.0568. It does not give evidence against the joint null hypothesis.

Table A5.63: Rank variance ratio test (TVC)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.796217	253	0.1672
Wald (Chi-Square)	10.72614	5	0.0568

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.112927	0.062869	1.796217	0.0716
5	0.935127	0.137740	-0.470981	0.6364
10	0.860494	0.212272	-0.657204	0.5296
20	0.749468	0.312456	-0.801818	0.4788
30	0.657589	0.387667	-0.883261	0.4590

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	1.11293	1.11293	252
5	0.93513	0.93513	249
10	0.86049	0.86049	244
20	0.74947	0.74947	234
30	0.65759	0.65759	224

Source: Outcome from EViews 10.

11. VLA

In ***Table A5.64***, the Chow & Denning's maximum statistic of 3.182560 significantly exceeds the critical value of 1.96, and its bootstrap p-value of 0.0073 is lower than 0.05. Additionally, the individual statistical results in the period 2 and 5 individual tests refuse to accept the null hypothesis. Thus, the joint and individual null hypotheses of a random walk are rejected. Besides that, in the statistic value of the Wald-type test, its p-value of 0.0320 is smaller than 0.05. Therefore, the null hypothesis could be decisively rejected in these major and supplementary tests.

Table A5.64: Variance ratio test under homoscedasticity (VLA)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	3.182560	253	0.0073
Wald (Chi-Square)	12.21038	5	0.0320

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.799914	0.062869	-3.182560	0.0015
5	0.720206	0.137740	-2.031317	0.0422
10	0.788897	0.212272	-0.994493	0.3200
20	0.819907	0.312456	-0.576380	0.5644
30	0.712383	0.387667	-0.741917	0.4581

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00113708329032)

Period	Variance	Var. Ratio	Obs.
1	0.00054	--	253
2	0.00043	0.79991	252
5	0.00039	0.72021	249
10	0.00042	0.78890	244
20	0.00044	0.81991	234
30	0.00038	0.71238	224

Source: Outcome from EViews 10.

Table A5.65 shows that the Chow & Denning's maximum $|z|$statistic of 1.399509 is lower than the critical value of 1.96 and its p-value of 0.5859 is higher than the significance level of 0.05. Furthermore, the Lo & MacKinlay's individual variance ratio statistics are close to 1, absolute values of z-statistic are all smaller than 1.96, and their appropriate p-values all significantly exceed 0.05. Thus, the joint and null hypotheses of a martingale are not rejected.

Table A5.65: Variance ratio test under heteroscedasticity (VLA)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.399509	253	0.5859

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.799914	0.142969	-1.399509	0.1617
5	0.720206	0.318441	-0.878636	0.3796
10	0.788897	0.472054	-0.447201	0.6547

20	0.819907	0.640602	-0.281131	0.7786
30	0.712383	0.724090	-0.397211	0.6912

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00113708329032)

Period	Variance	Var. Ratio	Obs.
1	0.00054	--	253
2	0.00043	0.79991	252
5	0.00039	0.72021	249
10	0.00042	0.78890	244
20	0.00044	0.81991	234
30	0.00038	0.71238	224

Source: Outcome from EViews 10.

Table A5.66 reveals that the Chow & Denning's maximum $|z|$statistic of 1.838502 has a bootstrap p-value of 0.1620. All the individual statistic tests reveal that all the values of z-statistics belong to (-1.96; 1.96), and their p-values are much more than 0.05. Thus, it is unable to reject the joint and individual null hypotheses based on these decisive tests. Additionally, the Wald-type result of 6.835066 belongs to the accepted region, and its p-value is 0.2282, meaning that this test does not give evidence against the joint null hypothesis.

Table A5.66: Rank variance ratio test (VLA)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 1/07/2019
Included observations: 253 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	1.838502	253	0.1620
Wald (Chi-Square)	6.835066	5	0.2282

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.988500	0.062869	-0.182913	0.8412
5	0.746765	0.137740	-1.838502	0.0618
10	0.636080	0.212272	-1.714406	0.0842
20	0.589187	0.312456	-1.314789	0.2048
30	0.499655	0.387667	-1.290657	0.2278

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	253
2	0.98850	0.98850	252
5	0.74676	0.74676	249
10	0.63608	0.63608	244
20	0.58919	0.58919	234
30	0.49966	0.49966	224

Source: Outcome from EViews 10.

Appendix 5.3: Data and sign of daily returns (HNX Index)

No	Date	Pt	Pt-1	Return	Sign	No	Date	Pt	Pt-1	Return	Sign
1	20180102	118.86	116.14	0.02342	+	66	20180410	136.68	137.78	-0.00798	-
2	20180103	119.18	118.86	0.00269	+	67	20180411	133.74	136.68	-0.02151	-
3	20180104	119.49	119.18	0.00260	+	68	20180412	135.63	133.74	0.01413	+
4	20180105	118.91	119.49	-0.00485	-	69	20180413	133.33	135.63	-0.01696	-
5	20180108	121.07	118.91	0.01816	+	70	20180416	133.3	133.33	-0.00023	-
6	20180109	122.14	121.07	0.00884	+	71	20180417	134.24	133.3	0.00705	+
7	20180110	121.92	122.14	-0.00180	-	72	20180418	132.77	134.24	-0.01095	-
8	20180111	122.84	121.92	0.00755	+	73	20180419	131.05	132.77	-0.01295	-
9	20180112	120.75	122.84	-0.01701	-	74	20180420	132.57	131.05	0.01160	+
10	20180115	122.03	120.75	0.01060	+	75	20180423	126.13	132.57	-0.04858	-
11	20180116	121.59	122.03	-0.00361	-	76	20180424	126.3	126.13	0.00135	+
12	20180117	120.42	121.59	-0.00962	-	77	20180426	120.11	126.3	-0.04901	-
13	20180118	121.89	120.42	0.01221	+	78	20180427	122.64	120.11	0.02106	+
14	20180119	122.39	121.89	0.00410	+	79	20180502	120.97	122.64	-0.01362	-
15	20180122	123.88	122.39	0.01217	+	80	20180503	122.5	120.97	0.01265	+
16	20180123	126.32	123.88	0.01970	+	81	20180504	122.57	122.5	0.00057	+
17	20180124	126.25	126.32	-0.00055	-	82	20180507	126.54	122.57	0.03239	+
18	20180125	126.62	126.25	0.00293	+	83	20180508	125.32	126.54	-0.00964	-
19	20180126	126.82	126.62	0.00158	+	84	20180509	123.85	125.32	-0.01173	-
20	20180129	127.35	126.82	0.00418	+	85	20180510	120.95	123.85	-0.02342	-
21	20180130	127.36	127.35	0.00008	+	86	20180511	122.76	120.95	0.01496	+
22	20180131	125.89	127.36	-0.01154	-	87	20180514	123.27	122.76	0.00415	+
23	20180201	123.15	125.89	-0.02177	-	88	20180515	123.65	123.27	0.00308	+
24	20180202	123.97	123.15	0.00666	+	89	20180516	121.48	123.65	-0.01755	-
25	20180205	118.94	123.97	-0.04057	-	90	20180517	121.49	121.48	0.00008	+
26	20180206	115.63	118.94	-0.02783	-	91	20180518	121.26	121.49	-0.00189	-
27	20180207	119.62	115.63	0.03451	+	92	20180521	119.65	121.26	-0.01328	-
28	20180208	116.93	119.62	-0.02249	-	93	20180522	116.71	119.65	-0.02457	-
29	20180209	117.49	116.93	0.00479	+	94	20180523	118.1	116.71	0.01191	+
30	20180212	122.01	117.49	0.03847	+	95	20180524	117.06	118.1	-0.00881	-
31	20180213	124.3	122.01	0.01877	+	96	20180525	114.48	117.06	-0.02204	-
32	20180221	125.85	124.3	0.01247	+	97	20180528	107.37	114.48	-0.06211	-
33	20180222	124.69	125.85	-0.00922	-	98	20180529	112.88	107.37	0.05132	+
34	20180223	126.24	124.69	0.01243	+	99	20180530	111.69	112.88	-0.01054	-
35	20180226	126.18	126.24	-0.00048	-	100	20180531	114.91	111.69	0.02883	+
36	20180227	127.28	126.18	0.00872	+	101	20180601	115.74	114.91	0.00722	+
37	20180228	128.04	127.28	0.00597	+	102	20180604	118.31	115.74	0.02220	+
38	20180301	127.09	128.04	-0.00742	-	103	20180605	118.18	118.31	-0.00110	-
39	20180302	128.25	127.09	0.00913	+	104	20180606	120.41	118.18	0.01887	+
40	20180305	125.51	128.25	-0.02136	-	105	20180607	118.99	120.41	-0.01179	-
41	20180306	127.33	125.51	0.01450	+	106	20180608	119.85	118.99	0.00723	+
42	20180307	125.6	127.33	-0.01359	-	107	20180611	118.45	119.85	-0.01168	-
43	20180308	126.14	125.6	0.00430	+	108	20180612	116.48	118.45	-0.01663	-
44	20180309	127.57	126.14	0.01134	+	109	20180613	116.66	116.48	0.00155	+
45	20180312	129.06	127.57	0.01168	+	110	20180614	114.91	116.66	-0.01500	-
46	20180313	129.66	129.06	0.00465	+	111	20180615	115.9	114.91	0.00862	+
47	20180314	130.42	129.66	0.00586	+	112	20180618	113.04	115.9	-0.02468	-
48	20180315	131.28	130.42	0.00659	+	113	20180619	110.57	113.04	-0.02185	-
49	20180316	133.09	131.28	0.01379	+	114	20180620	112.1	110.57	0.01384	+
50	20180319	134.09	133.09	0.00751	+	115	20180621	110.16	112.1	-0.01731	-
51	20180320	135.28	134.09	0.00887	+	116	20180622	111.98	110.16	0.01652	+
52	20180321	134.96	135.28	-0.00237	-	117	20180625	111.99	111.98	0.00009	+
53	20180322	134.04	134.96	-0.00682	-	118	20180626	110.92	111.99	-0.00955	-
54	20180323	131.87	134.04	-0.01619	-	119	20180627	109.66	110.92	-0.01136	-
55	20180326	133.66	131.87	0.01357	+	120	20180628	107.05	109.66	-0.02380	-
56	20180327	133.28	133.66	-0.00284	-	121	20180629	106.16	107.05	-0.00831	-
57	20180328	132.55	133.28	-0.00548	-	122	20180702	102.76	106.16	-0.03203	-
58	20180329	131.87	132.55	-0.00513	-	123	20180703	98.79	102.76	-0.03863	-
59	20180330	132.45	131.87	0.00440	+	124	20180704	99.99	98.79	0.01215	+
60	20180402	135.4	132.45	0.02227	+	125	20180705	96.38	99.99	-0.03610	-
61	20180403	135.62	135.4	0.00162	+	126	20180706	100.69	96.38	0.04472	+
62	20180404	135.32	135.62	-0.00221	-	127	20180709	100.75	100.69	0.00060	+
63	20180405	136.75	135.32	0.01057	+	128	20180710	101.62	100.75	0.00864	+
64	20180406	138.01	136.75	0.00921	+	129	20180711	98.52	101.62	-0.03051	-
65	20180409	137.78	138.01	-0.00167	-	130	20180712	100.43	98.52	0.01939	+

No	Date	Pt	Pt-1	Return	Sign	No	Date	Pt	Pt-1	Return	Sign
131	20180713	102.51	100.43	0.02071	+	196	20181015	107.67	109.75	-0.01895	-
132	20180716	103.12	102.51	0.00595	+	197	20181016	108.59	107.67	0.00854	+
133	20180717	104.82	103.12	0.01649	+	198	20181017	109.39	108.59	0.00737	+
134	20180718	106.92	104.82	0.02003	+	199	20181018	107.91	109.39	-0.01353	-
135	20180719	105.58	106.92	-0.01253	-	200	20181019	108.09	107.91	0.00167	+
136	20180720	107.61	105.58	0.01923	+	201	20181022	107.54	108.09	-0.00509	-
137	20180723	106.3	107.61	-0.01217	-	202	20181023	105.06	107.54	-0.02306	-
138	20180724	105.54	106.3	-0.00715	-	203	20181024	103.73	105.06	-0.01266	-
139	20180725	103.58	105.54	-0.01857	-	204	20181025	103.09	103.73	-0.00617	-
140	20180726	104.58	103.58	0.00965	+	205	20181026	101.79	103.09	-0.01261	-
141	20180727	105.7	104.58	0.01071	+	206	20181029	101.17	101.79	-0.00609	-
142	20180730	106.75	105.7	0.00993	+	207	20181030	101.72	101.17	0.00544	+
143	20180731	106.15	106.75	-0.00562	-	208	20181031	105.35	101.72	0.03569	+
144	20180801	105.56	106.15	-0.00556	-	209	20181101	103.36	105.35	-0.01889	-
145	20180802	105.65	105.56	0.00085	+	210	20181102	105.75	103.36	0.02312	+
146	20180803	106.24	105.65	0.00558	+	211	20181105	105.53	105.75	-0.00208	-
147	20180806	105.59	106.24	-0.00612	-	212	20181106	104.55	105.53	-0.00929	-
148	20180807	105.71	105.59	0.00114	+	213	20181107	104.19	104.55	-0.00344	-
149	20180808	107.66	105.71	0.01845	+	214	20181108	104.53	104.19	0.00326	+
150	20180809	107.79	107.66	0.00121	+	215	20181109	103.01	104.53	-0.01454	-
151	20180810	108.41	107.79	0.00575	+	216	20181112	103.36	103.01	0.00340	+
152	20180813	110.46	108.41	0.01891	+	217	20181113	102.47	103.36	-0.00861	-
153	20180814	109.78	110.46	-0.00616	-	218	20181114	101.19	102.47	-0.01249	-
154	20180815	108.02	109.78	-0.01603	-	219	20181115	101.01	101.19	-0.00178	-
155	20180816	107.91	108.02	-0.00102	-	220	20181116	103.01	101.01	0.01980	+
156	20180817	108.02	107.91	0.00102	+	221	20181119	103.94	103.01	0.00903	+
157	20180820	108.06	108.02	0.00037	+	222	20181120	103.9	103.94	-0.00038	-
158	20180821	110.02	108.06	0.01814	+	223	20181121	103.89	103.9	-0.00010	-
159	20180822	109.98	110.02	-0.00036	-	224	20181122	104.55	103.89	0.00635	+
160	20180823	110.51	109.98	0.00482	+	225	20181123	104.27	104.55	-0.00268	-
161	20180824	111.61	110.51	0.00995	+	226	20181126	103.97	104.27	-0.00288	-
162	20180827	111.61	111.61	0.00000	=	227	20181127	103.18	103.97	-0.00760	-
163	20180828	112.23	111.61	0.00556	+	228	20181128	104.09	103.18	0.00882	+
164	20180829	112.78	112.23	0.00490	+	229	20181129	104.17	104.09	0.00077	+
165	20180830	113.58	112.78	0.00709	+	230	20181130	104.82	104.17	0.00624	+
166	20180831	112.79	113.58	-0.00696	-	231	20181203	107.63	104.82	0.02681	+
167	20180904	111.22	112.79	-0.01392	-	232	20181204	107.38	107.63	-0.00232	-
168	20180905	110.46	111.22	-0.00683	-	233	20181205	107.74	107.38	0.00335	+
169	20180906	110.47	110.46	0.00009	+	234	20181206	107.09	107.74	-0.00603	-
170	20180907	111.7	110.47	0.01113	+	235	20181207	107.13	107.09	0.00037	+
171	20180910	110.69	111.7	-0.00904	-	236	20181210	106.81	107.13	-0.00299	-
172	20180911	111.42	110.69	0.00659	+	237	20181211	106.58	106.81	-0.00215	-
173	20180912	111.64	111.42	0.00197	+	238	20181212	107.67	106.58	0.01023	+
174	20180913	112.66	111.64	0.00914	+	239	20181213	107.3	107.67	-0.00344	-
175	20180914	113.36	112.66	0.00621	+	240	20181214	106.65	107.3	-0.00606	-
176	20180917	112.76	113.36	-0.00529	-	241	20181217	105	106.65	-0.01547	-
177	20180918	113.59	112.76	0.00736	+	242	20181218	104.42	105	-0.00552	-
178	20180919	114.2	113.59	0.00537	+	243	20181219	104.16	104.42	-0.00249	-
179	20180920	115.05	114.2	0.00744	+	244	20181220	104.52	104.16	0.00346	+
180	20180921	115.79	115.05	0.00643	+	245	20181221	104.44	104.52	-0.00077	-
181	20180924	115.58	115.79	-0.00181	-	246	20181224	103.34	104.44	-0.01053	-
182	20180925	115.52	115.58	-0.00052	-	247	20181225	102.43	103.34	-0.00881	-
183	20180926	115.57	115.52	0.00043	+	248	20181226	102.27	102.43	-0.00156	-
184	20180927	116.08	115.57	0.00441	+	249	20181227	103.98	102.27	0.01672	+
185	20180928	116.27	116.08	0.00164	+	250	20181228	104.23	103.98	0.00240	+
186	20181001	115.52	116.27	-0.00645	-	251	20190102	102.67	104.23	-0.01497	-
187	20181002	115	115.52	-0.00450	-	252	20190103	100.52	102.67	-0.02094	-
188	20181003	115.29	115	0.00252	+	253	20190104	100.84	100.52	0.00318	+
189	20181004	116.27	115.29	0.00850	+	254	20190107	101.92	100.84	0.01071	+
190	20181005	114.67	116.27	-0.01376	-						
191	20181008	114.38	114.67	-0.00253	-						
192	20181009	114.29	114.38	-0.00079	-						
193	20181010	113.76	114.29	-0.00464	-						
194	20181011	107.17	113.76	-0.05793	-						
195	20181012	109.75	107.17	0.02407	+						

Source: Compiled by author.

Appendix 5.4: Statistical tests from 02 January 2018 to 31 December 2019.

The daily prices of the two market indices and the listed stocks, excepting DGW, YEG, and LDP, have small probability values less than the significance level of 5%. It implies that the data are not normally distributed, the data of the market indices and the companies other than DGW, YEG, and LDP is further appraised from 02 January 2018 to 31 December 2019 to ensure the reliability of this research. The included observations in the output of EViews 10 refers to the number of observations with valid data for all the relevant variables out of the total observations in this period after the adjustment of the sample in each case.

I. VN Index

Variance ratio test under homoscedasticity (VN Index)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	2.051586	497	0.1855
Wald (Chi-Square)	13.51411	5	0.0190

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.000700	0.044856	0.015608	0.9875
5	1.201619	0.098275	2.051586	0.0402
10	1.170853	0.151452	1.128102	0.2593
20	1.038178	0.222931	0.171253	0.8640
30	0.992365	0.276593	-0.027605	0.9780

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -7.15338111347e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00012	--	497
2	0.00012	1.00070	496
5	0.00015	1.20162	493
10	0.00014	1.17085	488
20	0.00013	1.03818	478
30	0.00012	0.99236	468

Variance ratio test under heteroscedasticity (VN Index)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	1.390532	497	0.5925

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.000700	0.067692	0.010342	0.9917
5	1.201619	0.144994	1.390532	0.1644
10	1.170853	0.214893	0.795062	0.4266
20	1.038178	0.304677	0.125305	0.9003
30	0.992365	0.367704	-0.020765	0.9834

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -7.15338111347e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00012	--	497
2	0.00012	1.00070	496
5	0.00015	1.20162	493
10	0.00014	1.17085	488
20	0.00013	1.03818	478
30	0.00012	0.99236	468

Rank variance ratio test (VN Index)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	1.793294	497	0.1778
Wald (Chi-Square)	6.430104	5	0.2664

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.019309	0.044856	0.430472	0.6778
5	1.176236	0.098275	1.793294	0.0674
10	1.194238	0.151452	1.282507	0.2010
20	1.167488	0.222931	0.751298	0.4838
30	1.096058	0.276593	0.347291	0.7580

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	1.01931	1.01931	496
5	1.17624	1.17624	493
10	1.19424	1.19424	488
20	1.16749	1.16749	478
30	1.09606	1.09606	468

Source: Outcome from EViews 10.

II. HNX Index

Variance ratio test under homoscedasticity (HNX Index)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	2.762332	499	0.0284
Wald (Chi-Square)	23.67256	5	0.0003

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.876341	0.044766	-2.762332	0.0057
5	1.013785	0.098078	0.140552	0.8882
10	0.933716	0.151148	-0.438535	0.6610
20	0.877452	0.222484	-0.550816	0.5818
30	0.856812	0.276038	-0.518727	0.6040

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000296565080447)

Period	Variance	Var. Ratio	Obs.
1	0.00014	--	499
2	0.00012	0.87634	498
5	0.00014	1.01379	495
10	0.00013	0.93372	490
20	0.00012	0.87745	480
30	0.00012	0.85681	470

Variance ratio test under heteroscedasticity (HNX Index)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.559943	499	0.4686

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.876341	0.079271	-1.559943	0.1188
5	1.013785	0.165559	0.083264	0.9336
10	0.933716	0.237470	-0.279124	0.7801
20	0.877452	0.321131	-0.381612	0.7027
30	0.856812	0.384807	-0.372103	0.7098

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000296565080447)

Period	Variance	Var. Ratio	Obs.
1	0.00014	--	499
2	0.00012	0.87634	498

5	0.00014	1.01379	495
10	0.00013	0.93372	490
20	0.00012	0.87745	480
30	0.00012	0.85681	470

Rank variance ratio test (HNX Index)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap:
reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.147545	499	0.5534
Wald (Chi-Square)	6.145345	5	0.2798

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.948629	0.044766	-1.147545	0.2490
5	1.030443	0.098078	0.310397	0.7578
10	0.991337	0.151148	-0.057312	0.9576
20	1.001136	0.222484	0.005107	0.9968
30	1.024049	0.276038	0.087121	0.9332

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	0.94863	0.94863	498
5	1.03044	1.03044	495
10	0.99134	0.99134	490
20	1.00114	1.00114	480
30	1.02405	1.02405	470

Source: Outcome from EViews 10.

III. Listed companies on HOSE

1. AAA

Variance ratio test under homoscedasticity (AAA)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	1.518724	497	0.4982
Wald (Chi-Square)	4.396357	5	0.4939

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.986130	0.044856	-0.309201	0.7572
5	0.850748	0.098275	-1.518724	0.1288
10	0.826146	0.151452	-1.147918	0.2510
20	0.807530	0.222931	-0.863362	0.3879
30	0.764733	0.276593	-0.850590	0.3950

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00191217253816)

Period	Variance	Var. Ratio	Obs.
1	0.00053	--	497
2	0.00053	0.98613	496
5	0.00045	0.85075	493
10	0.00044	0.82615	488
20	0.00043	0.80753	478
30	0.00041	0.76473	468

Variance ratio test under heteroscedasticity (AAA)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	1.175483	497	0.7461

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.986130	0.058852	-0.235667	0.8137
5	0.850748	0.126971	-1.175483	0.2398
10	0.826146	0.202852	-0.857050	0.3914
20	0.807530	0.282373	-0.681615	0.4955
30	0.764733	0.332524	-0.707517	0.4792

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.00191217253816)

Period	Variance	Var. Ratio	Obs.
1	0.00053	--	497
2	0.00053	0.98613	496
5	0.00045	0.85075	493
10	0.00044	0.82615	488
20	0.00043	0.80753	478
30	0.00041	0.76473	468

Rank variance ratio test (AAA)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	1.347282	497	0.4252
Wald (Chi-Square)	4.426325	5	0.4876

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.977298	0.044856	-0.506115	0.6028
5	0.867596	0.098275	-1.347282	0.1876
10	0.880278	0.151452	-0.790499	0.4472

20	0.826306	0.222931	-0.779139	0.4708
30	0.838539	0.276593	-0.583751	0.6038

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	0.97730	0.97730	496
5	0.86760	0.86760	493
10	0.88028	0.88028	488
20	0.82631	0.82631	478
30	0.83854	0.83854	468

Source: Outcome from EViews 10.

2. BWE

Variance ratio test under homoscedasticity (BWE)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	0.728012	497	0.9568
Wald (Chi-Square)	4.751010	5	0.4470

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.019694	0.044856	0.439046	0.6606
5	0.979121	0.098275	-0.212453	0.8318
10	0.922129	0.151452	-0.514166	0.6071
20	1.048355	0.222931	0.216906	0.8283
30	1.201363	0.276593	0.728012	0.4666

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -1.74206493825e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00030	--	497
2	0.00031	1.01969	496
5	0.00030	0.97912	493
10	0.00028	0.92213	488
20	0.00032	1.04836	478
30	0.00037	1.20136	468

Variance ratio test under heteroscedasticity (BWE)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	0.688696	497	0.9658

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.019694	0.042242	0.466221	0.6411
5	0.979121	0.103787	-0.201170	0.8406
10	0.922129	0.163209	-0.477127	0.6333
20	1.048355	0.237130	0.203918	0.8384
30	1.201363	0.292383	0.688696	0.4910

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -1.74206493825e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00030	--	497
2	0.00031	1.01969	496
5	0.00030	0.97912	493
10	0.00028	0.92213	488
20	0.00032	1.04836	478
30	0.00037	1.20136	468

Rank variance ratio test (BWE)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 30)	0.738522	497	0.8314
Wald (Chi-Square)	4.962862	5	0.4118

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.023491	0.044856	0.523695	0.5928
5	0.965906	0.098275	-0.346922	0.7266
10	0.931792	0.151452	-0.450358	0.6592
20	1.036064	0.222931	0.161772	0.8828
30	1.204270	0.276593	0.738522	0.4996

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	1.02349	1.02349	496
5	0.96591	0.96591	493
10	0.93179	0.93179	488
20	1.03606	1.03606	478
30	1.20427	1.20427	468

Source: Outcome from EViews 10.

3. DAG

Variance ratio test under homoscedasticity (DAG)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.328480	497	0.6383
Wald (Chi-Square)	4.299466	5	0.5072

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.031171	0.044856	0.694912	0.4871
5	1.038430	0.098275	0.391043	0.6958
10	0.955328	0.151452	-0.294958	0.7680
20	0.800571	0.222931	-0.894577	0.3710
30	0.632552	0.276593	-1.328480	0.1840

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000594974911569)

Period	Variance	Var. Ratio	Obs.
1	0.00032	--	497
2	0.00033	1.03117	496
5	0.00034	1.03843	493
10	0.00031	0.95533	488
20	0.00026	0.80057	478
30	0.00021	0.63255	468

Variance ratio test under heteroscedasticity (DAG)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 30) *	1.172319	497	0.7482

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.031171	0.055722	0.559404	0.5759
5	1.038430	0.125104	0.307183	0.7587
10	0.955328	0.186448	-0.239594	0.8106
20	0.800571	0.258466	-0.771588	0.4404
30	0.632552	0.313437	-1.172319	0.2411

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000594974911569)

Period	Variance	Var. Ratio	Obs.
1	0.00032	--	497
2	0.00033	1.03117	496

5	0.00034	1.03843	493
10	0.00031	0.95533	488
20	0.00026	0.80057	478
30	0.00021	0.63255	468

Rank variance ratio test (DAG)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.671795	497	0.2396
Wald (Chi-Square)	7.915151	5	0.1634

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.074990	0.044856	1.671795	0.0944
5	1.086102	0.098275	0.876139	0.3962
10	1.099449	0.151452	0.656635	0.5458
20	0.958097	0.222931	-0.187963	0.8650
30	0.761793	0.276593	-0.861220	0.4468

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	1.07499	1.07499	496
5	1.08610	1.08610	493
10	1.09945	1.09945	488
20	0.95810	0.95810	478
30	0.76179	0.76179	468

Source: Outcome from EViews 10.

4. DBD

Variance ratio test under homoscedasticity (DBD)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	0.891214	497	0.9030
Wald (Chi-Square)	2.702539	5	0.7457

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.027302	0.044856	0.608662	0.5427
5	0.947551	0.098275	-0.533700	0.5935
10	0.865024	0.151452	-0.891214	0.3728
20	0.840063	0.222931	-0.717430	0.4731
30	0.841945	0.276593	-0.571436	0.5677

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.000158849931827)

Period	Variance	Var. Ratio	Obs.
1	0.00026	--	497
2	0.00026	1.02730	496
5	0.00024	0.94755	493
10	0.00022	0.86502	488
20	0.00022	0.84006	478
30	0.00022	0.84194	468

Variance ratio test under heteroscedasticity (DBD)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	0.663286	497	0.9709

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.027302	0.077630	0.351695	0.7251
5	0.947551	0.149946	-0.349788	0.7265
10	0.865024	0.203496	-0.663286	0.5071
20	0.840063	0.269735	-0.592942	0.5532
30	0.841945	0.317709	-0.497484	0.6188

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.000158849931827)

Period	Variance	Var. Ratio	Obs.
1	0.00026	--	497
2	0.00026	1.02730	496
5	0.00024	0.94755	493
10	0.00022	0.86502	488
20	0.00022	0.84006	478
30	0.00022	0.84194	468

Rank variance ratio test (DBD)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	1.437285	497	0.3810
Wald (Chi-Square)	3.037239	5	0.7026

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.938313	0.044856	-1.375229	0.1732
5	0.858751	0.098275	-1.437285	0.1636
10	0.808180	0.151452	-1.266539	0.2242

20	0.695977	0.222931	-1.363754	0.1882
30	0.637579	0.276593	-1.310307	0.2100

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	0.93831	0.93831	496
5	0.85875	0.85875	493
10	0.80818	0.80818	488
20	0.69598	0.69598	478
30	0.63758	0.63758	468

Source: Outcome from EViews 10.

5. DRC

Variance ratio test under homoscedasticity (DRC)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.335389	497	0.6332
Wald (Chi-Square)	4.690794	5	0.4548

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.940100	0.044856	-1.335389	0.1817
5	0.993886	0.098275	-0.062211	0.9504
10	0.997102	0.151452	-0.019135	0.9847
20	0.994536	0.222931	-0.024511	0.9804
30	0.926144	0.276593	-0.267020	0.7895

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000149727335143)

Period	Variance	Var. Ratio	Obs.
1	0.00048	--	497
2	0.00045	0.94010	496
5	0.00048	0.99389	493
10	0.00048	0.99710	488
20	0.00048	0.99454	478
30	0.00044	0.92614	468

Variance ratio test under heteroscedasticity (DRC)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.235332	497	0.7051

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.940100	0.048489	-1.235332	0.2167
5	0.993886	0.110141	-0.055509	0.9557
10	0.997102	0.171423	-0.016906	0.9865
20	0.994536	0.250561	-0.021808	0.9826
30	0.926144	0.307435	-0.240232	0.8102

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000149727335143)

Period	Variance	Var. Ratio	Obs.
1	0.00048	--	497
2	0.00045	0.94010	496
5	0.00048	0.99389	493
10	0.00048	0.99710	488
20	0.00048	0.99454	478
30	0.00044	0.92614	468

Rank variance ratio test (DRC)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.450079	497	0.3496
Wald (Chi-Square)	4.214418	5	0.5284

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.934955	0.044856	-1.450079	0.1472
5	0.936283	0.098275	-0.648355	0.5300
10	0.876667	0.151452	-0.814340	0.4282
20	0.827080	0.222931	-0.775667	0.4636
30	0.743304	0.276593	-0.928065	0.3910

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	0.93496	0.93496	496
5	0.93628	0.93628	493
10	0.87667	0.87667	488
20	0.82708	0.82708	478
30	0.74330	0.74330	468

Source: Outcome from EViews 10.

6. PLX

Variance ratio test under homoscedasticity (PLX)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 20) *	1.509040	497	0.5053
Wald (Chi-Square)	7.136878	5	0.2107

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.018666	0.044856	0.416120	0.6773
5	1.024333	0.098275	0.247600	0.8044
10	0.833755	0.151452	-1.097679	0.2723
20	0.663588	0.222931	-1.509040	0.1313
30	0.592687	0.276593	-1.472609	0.1409

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000587799643463)

Period	Variance	Var. Ratio	Obs.
1	0.00064	--	497
2	0.00065	1.01867	496
5	0.00065	1.02433	493
10	0.00053	0.83375	488
20	0.00042	0.66359	478
30	0.00038	0.59269	468

Variance ratio test under heteroscedasticity (PLX)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 20) *	1.076068	497	0.8090

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.018666	0.063628	0.293354	0.7693
5	1.024333	0.151913	0.160176	0.8727
10	0.833755	0.228296	-0.728201	0.4665
20	0.663588	0.312630	-1.076068	0.2819
30	0.592687	0.382637	-1.064489	0.2871

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000587799643463)

Period	Variance	Var. Ratio	Obs.
1	0.00064	--	497
2	0.00065	1.01867	496
5	0.00065	1.02433	493
10	0.00053	0.83375	488

20	0.00042	0.66359	478
30	0.00038	0.59269	468

Rank variance ratio test (PLX)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.637842	497	0.2562
Wald (Chi-Square)	4.171495	5	0.5324

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.926533	0.044856	-1.637842	0.1062
5	0.862897	0.098275	-1.395095	0.1626
10	0.788872	0.151452	-1.394030	0.1646
20	0.646634	0.222931	-1.585092	0.1106
30	0.603877	0.276593	-1.432152	0.1558

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	0.92653	0.92653	496
5	0.86290	0.86290	493
10	0.78887	0.78887	488
20	0.64663	0.64663	478
30	0.60388	0.60388	468

Source: Outcome from EViews 10.

7. SAB

Variance ratio test under homoscedasticity (SAB)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.952080	497	0.2300
Wald (Chi-Square)	4.402822	5	0.4930

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.912437	0.044856	-1.952080	0.0509
5	0.882593	0.098275	-1.194684	0.2322
10	0.853806	0.151452	-0.965284	0.3344
20	0.781145	0.222931	-0.981717	0.3262
30	0.721970	0.276593	-1.005197	0.3148

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom

Test Details (Mean = -0.000241089291781)

Period	Variance	Var. Ratio	Obs.
1	0.00023	--	497
2	0.00021	0.91244	496
5	0.00021	0.88259	493
10	0.00020	0.85381	488
20	0.00018	0.78114	478
30	0.00017	0.72197	468

Variance ratio test under heteroscedasticity (SAB)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.164296	497	0.7535

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.912437	0.075207	-1.164296	0.2443
5	0.882593	0.134616	-0.872165	0.3831
10	0.853806	0.182169	-0.802516	0.4223
20	0.781145	0.253146	-0.864542	0.3873
30	0.721970	0.309891	-0.897187	0.3696

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000241089291781)

Period	Variance	Var. Ratio	Obs.
1	0.00023	--	497
2	0.00021	0.91244	496
5	0.00021	0.88259	493
10	0.00020	0.85381	488
20	0.00018	0.78114	478
30	0.00017	0.72197	468

Rank variance ratio test (SAB)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	2.037932	497	0.1046
Wald (Chi-Square)	4.814326	5	0.4486

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.055901	0.044856	1.246234	0.2188
5	1.200277	0.098275	2.037932	0.0432
10	1.292694	0.151452	1.932587	0.0462
20	1.402772	0.222931	1.806712	0.0578
30	1.478713	0.276593	1.730750	0.0674

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	1.05590	1.05590	496
5	1.20028	1.20028	493
10	1.29269	1.29269	488
20	1.40277	1.40277	478
30	1.47871	1.47871	468

Source: Outcome from EViews 10.

8. SCR

Variance ratio test under homoscedasticity (SCR)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.269829	497	0.6807
Wald (Chi-Square)	9.310069	5	0.0973

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.943040	0.044856	-1.269829	0.2041
5	1.009340	0.098275	0.095042	0.9243
10	0.887547	0.151452	-0.742503	0.4578
20	0.782334	0.222931	-0.976385	0.3289
30	0.722297	0.276593	-1.004015	0.3154

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000914699294033)

Period	Variance	Var. Ratio	Obs.
1	0.00048	--	497
2	0.00045	0.94304	496
5	0.00048	1.00934	493
10	0.00043	0.88755	488
20	0.00038	0.78233	478
30	0.00035	0.72230	468

Variance ratio test under heteroscedasticity (SCR)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2)*	0.908594	497	0.8956

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.943040	0.062690	-0.908594	0.3636
5	1.009340	0.130827	0.071394	0.9431
10	0.887547	0.198528	-0.566435	0.5711

20	0.782334	0.283612	-0.767479	0.4428
30	0.722297	0.344643	-0.805771	0.4204

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000914699294033)

Period	Variance	Var. Ratio	Obs.
1	0.00048	--	497
2	0.00045	0.94304	496
5	0.00048	1.00934	493
10	0.00043	0.88755	488
20	0.00038	0.78233	478
30	0.00035	0.72230	468

Rank variance ratio test (SCR)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 10)	1.205051	497	0.5264
Wald (Chi-Square)	3.826409	5	0.5846

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.989513	0.044856	-0.233801	0.8240
5	0.967016	0.098275	-0.335632	0.7454
10	0.817493	0.151452	-1.205051	0.2452
20	0.732353	0.222931	-1.200585	0.2612
30	0.709850	0.276593	-1.049016	0.3412

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	0.98951	0.98951	496
5	0.96702	0.96702	493
10	0.81749	0.81749	488
20	0.73235	0.73235	478
30	0.70985	0.70985	468

Source: Outcome from EViews 10.

9. VCB

Variance ratio test under homoscedasticity (VCB)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2)*	1.418814	497	0.5716
Wald (Chi-Square)	5.824890	5	0.3236

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.936358	0.044856	-1.418814	0.1560
5	0.961994	0.098275	-0.386730	0.6990
10	0.875693	0.151452	-0.820767	0.4118
20	0.796058	0.222931	-0.914823	0.3603
30	0.827030	0.276593	-0.625360	0.5317

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00103898297605)

Period	Variance	Var. Ratio	Obs.
1	0.00041	--	497
2	0.00039	0.93636	496
5	0.00040	0.96199	493
10	0.00036	0.87569	488
20	0.00033	0.79606	478
30	0.00034	0.82703	468

Variance ratio test under heteroscedasticity (VCB)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2)*	1.002904	497	0.8502

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.936358	0.063458	-1.002904	0.3159
5	0.961994	0.136225	-0.278994	0.7802
10	0.875693	0.202045	-0.615242	0.5384
20	0.796058	0.284691	-0.716364	0.4738
30	0.827030	0.345369	-0.500827	0.6165

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00103898297605)

Period	Variance	Var. Ratio	Obs.
1	0.00041	--	497
2	0.00039	0.93636	496
5	0.00040	0.96199	493
10	0.00036	0.87569	488
20	0.00033	0.79606	478
30	0.00034	0.82703	468

Rank variance ratio test (VCB)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	1.706266	497	0.2176
Wald (Chi-Square)	3.539287	5	0.6316

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.923464	0.044856	-1.706266	0.0860
5	0.901845	0.098275	-0.998780	0.3102
10	0.862972	0.151452	-0.904761	0.3708
20	0.797241	0.222931	-0.909514	0.3852
30	0.791429	0.276593	-0.754072	0.5060

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	0.92346	0.92346	496
5	0.90184	0.90184	493
10	0.86297	0.86297	488
20	0.79724	0.79724	478
30	0.79143	0.79143	468

Source: Outcome from EViews 10.

IV. Listed companies on HNX

1. ACB

Variance ratio test under homoscedasticity (ACB)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	3.004744	499	0.0132
Wald (Chi-Square)	20.70229	5	0.0009

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.865489	0.044766	-3.004744	0.0027
5	0.959721	0.098078	-0.410688	0.6813
10	0.876988	0.151148	-0.813854	0.4157
20	0.821501	0.222484	-0.802302	0.4224
30	0.837634	0.276038	-0.588202	0.5564

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -6.85849413014e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00039	--	499
2	0.00034	0.86549	498
5	0.00037	0.95972	495
10	0.00034	0.87699	490
20	0.00032	0.82150	480
30	0.00032	0.83763	470

Variance ratio test under heteroscedasticity (ACB)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.706103	499	0.3690

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.865489	0.078841	-1.706103	0.0880
5	0.959721	0.165134	-0.243920	0.8073
10	0.876988	0.239952	-0.512654	0.6082
20	0.821501	0.328041	-0.544137	0.5863
30	0.837634	0.393146	-0.412991	0.6796

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -6.85849413014e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00039	--	499
2	0.00034	0.86549	498
5	0.00037	0.95972	495
10	0.00034	0.87699	490
20	0.00032	0.82150	480
30	0.00032	0.83763	470

Rank variance ratio test (ACB)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	0.826171	499	0.7914
Wald (Chi-Square)	3.843394	5	0.5748

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.963015	0.044766	-0.826171	0.4134
5	1.010614	0.098078	0.108216	0.9136
10	0.963340	0.151148	-0.242545	0.8168
20	0.911758	0.222484	-0.396621	0.7348
30	0.962542	0.276038	-0.135700	0.9036

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	0.96302	0.96302	498
5	1.01061	1.01061	495
10	0.96334	0.96334	490
20	0.91176	0.91176	480
30	0.96254	0.96254	470

Source: Outcome from EViews 10.

2. AMC

Variance ratio test under homoscedasticity (AMC)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	2.701846	499	0.0340
Wald (Chi-Square)	10.04823	5	0.0739

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.910268	0.044766	-2.004456	0.0450
5	0.735009	0.098078	-2.701846	0.0069
10	0.648111	0.151148	-2.328113	0.0199
20	0.578973	0.222484	-1.892396	0.0584
30	0.429088	0.276038	-2.068239	0.0386

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000885436377313)

Period	Variance	Var. Ratio	Obs.
1	0.00084	--	499
2	0.00077	0.91027	498
5	0.00062	0.73501	495
10	0.00054	0.64811	490
20	0.00049	0.57897	480
30	0.00036	0.42909	470

Variance ratio test under heteroscedasticity (AMC)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	1.860004	499	0.2773

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.910268	0.063617	-1.410489	0.1584
5	0.735009	0.142468	-1.860004	0.0629
10	0.648111	0.213310	-1.649663	0.0990
20	0.578973	0.301125	-1.398180	0.1621
30	0.429088	0.361737	-1.578250	0.1145

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000885436377313)

Period	Variance	Var. Ratio	Obs.
1	0.00084	--	499
2	0.00077	0.91027	498
5	0.00062	0.73501	495
10	0.00054	0.64811	490

20	0.00049	0.57897	480
30	0.00036	0.42909	470

Rank variance ratio test (AMC)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 30)	1.395559	499	0.3878
Wald (Chi-Square)	4.050833	5	0.5448

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.967034	0.044766	-0.736398	0.4608
5	0.872976	0.098078	-1.295131	0.1910
10	0.837915	0.151148	-1.072358	0.2930
20	0.755703	0.222484	-1.098044	0.2874
30	0.614773	0.276038	-1.395559	0.1710

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	0.96703	0.96703	498
5	0.87298	0.87298	495
10	0.83792	0.83792	490
20	0.75570	0.75570	480
30	0.61477	0.61477	470

Source: Outcome from EViews 10.

3. CDN

Variance ratio test under homoscedasticity (CDN)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	4.557144	499	0.0000
Wald (Chi-Square)	23.79988	5	0.0002

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.803433	0.044766	-4.390975	0.0000
5	0.553046	0.098078	-4.557144	0.0000
10	0.396737	0.151148	-3.991206	0.0001
20	0.322881	0.222484	-3.043453	0.0023
30	0.264591	0.276038	-2.664159	0.0077

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 8.89896792436e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00090	--	499
2	0.00072	0.80343	498
5	0.00050	0.55305	495
10	0.00036	0.39674	490
20	0.00029	0.32288	480
30	0.00024	0.26459	470

Variance ratio test under heteroscedasticity (CDN)

Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	4.135105	499	0.0002

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.803433	0.053517	-3.673014	0.0002
5	0.553046	0.108088	-4.135105	0.0000
10	0.396737	0.156975	-3.843038	0.0001
20	0.322881	0.226093	-2.994864	0.0027
30	0.264591	0.277002	-2.654880	0.0079

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 8.89896792436e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00090	--	499
2	0.00072	0.80343	498
5	0.00050	0.55305	495
10	0.00036	0.39674	490
20	0.00029	0.32288	480
30	0.00024	0.26459	470

Rank variance ratio test (CDN)

Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	3.932796	499	0.0016
Wald (Chi-Square)	18.23723	5	0.0052

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.823944	0.044766	-3.932796	0.0000
5	0.625795	0.098078	-3.815389	0.0004
10	0.490900	0.151148	-3.368223	0.0022
20	0.446212	0.222484	-2.489118	0.0080
30	0.398941	0.276038	-2.177452	0.0156

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	0.82394	0.82394	498
5	0.62580	0.62580	495
10	0.49090	0.49090	490
20	0.44621	0.44621	480
30	0.39894	0.39894	470

Source: Outcome from EViews 10.

4. CET

Variance ratio test under homoscedasticity (CET)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 495 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	3.631086	495	0.0014
Wald (Chi-Square)	16.60916	5	0.0053

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.836795	0.044947	-3.631086	0.0003
5	0.688355	0.098473	-3.164772	0.0016
10	0.523861	0.151757	-3.137501	0.0017
20	0.415310	0.223381	-2.617458	0.0089
30	0.311439	0.277151	-2.484428	0.0130

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000514933837634)

Period	Variance	Var. Ratio	Obs.
1	0.00191	--	495
2	0.00160	0.83679	494
5	0.00132	0.68835	491
10	0.00100	0.52386	486
20	0.00080	0.41531	476
30	0.00060	0.31144	466

Variance ratio test under heteroscedasticity (CET)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 495 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	2.935651	495	0.0165

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.836795	0.055594	-2.935651	0.0033
5	0.688355	0.115330	-2.702197	0.0069

10	0.523861	0.172743	-2.756336	0.0058
20	0.415310	0.247067	-2.366519	0.0180
30	0.311439	0.301741	-2.281961	0.0225

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000514933837634)

Period	Variance	Var. Ratio	Obs.
1	0.00191	--	495
2	0.00160	0.83679	494
5	0.00132	0.68835	491
10	0.00100	0.52386	486
20	0.00080	0.41531	476
30	0.00060	0.31144	466

Rank variance ratio test (CET)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 495 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	3.443273	495	0.0014
Wald (Chi-Square)	13.35523	5	0.0288

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.845236	0.044947	-3.443273	0.0006
5	0.727185	0.098473	-2.770450	0.0046
10	0.603047	0.151757	-2.615707	0.0066
20	0.535948	0.223381	-2.077405	0.0404
30	0.488904	0.277151	-1.844108	0.0940

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	495
2	0.84524	0.84524	492
5	0.72718	0.72718	483
10	0.60305	0.60305	468
20	0.53595	0.53595	438
30	0.48890	0.48890	408

Source: Outcome from EViews 10.

5. KHS

Variance ratio test under homoscedasticity (KHS)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	4.621437	499	0.0000

Wald (Chi-Square)	23.69739	5	0.0002

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.817974	0.044766	-4.066144	0.0000
5	0.546740	0.098078	-4.621437	0.0000
10	0.351917	0.151148	-4.287743	0.0000
20	0.300647	0.222484	-3.143389	0.0017
30	0.313235	0.276038	-2.487937	0.0128

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000171387121119)

Period	Variance	Var. Ratio	Obs.
1	0.00105	--	499
2	0.00086	0.81797	498
5	0.00057	0.54674	495
10	0.00037	0.35192	490
20	0.00032	0.30065	480
30	0.00033	0.31324	470

Variance ratio test under heteroscedasticity (KHS)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	3.568629	499	0.0018

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.817974	0.059509	-3.058812	0.0022
5	0.546740	0.127012	-3.568629	0.0004
10	0.351917	0.183644	-3.529013	0.0004
20	0.300647	0.250712	-2.789466	0.0053
30	0.313235	0.302444	-2.270717	0.0232

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000171387121119)

Period	Variance	Var. Ratio	Obs.
1	0.00105	--	499
2	0.00086	0.81797	498
5	0.00057	0.54674	495
10	0.00037	0.35192	490
20	0.00032	0.30065	480
30	0.00033	0.31324	470

Rank variance ratio test (KHS)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 10)	3.448003	499	0.0020
Wald (Chi-Square)	16.38675	5	0.0086

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.852531	0.044766	-3.294208	0.0014
5	0.666266	0.098078	-3.402755	0.0008
10	0.478842	0.151148	-3.448003	0.0008
20	0.466152	0.222484	-2.399493	0.0076
30	0.461591	0.276038	-1.950490	0.0330

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	0.85253	0.85253	498
5	0.66627	0.66627	495
10	0.47884	0.47884	490
20	0.46615	0.46615	480
30	0.46159	0.46159	470

Source: Outcome from EViews 10.

6. MAS

Variance ratio test under homoscedasticity (MAS)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	3.472905	497	0.0026
Wald (Chi-Square)	12.51666	5	0.0284

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.881871	0.044856	-2.633504	0.0085
5	0.658701	0.098275	-3.472905	0.0005
10	0.526066	0.151452	-3.129276	0.0018
20	0.477809	0.222931	-2.342388	0.0192
30	0.506619	0.276593	-1.783783	0.0745

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000795552225592)

Period	Variance	Var. Ratio	Obs.
1	0.00105	--	497
2	0.00093	0.88187	496
5	0.00069	0.65870	493
10	0.00055	0.52607	488
20	0.00050	0.47781	478
30	0.00053	0.50662	468

Variance ratio test under heteroscedasticity (MAS)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	2.478399	497	0.0643

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.881871	0.069541	-1.698693	0.0894
5	0.658701	0.137710	-2.478399	0.0132
10	0.526066	0.196690	-2.409548	0.0160
20	0.477809	0.270753	-1.928664	0.0538
30	0.506619	0.323703	-1.524177	0.1275

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000795552225592)

Period	Variance	Var. Ratio	Obs.
1	0.00105	--	497
2	0.00093	0.88187	496
5	0.00069	0.65870	493
10	0.00055	0.52607	488
20	0.00050	0.47781	478
30	0.00053	0.50662	468

Rank variance ratio test (MAS)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 497 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	2.553932	497	0.0282
Wald (Chi-Square)	9.095901	5	0.1210

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.885440	0.044856	-2.553932	0.0126
5	0.760000	0.098275	-2.442132	0.0158
10	0.723893	0.151452	-1.823070	0.0722
20	0.775416	0.222931	-1.007415	0.3764
30	0.893867	0.276593	-0.383716	0.7844

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	497
2	0.88544	0.88544	495
5	0.76000	0.76000	489
10	0.72389	0.72389	479
20	0.77542	0.77542	459
30	0.89387	0.89387	439

Source: Outcome from EViews 10.

7. NDN

Variance ratio test under homoscedasticity (NDN)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	1.034937	499	0.8328
Wald (Chi-Square)	1.245335	5	0.9405

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.953670	0.044766	-1.034937	0.3007
5	0.932027	0.098078	-0.693052	0.4883
10	0.935621	0.151148	-0.425932	0.6702
20	0.945178	0.222484	-0.246407	0.8054
30	0.921178	0.276038	-0.285548	0.7752

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00143980959628)

Period	Variance	Var. Ratio	Obs.
1	0.00074	--	499
2	0.00071	0.95367	498
5	0.00069	0.93203	495
10	0.00070	0.93562	490
20	0.00070	0.94518	480
30	0.00069	0.92118	470

Variance ratio test under heteroscedasticity (NDN)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	0.702150	499	0.9629

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.953670	0.065983	-0.702150	0.4826
5	0.932027	0.136414	-0.498283	0.6183
10	0.935621	0.203180	-0.316855	0.7514
20	0.945178	0.288931	-0.189740	0.8495
30	0.921178	0.353965	-0.222683	0.8238

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00143980959628)

Period	Variance	Var. Ratio	Obs.
1	0.00074	--	499
2	0.00071	0.95367	498
5	0.00069	0.93203	495
10	0.00070	0.93562	490

20	0.00070	0.94518	480
30	0.00069	0.92118	470

Rank variance ratio test (NDN)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	2.141895	499	0.0758
Wald (Chi-Square)	5.138088	5	0.3928

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.927066	0.044766	-1.629217	0.1040
5	0.789928	0.098078	-2.141895	0.0282
10	0.722169	0.151148	-1.838141	0.0660
20	0.745149	0.222484	-1.145480	0.2742
30	0.732235	0.276038	-0.970030	0.3798

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	0.92707	0.92707	498
5	0.78993	0.78993	495
10	0.72217	0.72217	490
20	0.74515	0.74515	480
30	0.73224	0.73224	470

Source: Outcome from EViews 10.

8. TA9

Variance ratio test under homoscedasticity (TA9)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	3.170824	499	0.0076
Wald (Chi-Square)	13.41799	5	0.0198

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.858880	0.044766	-3.152373	0.0016
5	0.689013	0.098078	-3.170824	0.0015
10	0.568883	0.151148	-2.852289	0.0043
20	0.435492	0.222484	-2.537301	0.0112
30	0.298581	0.276038	-2.541024	0.0111

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 1.6200554657e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00108	--	499
2	0.00093	0.85888	498
5	0.00074	0.68901	495
10	0.00061	0.56888	490
20	0.00047	0.43549	480
30	0.00032	0.29858	470

Variance ratio test under heteroscedasticity (TA9)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 5) *	2.741130	499	0.0302

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.858880	0.054043	-2.611243	0.0090
5	0.689013	0.113452	-2.741130	0.0061
10	0.568883	0.166957	-2.582206	0.0098
20	0.435492	0.234139	-2.410994	0.0159
30	0.298581	0.284224	-2.467834	0.0136

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 1.6200554657e-05)

Period	Variance	Var. Ratio	Obs.
1	0.00108	--	499
2	0.00093	0.85888	498
5	0.00074	0.68901	495
10	0.00061	0.56888	490
20	0.00047	0.43549	480
30	0.00032	0.29858	470

Rank variance ratio test (TA9)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 5)	3.477934	499	0.0016
Wald (Chi-Square)	14.08884	5	0.0166

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.856200	0.044766	-3.212246	0.0010
5	0.658892	0.098078	-3.477934	0.0008
10	0.564248	0.151148	-2.882952	0.0032
20	0.514241	0.222484	-2.183348	0.0204
30	0.422381	0.276038	-2.092537	0.0222

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	0.85620	0.85620	498
5	0.65889	0.65889	495
10	0.56425	0.56425	490
20	0.51424	0.51424	480
30	0.42238	0.42238	470

Source: Outcome from EViews 10.

9. TVC

Variance ratio test under homoscedasticity (TVC)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	4.208721	499	0.0001
Wald (Chi-Square)	28.07569	5	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.188408	0.044766	4.208721	0.0000
5	1.095723	0.098078	0.975988	0.3291
10	1.002303	0.151148	0.015234	0.9878
20	1.011542	0.222484	0.051877	0.9586
30	0.974852	0.276038	-0.091102	0.9274

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00163081196062)

Period	Variance	Var. Ratio	Obs.
1	0.00034	--	499
2	0.00040	1.18841	498
5	0.00037	1.09572	495
10	0.00034	1.00230	490
20	0.00034	1.01154	480
30	0.00033	0.97485	470

Variance ratio test under heteroscedasticity (TVC)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 2) *	2.085493	499	0.1719

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.188408	0.090342	2.085493	0.0370
5	1.095723	0.175371	0.545831	0.5852
10	1.002303	0.231406	0.009950	0.9921
20	1.011542	0.292432	0.039468	0.9685

30	0.974852	0.346045	-0.072671	0.9421

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = 0.00163081196062)

Period	Variance	Var. Ratio	Obs.
1	0.00034	--	499
2	0.00040	1.18841	498
5	0.00037	1.09572	495
10	0.00034	1.00230	490
20	0.00034	1.01154	480
30	0.00033	0.97485	470

Rank variance ratio test (TVC)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 2)	4.091347	499	0.0000
Wald (Chi-Square)	24.70088	5	0.0002

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.183154	0.044766	4.091347	0.0000
5	1.110044	0.098078	1.122004	0.2694
10	1.060982	0.151148	0.403460	0.7088
20	1.098184	0.222484	0.441308	0.6914
30	1.147709	0.276038	0.535104	0.6448

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	1.18315	1.18315	498
5	1.11004	1.11004	495
10	1.06098	1.06098	490
20	1.09818	1.09818	480
30	1.14771	1.14771	470

Source: Outcome from EViews 10.

10. VLA

Variance ratio test under homoscedasticity (VLA)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 10) *	1.788489	499	0.3180
Wald (Chi-Square)	9.743017	5	0.0829

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.972292	0.044766	-0.618946	0.5360
5	1.079393	0.098078	0.809490	0.4182
10	1.270326	0.151148	1.788489	0.0737
20	1.383440	0.222484	1.723453	0.0848
30	1.290501	0.276038	1.052395	0.2926

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000370390154333)

Period	Variance	Var. Ratio	Obs.
1	0.00085	--	499
2	0.00083	0.97229	498
5	0.00092	1.07939	495
10	0.00108	1.27033	490
20	0.00118	1.38344	480
30	0.00110	1.29050	470

Variance ratio test under heteroscedasticity (VLA)
Null Hypothesis: Log PT is a martingale
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Heteroskedasticity robust standard error estimates
Use biased variance estimates
User-specified lags: 2 5 10 20 30

Joint Tests	Value	df	Probability
Max |z| (at period 20) *	0.979113	499	0.8625

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.972292	0.089487	-0.309631	0.7568
5	1.079393	0.196230	0.404591	0.6858
10	1.270326	0.290239	0.931393	0.3517
20	1.383440	0.391620	0.979113	0.3275
30	1.290501	0.450263	0.645180	0.5188

*Probability approximation using studentized maximum modulus with parameter value 5 and infinite degrees of freedom
Test Details (Mean = -0.000370390154333)

Period	Variance	Var. Ratio	Obs.
1	0.00085	--	499
2	0.00083	0.97229	498
5	0.00092	1.07939	495
10	0.00108	1.27033	490
20	0.00118	1.38344	480
30	0.00110	1.29050	470

Rank variance ratio test (VLA)
Null Hypothesis: Log PT is a random walk
Sample: 1/02/2018 12/31/2019
Included observations: 499 (after adjustments)
Standard error estimates assume no heteroskedasticity
User-specified lags: 2 5 10 20 30
Test probabilities computed using permutation bootstrap: reps=5000, rng=kn, seed=1000

Joint Tests	Value	df	Probability
Max |z| (at period 20)	0.854077	499	0.7656

Wald (Chi-Square)		4.382968	5	0.4962
Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.000740	0.044766	0.016534	0.9796
5	0.986763	0.098078	-0.134968	0.8950
10	1.093948	0.151148	0.621565	0.5582
20	1.190018	0.222484	0.854077	0.4172
30	1.124352	0.276038	0.450489	0.6838

Test Details (Mean = 0)

Period	Variance	Var. Ratio	Obs.
1	1.00000	--	499
2	1.00074	1.00074	498
5	0.98676	0.98676	495
10	1.09395	1.09395	490
20	1.19002	1.19002	480
30	1.12435	1.12435	470

Source: Outcome from EViews 10.

Appendix 6.1: Information sheet

PARTICIPANT INFORMATION SHEET

THÔNG TIN VỀ PHỎNG VẤN

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

What is the purpose of the study? ***Mục đích của bài nghiên cứu?***

The research focuses on evaluating the level of market efficiency in Vietnamese stock market and the way it benefits listed companies.

Nghiên cứu tập trung vào đánh giá mức độ hiệu quả của thị trường chứng khoán Việt Nam và cách nó mang lại lợi ích cho các công ty niêm yết.

Who can take part in the study? ***Ai có thể tham gia nghiên cứu?***

Potential interviewees will be specialists, financial managers, investors, staffs and stakeholders in the Vietnamese stock market and stock exchanges in Vietnam.

Đối tượng phỏng vấn tiềm năng sẽ là các chuyên gia, nhà quản lý tài chính, nhà đầu tư, nhân viên và các bên liên quan trong thị trường chứng khoán Việt Nam và các sở giao dịch chứng khoán tại Việt Nam.

Do you have to take part? ***Anh/chị có phải tham gia không?***

It is entirely up to you to decide whether you want to take part or not. If you do decide to take part, you will be able to keep a copy of this information sheet. You will also be asked to sign a 'consent form'. If you change your mind about taking part in the study, you can withdraw at any point during the session without giving a reason and without penalty.

Anh/chị hoàn toàn có quyền quyết định rằng anh/chị có muốn tham gia hay không. Nếu anh/chị quyết định tham gia, anh chị sẽ có thể giữ một bản sao của tờ thông tin này. Anh/chị cũng sẽ được yêu cầu ký "Phiếu đồng ý". Nếu anh/chị thay đổi ý định tham gia nghiên cứu, anh/chị có thể rút lại bất kỳ lúc nào trong suốt quá trình mà không cần nêu lý do và không bị thiệt hại.

What are the possible disadvantages and risks of taking part? ***Những bất lợi và rủi ro có thể có khi tham gia là gì?***

There is no disadvantage or risk for you when taking part in the study.

Không có bất lợi hay rủi ro nào cho anh/chị khi tham gia nghiên cứu.

What are the possible benefits of taking part? ***Những lợi ích có thể có khi tham gia là gì?***

The interview section plays a key role in studying market information efficiency. Your participation in interviews provides opinions and reflects reality of listed companies, contributes an important part in researching on the development of stock market informational efficiency to bring lots of benefits and fairness to listed companies and investors. At the same time, your participation in interviews indirectly contributes to giving suggestions and recommendations to enhance and promote investment efficiency and economic development in Vietnam.

Phần phỏng vấn giữ vai trò then chốt trong việc nghiên cứu về hiệu quả thông tin của thị trường. Việc tham gia phỏng vấn của anh/chị đóng góp ý kiến và phản ánh thực tế của công ty niêm yết, đóng vai trò quan trọng trong việc nghiên cứu về sự phát triển của hiệu quả thông tin thị trường chứng khoán để mang lại nhiều lợi ích và công bằng cho công ty niêm yết và nhà đầu tư. Đồng thời, việc tham gia phỏng vấn của anh/chị gián tiếp góp phần đưa ra các đề xuất và khuyến nghị tăng cường, thúc đẩy sự hiệu quả đầu tư và phát triển kinh tế ở Việt Nam.

What if something goes wrong? ***Điều gì sẽ xảy ra nếu có gì đó không ổn?***

If you change your mind about participation, please contact me by email to cancel your participation. If you feel unhappy to continue participating in the project, please contact me in the time limit of 1 month from the interviewing date. If you feel unhappy about the conduct of the study, please contact me immediately or the Chairperson of the University of Sunderland Research Ethics Group, whose contact details are given below.

Nếu anh/chị thay đổi quyết định về việc tham gia, vui lòng liên hệ với tôi qua email để hủy việc tham gia của anh/chị. Nếu anh/chị cảm thấy không hài lòng khi tiếp tục tham gia dự án, vui lòng liên hệ với tôi trong thời hạn 1 tháng kể từ ngày phỏng vấn. Nếu bạn cảm thấy không hài lòng về việc tiến hành nghiên cứu, vui lòng liên hệ ngay với tôi hoặc Chủ tịch Tổ Đạo đức Nghiên cứu của Đại học Sunderland, chi tiết liên hệ được cung cấp bên dưới.

Will your taking part in this study be kept confidential? ***Việc anh/chị tham gia nghiên cứu này có được giữ bí mật không?***

Personal information of participants will be secured confidentially and separately when storing the raw data collected from interviews. The full audio and transcripts will only be accessible to the researcher. The data will be used only for my thesis and audio data will be removed as soon as it is possible when publications are completed from this study.

Thông tin cá nhân của người tham gia sẽ được bảo mật một cách bí mật và riêng biệt khi lưu trữ dữ liệu thu nhận từ phỏng vấn. Chỉ nhà nghiên cứu mới có thể truy cập toàn bộ âm thanh và bản ghi. Dữ liệu sẽ chỉ được sử dụng cho luận án của tôi và dữ liệu âm thanh sẽ bị xóa càng sớm càng tốt khi các ấn phẩm được hoàn thành từ nghiên cứu này.

What will happen to the results of the research study? ***Điều gì sẽ xảy ra với kết quả của nghiên cứu?***

If suitable, the results may also be presented not only in the Ph.D. thesis but also at academic conferences and/or written up for publication in peer reviewed academic journals.

Nếu phù hợp, kết quả cũng có thể được trình bày không chỉ trong luận văn Tiến sĩ mà còn tại các hội nghị học thuật và/hoặc được viết để công bố trên các tạp chí học thuật được bình duyệt.

Who is organising and funding the research? *Ai là người tổ chức và tài trợ cho nghiên cứu?*

This is PhD research of the researcher, so the research is self-funded.

Đây là nghiên cứu tiến sĩ của tác giả nên nghiên cứu được tự túc.

Who has reviewed the study? *Ai đã xem xét nghiên cứu?*

The University of Sunderland Research Ethics Group has reviewed and approved the study.

Tổ Đạo đức Nghiên cứu của Đại học Sunderland đã xem xét và phê duyệt nghiên cứu.

Contact for further information/ *Chi tiết xin liên hệ:*

Dr. John Fulton (Chair of the University of Sunderland Research Ethics Group, University of Sunderland)

Email: john.fulton@sunderland.ac.uk

Phone: (+44)191 515 2529

Dr. Hamid Seddighi (Senior Lecturer in Business Management, University of Sunderland)

Email: hamid.seddighi@sunderland.ac.uk

Phone: (+44)191 515 3109

Nguyen Hong Van Tran (PhD student, University of Sunderland)

Email: vantran810@gmail.com or bg68rz@research.sunderland.ac.uk

Phone: (+84)935 877 155

Appendix 6.2: Consent forms signed by the participants

This appendix provides the consent forms signed by the participants in the pilot study and the interviews as follows. The consent form of the first participant in the pilot study:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.
Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*
Participant code/ ***Mã số tham gia*****:** PILOT STUDY 1

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Ngô Nguyễn Bảo Trân

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 16/10/2021

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the second participant in the pilot study:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ *Mã số tham gia*: PILOT STUDY 2

I am over the age of 18 *Tôi trên 18 tuổi.*	✗
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	✗
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	✗
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	✗

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: TRẦN THUẬN HOÀ

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 12/11/2020

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM01:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ ***Mã số tham gia*****:** VNSM01

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Nguyễn Ngọc Tâm

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 02/12/2020

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM02:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ ***Mã số tham gia*****:** VNSM 02

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Trần Thị Diệu Thuý

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 17/03/2021

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM03:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ ***Mã số tham gia*****:** VNSM03

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Phan Minh Anh Tuan

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 12/11/2020

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM04:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ ***Mã số tham gia*****:** VNSM04

I am over the age of 18 *Tôi trên 18 tuổi.*	×
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	×
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	×
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	×

TỔNG GIÁM ĐỐC

CÔNG TY CỔ PHẦN CAO SU ĐÀ NẴNG

Signed/ *Ký tên:* _____

Full name/ *Họ và tên:* Lê Hoàng Khánh Nhựt

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 23/03/2021

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM05:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ ***Mã số tham gia:*** VNSM05

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Trương Quang Minh

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 04/03/2021

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM06:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ ***Mã số tham gia*****:** VNSM06

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Nguyễn Quốc Khanh.

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 30/12/2020

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM07:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ ***Mã số tham gia*****:** VNSM07

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Lê Vũ Kim Tinh

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 25/12/2020

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM08:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ *Mã số tham gia*: VNSM08

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Hoàng Công Bình

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 25/12/2020

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM09:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ *Mã số tham gia*: VNSM09

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Nguyễn Hiếu

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 31/12/2020

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

The consent form of the interviewee VNSM10:

University of Sunderland

CONSENT FORM

Phiếu đồng ý

Study title: Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam.

Đề tài: *Phản ứng của hiệu quả thị trường chứng khoán đối với chiến lược tái cấu trúc sàn chứng khoán: Dẫn chứng từ Việt Nam (tạm dịch).*

Participant code/ ***Mã số tham gia*****:** VNSM10

I am over the age of 18 *Tôi trên 18 tuổi.*	X
I have read and understood the attached study information and, by signing below, I consent to participate in this study *Tôi đã đọc và hiểu thông tin nghiên cứu đính kèm và bằng cách ký tên dưới đây, tôi đồng ý tham gia vào nghiên cứu này.*	X
I understand that I have the right to withdraw from the study without giving a reason at any time during the study itself. *Tôi hiểu rằng tôi có quyền rút khỏi nghiên cứu mà không cần đưa ra lý do vào bất kỳ lúc nào trong quá trình nghiên cứu.*	X
I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded. *Tôi hiểu rằng tôi cũng có quyền thay đổi quyết định về việc tham gia nghiên cứu trong một thời gian ngắn sau khi nghiên cứu kết thúc.*	X

Signed/ *Ký tên*: _____

Full name/ *Họ và tên*: Phạm Hồng Lấn

(Your name, along with your participant code is important to help match your data. It will not be used for any purpose other than this.

Tên của bạn, cùng với mã số tham gia của bạn rất quan trọng để giúp khớp nối dữ liệu của bạn. Nó sẽ không được sử dụng cho bất kỳ mục đích nào khác ngoài mục đích này)

Date/ *Ngày*: 19 / 03 / 2021

Witnessed by/ *Chứng kiến bởi*: _____

Full name/ *Họ và tên*: _____

Date/ *Ngày*: _____

Appendix 6.3: Key factors of the Vietnamese stock market efficiency

Three major factors of the Vietnamese stock market efficiency include information availability in the stock market, relationship between the information and the stock prices, and market valuation.

1. Information availability in stock market

The two key elements of the information availability in the stock market are the amount and variety of the information and the quality and transparency of the information.

- **Amount and variety**

The participants mainly stated that the information in the stock market was massive, abundant, various, and diversified. Further, they also indicated the enhancement of the information. The findings were evident from the interview responses as follows. The interviewee VNSM02, who is Chief of Supervisory Board of TA9, stated:

"The information is more and more enhanced."

Interviewee VNSM04, who is Chief Executive Officer and also a member of the board of directors of DRC, supported that the market participants deeply understood the listed company and the market *"due to the investigation from various sources of information, in general, informational socialisation".*

The interviewee VNSM05, who is Deputy Director of Ho Chi Minh Branch of VCB, said:

"The speed and amount of information at the present is too much and too great. Sometimes, I feel that it is overloaded."

"Well, I think the amount of information is currently massive and abundant. It is fast and timely, so that it sometimes causes confusion. Because it is overloaded and indigestible, at the level of overloaded and indigestible information. Therefore, the amount of information is massive, but it is up to individuals to decide whether it is accurate or not for themselves."

The interviewee VNSM07, a branch director of Phu Hung Securities Corporation, stated:

"In recent years, our information is more stable, better, and more."

The interviewee VNSM10, a senior broker of Mirae Asset Securities, agreed:

"Now, the sources of information are various and diversified."

In addition, interviewee VNSM06, who is Deputy Director of Transaction Supervision Department of HOSE, classified the information as following:

> *"In the* stock *market, there are two types of the information. The first type is official information and the other one is rumours. The rumours often precede the official information. Well, the rumours have already affected the stock price. Therefore, when the official information is published, the price has already reflected. It refers to some cases. There are also some other cases in which the listed price is affected when the official information is published."*

On the other hand, the interviewee VNSM03, who is Deputy Director of Saigon Branch of ACB – a listed company on HNX, said:

> *"Regarding to information of the system, I think there are two types of information now. Internal information and external information."*
>
> *"The first thing refers to information in the market, including the public information and the internal information. We base on them to invest in the stocks. Secondly, I think that there is a lack of information in the current stock market."*

- **Quality and transparency**

There has been an improvement of the information quality and transparency thanks to the current regulations. The interviewee VNSM06, the representative of HOSE, claimed:

> *"The current regulations on information disclosure in Vietnam are very strict and tight. Particularly, Circular 155 of the Ministry of Finance regulates the information disclosure in the stock market. In this circular, all requirements for the information disclosure of business to the market are timely."*

The interviewee VNSM09, who is General Director and a member of the board of directors of VDS – a newly listed company on HOSE, totally agreed with him and declared:

> *"Recently, the informational efficiency and the quality of information of the Vietnamese stock market has improved thanks to the following factors:*
>
> *The legal framework clearly and strictly regulates information disclosure requirements (Law on Securities 54/2019/QH14; Decree No. 58/2012/ND-CP guiding implementation of the Law on Securities; Decree 60/2015/ND-CP (amendment); Circular No. 96/2020/TT-BTC guiding information disclosure on the stock market and other legal documents)*

Awareness of compliance and awareness of the informational efficiency and transparency will attract more investors for listed companies.

Market requirements and pressures for the information disclosure,

Information from regulatory agencies and media agencies also makes the market information sufficient and timely."

The interviewee VNSM04, Chief Executive Officer of DRC, was of the same mind on this regard. He declared that the information reflects the reality and especially the information used for evaluation was extremely good. He said:

"I find that the information is extremely good, and it is also comprehensive. It is comprehensive and especially the information used to evaluate is extremely good. It helps the investors learn more about the company. I have no idea about the other companies, but the information which is used by the market to evaluate our company is very close to reality. It might be due to that the information technology develops nowadays. Therefore, in addition to capturing the general market information, they have the information in work or in online community. The efficiency as well as the impacts of the company on the market was almost reflected very realistically."

"Thus, I find that the information of the market which is published on the internet appropriately reflects the reality."

The interviewee VNSM01, Head of Finance – Accounting and an authorised person to disclose information of CDN, sympathised:

"All important information has been disclosed on the stock exchange already."

The interviewee VNSM08, who is a senior broker of Phu Hung Securities Corporation, supported:

"Regarding the information, the information is now very fast and sensitive. Accuracy must be reviewed. Sometimes, the information is provided from the viewpoint of the business, not according to the perception of the market. It also depends on the web. Lots of reputable websites always justify the market according to their objectivity. Many websites follow their objectivity."

The interviewee VNSM05 added:

"It is fast and timely, so that it sometimes causes confusion."

He also emphasised the importance of good information and stated:

"People who clarify the information, have a good job with the information and make the information beautiful will certainly get success. It is like promotion (PR). Nowadays, people do not usually use the word "PR" anymore, but I think the information is enormously important."

The interviewee VNSM07 provided his perspective in this regard and compared the quality of official information and unofficial information as follows:

"In recent years, our information is more stable, better, and more. There is still some off-the-record information or rumours which are not accurate. However, the sources of business information to report, such as the State reports, auditing reports, are very good. Nevertheless, the information related to projects or unofficial information still have some inaccuracies. Because there is no enforcement. The unofficial information means the information without legality, so it still has some inaccuracies. I think that the information which is legal is quite accurate and quite ok. Comparing the information from the businesses and the investors and the information from macro environment and the State agencies, I think the information from the State is better, greater, and more accurate."

"In general, it could be summarised that our public information is quite accurate and quite stable, but there is still some bad information. The official information is quite excellent, but the unofficial information of investors and off-the-record information have some inaccuracies. Currently, there are extremely significant foreign investors in Vietnam, so our government wants our information to be accurate. The foreigners also evaluated that the current information in Vietnam is quite stable, and it is a very good, very great sign."

The interviewee VNSM10 thought that the quality and transparency of information depends on the attractiveness of the listed companies. In detail:

"For attractive companies, the information is sensitive, and it reaches the public more quickly. For companies with little interest and little demand from the investors and the public for the information related to it, the information is slow. The websites do not have a mandatory duty to report the information punctually, so they sometimes omit and lately update the information related to the company that is of little interest. It is very difficult to find the information related to the shareholder structure of the company on the company websites."

On the contrary, the interviewee VNSM03, who is the manager of a listed bank on HNX, said that the internal information was limitedly provided to external people. In particular:

"They limitedly provide the internal information which can be provided outside. They will limitedly provide any unfavourable information. And they will provide the beneficial information. It makes the listed price untransparent."

2. Relationship between information and stock prices

The relationship between the information and the stock prices involves the access to the information and the reflections of the information on the stock prices as follows:

- **Access to information**

With reference to accessing and capturing information, most of the participants consented that all relevant information about the listed companies and the market is accessed and captured by the market to determine the stock price and market value of the listed companies. It was supported by the evidence from their interview responses. The interviewee VNSM04 stated:

"I think that they even have deeper understanding than the employees."

The interviewee VNSM07 definitely adopted consistent perspective regarding the access to the information, in particular:

"All the information related to the companies listed on the stock exchange are captured by some people sooner and by the other people later."

"Everyone captures the information, but it depends on the point in time. I will win if I capture the information first and I will lose if I capture the information later."

"Everyone captures it, but they surely capture sooner or later."

In this regard, the interviewee VNSM08 approved:

"All relevant information about the listed companies is accessed and captured by the investors for stock valuation in the market."

The interviewee VNSM05 strongly agreed with this opinion as following:

"Communications and information affect the key to success of an organisation, a group or an individual leader. As we know, people who capture the information will win and achieve success."

"I think in fact our shareholders capture and really savvy the relevant information about our bank by accessing official resources of information or unofficial resources of information or all of them. No matter how secret it is, it is definitely impossible to keep it secret at all. I think so."

In this regard, the interviewee VNSM02 added:

"People get easier access to securities."

"I think it is fully captured. Because we mostly publish new information, and it affects the stock prices. For example, we are preparing for the general meeting of shareholders, the stock price is increasing. It was only 10,000 – 11,000 in the previous time, it is currently rising to 12,000. It is affected by the disclosed information. Around 20 days ago, we finalised the list of shareholders in the general meeting of shareholders, so the stock price climbed and changed. Whenever we publish the financial statements or announce the dividends, the share price always changes. Investors also learn the information to decide to participate in the stock market or not, so their buying and selling decisions are changed. It proves that the market information is captured."

The interviewee VNSM06 also went along with this opinion, and he explained that the stock price is affected by the available information and the investment styles. In particular:

"It will be certainly right. The stock price is based on the supply and the demand, and the supply and the demand are based on the available information and the investment style. For example, Vietnamese people like to buy the shares of banks, securities companies, and real estate companies but foreigners like to buy shares of technological companies, so it is not the same."

The interviewee VNSM09, an experienced and professional expert in the field of finance and stock market and also the General Director of VDS – the listed company on HOSE, claimed:

"All the provided information is an input for valuation; however, it still requires other non-financial information to make more accurate and more reliable valuation (experience, management ability, industry trends and so on)."

The interviewee VNSM01 agreed with the mentioned opinions. From his perspective, different investors pursue different attention and investigations. In detail:

"There are several types of investors. I could classify into two groups. The first group is experts and specialists, the second group is people who buy and resell, buy, and sell small assets for earning from arbitrage. There are differences between the different groups. The less money is spent, the less investment is made, and the more investment is made, the more people have to think. We now contact with the group including professional investors on the stock exchange and large investors who wish to participate in the port and study very carefully. Because I manage shareholder relationships, I usually contact with the group and deal with issues. It depends on levels of investment and the more funds they invest, the more attention they pay. They devote a lot of attention. According to the laws, a shareholder has right to require searching all documents, so we publish the information. All important information has been disclosed on the stock exchange already."

The interviewee VNSM10 was aligned with the idea and expressed:

"I think all relevant information about listed companies is accessed and captured by investors to valuate stocks in the market. Now, the sources of information are various and diversified, so it is easy for the investors to access the information. However, the importance is whether people catch it soon or late. Investors will have more advantages if they obtain the information soon and fully."

On the other hand, the interview VNSM03, the manager of the listed company on HNX, disagreed:

"When investors invest in the stock market, in terms of the information, as far as I know from the securities companies, it is rare that they access to the information providing the transparency and accuracy. The information is published after the event has happened for a period. They do not publish immediately and timely. According to me, it is limited for the investors to access that information."

- **Reflections of information on stock prices**

In their responses, six interviewees discussed the reflections and the incorporation of the information on the stock prices. It was primarily agreed that the stock prices contained all relevant information related to the listed companies and the market. When the interviewer

asked whether all the relevant information was reflected on the stock prices, the interviewee VNSM02 stated:

> *"Yes, it is. It is surely reflected on the prices. Because the content of information is valuable and useful for the participants in the securities market. They could not participate in the market without the information. The information might be untrue or not, but it has reflections."*

The interviewee VNSM04 was of the same mind on this regard:

> *"Yes. Exactly, exactly. It is nearly like that. Every event. For example, when there is a resolution or an announcement of quarterly business results and production as well as business performance or investment projects or personnel changes, there are changes on the market."*

The interviewee VNSM07 also went along with this opinion:

> *"Actually, the question refers to whether the information of the listed companies is used in decisions of the investors or not. Yes, it is but the issue is soon or late decisions."*

With the reference to the reflections of the information on the stock prices, VNSM06 claimed:

> *"The positive information causes an increase, the negative information causes a decrease, and the neutral information causes an insignificant changed price."*

> *"The public information has effects on the stocks."*

In addition, the interviewee VNSM10 sympathised with the provided perspective and said:

> *"Sometimes, the stock values move in the same direction with the news. In other words, when there is good news, the stock price increases. However, the stock price is sometimes inverse with the unfavourable information. And sometimes there is no fluctuations in the stock price when there is new neutral information. Additionally, information leakage in Vietnam is a normal issue. Sometimes, rumours appear nearly a month before becoming official news. Therefore, the stock prices only suddenly change when the new information is really unexpected and unpredictable, or it cannot be obtained in advance."*

In this regard, the interview VNSM01 thought that the incorporation of the business information on the stock prices was not extremely sufficient. He claimed that it played extremely important roles when participating in the stock market and the sooner the reflection of the information on the stock prices was, the better it was. In particular:

"If it requires to say whether it is sufficient, I will feel that it is not extremely sufficient."

"Now, when we participate in the stock market, I see that business information is extremely important. For example, we are good, but people do not know how to claim that it is good, and no one knows what we are doing. Having those experiences, I think the sooner the better."

3. Market valuation

The provided answers of the participants consistently indicated the crucial contribution of the stock prices towards the market valuation in the Vietnamese stock market. In their responses, they mainly believed that the market values of the listed companies were fair and reasonable. The interviewee VNSM04 and the interviewee VNSM05 strongly claimed that the valuation of their listed companies based on their stock prices was adequate, and their market valuation was greatly reasonable and extremely fair. The interviewee VNSM04 stated:

"In fact, the valuation of our company is based on the market price. I find that it is extremely well-founded, and it nearly reflect the reality. Because the stock price is fundamentally determined based on the production and the business performance as well as the evaluation of the total assets value of the company. It results in the stock valuation, and I think that it is proper for my company."

"In a period of peace and stability without any major fluctuations due to force majeure circumstances, I find it extremely fair. There are no worries as it follows the business timeliness. When all influencing factors are not in a state of urgency and it is peaceful and stable, I find that the market evaluation is very reasonable and enough fair."

The interviewee VNSM05 endorsed:

"The brand value of our bank is represented by the value on the stock market."

"Compared to companies or banks having the same type of ownership and compared to companies or banks in the same industry, I think the stock value of Vietcombank is relatively reflected. The reflection of Vietcombank's stock price is usually relatively

accurate, it is accurate with a reasonable difference. Compared to the common ground, its brand value is not underestimated, not equalised or not undistinguished."

"Yes, it is at the reasonable and fair level. It is relative to the companies in the same industry. Based on the benchmark, our bank is adequately evaluated."

The interviewee VNSM06, the manager of HOSE, was in agreement with the managers of the companies listed on HOSE. He explained that the market price was based on the supply and the demand in the market, so it was reasonable as compared to the book value. It was evident from his response as follows:

"The market value is determined by the market, and the determination by the market refers to being determined by several factors. The first factor is macroeconomic factors, and the second factor is microeconomic factors of the business. We all understand the macroeconomic factors. The microeconomic factors of the business are reflected through disclosed information and undisclosed information. Its market price is formed based on the supply and the demand in the market. Comparing the book price and the market price based on the supply and the demand in the market, the market price based on the supply and the demand in the market is reasonable."

"The market value is always used in investors' purchase and sales, and it is determined by the supply and the demand in the market. Thus, I think it is "fair". Being low does not mean that it is not "fair". Because they valuate the future value, and the stock price is the future price not the present price. It depends on the potential and implicit value of the business in the future."

The interviewee VNSM10 totally agreed with the given idea and explained:

"The share price is considered as the market price of a company. The stock prices are momentary, so people accept them based on their ability to make a profit. When the ability to make a profit of the stock is high, people will accept its price and consider the price reasonable even if the price is unreasonable. When investors place a lot of faith in a company's potential earnings, its stock price rises, and vice versa. The market value is determined by the market supply and the market demand. I think the market assessment is reasonable and fair enough."

He went along with the opinion that the market value was affected by various factors, and he mentioned some common methods used in the market valuation based on the types of investors.

“Today, the most common methods are the free cash flow to equity (FCFE) and the free cash flow to the firm (FCFF) method, and the earnings per common share (EPS) and price-to-earnings ratio (P/E). The FCFE & FCFF method is used for in-depth analysis by professionals, while EPS & P/E is a basic method for the investors to understand. For large deals involving the purchase and the sale of shares, more complex valuation methods are used. I find it very difficult to determine the market value of a company. Only when buying and selling a big deal, the valuation will be made, and the valuation team will do it. Because the market value is affected by several factors, including both microenvironment factors and macroenvironment factors.”

In terms of the market valuation, the interviewee VNSM03 entirely agreed with the provided idea and stated:

“The fairness and reasonability of valuation is thanks to our bank's stock since its inception. It is regulated by the market. The whole market decides whether it is fair or transparent. I think that ACB’s stock is compared to the market, compared to the common situation, and compared to the socio-economic situation. Thus, I think it is extremely proper and reasonable.”

From his perspective, the market value of his company was influenced by several factors. In particular:

“The first important thing is the customer taste, the market, and the brand value of the stock. For the banks in Vietnam, the stock value is often affected by the vision, the strategy, and the social activities of the bank's owners. In addition to the transparency of the banks and the stocks, they decide the stock value. For large joint-stock commercial banks, I mean for the joint-stock commercial banks but not for the state-owned banks, the sustainability, stability, and durability will mainly determine its stock value.”

The interviewee VNSM07 believed the market value of the listed companies was reasonable and square, and the accuracy of the market valuation based on the stock prices was high. He expressed:

“When conducting the market valuation, people will investigate the reality and evaluate the business reports as well as the audited reports and then they will investigate the reality to recheck.”

"Actually, I think that there seems to be the general thing in the valuation of the stock price when it is listed, and it has been tested several times. For example, the company is hired to conduct the market valuation, then it has to submit to the stock exchange and several authorised agencies and departments to examine, so I think it is unable to state anything discretionarily and setting a reasonable price follows the specific rule. So, regarding the accuracy, I think it is approximately 80%."

"The valuation may be not fair as long as it is reasonable."

"It depends on not only the investors or the businesses, but also the investment funds, a lot of things and the right time, all of them. Is it right? So, is it fair? Not fair at all. If they play a game, nothing will be fair, but square. In other words, square but not fair."

The interviewee VNSM08 showed consent with the provided opinion and said:

"The market value and the market capitalisation are always exact. Because they are specific numbers. The capitalisation, the number of listed companies and the transactions on the market are always specific so they cannot be wrong. They are verifiable, so it cannot be wrong."

"Reasonable, reasonable. Because many people sometimes have a lot of information, they can filter the information. A market view about a company valuation, such as stock prices. Regarding the stock valuation, almost all securities companies always rely on the same valuation methods."

"Regarding whether the market price is determined reasonably and fairly, according to me, my view refers that it is according to the supply and the demand. The price is determined by the supply and the demand, and no individual or no organisation can decide it. Because the supply and the demand decide the price, that is my opinion."

He also categorised investment styles of the investors in this stock market into two schools to make the stock valuation.

"When money rushes into stocks in a season, people have a race of surfing. So that, they know the prices and then compare to determine which stocks have good waves. Then, people who find out the good waves make surfing investment. And when gaining profits, they take the profits immediately and withdraw them. For the long-term investors, of course, they investigate and analyse the financial statements to grasp the price of common stocks. They compare in the same industry to understand how the valuation in

the industry is and whether it is expensive or cheap to buy the stocks for the long-term investment. They are two schools to make the stock valuation."

With respect to the market valuation and the market value of the listed companies, the interviewee VNSM09 expressed that the businesses with good fundamentals and good performance would be basically and sustainably valuated well, in accordance with the actual value of the business. He stated that the stock price was one of its factors of the market valuation in the short term. It was evident from his answer as follows:

"In the short term, the movements of market price of listed companies are always volatile under the impacts of the market supply and demand. However, the businesses with good fundamentals and good performance will be basically and sustainably valuated well, in accordance with the actual value of the business. Therefore, the market price of the stock is only one factor in the valuation."

"In the short term, it is difficult to require a reasonable valuation of listed companies based on their market prices due to the impacts of the supply and the demand as well as the market sentiment. In order to determine the reasonable price, it is necessary to investigate a variety of other factors and the most important thing is still the basic financial foundation of the business."

The interviewee VNSM02 and the interviewee VNSM01, the managers of the newly listed companies on HNX, approved that the stock prices partially contributed to the market valuation, and they believed that the market values of their listed companies were relative. The interviewee VNSM02 explained:

"Because the market value is determined by the market, it almost depends on the market. So that it is obvious that the share prices of the company on the stock exchange are determined by the market. The market participants and customers could base on the information about the company to evaluate the company and then they would participate at their estimated price."

"I think it is relative, relative. Because our current company value could be actually greater. In recent years, our stock price sometimes has gone down under the par value. The stock price is currently 2500 higher than the par value but it was lower than the par value in the previous years. However, in fact, our share and dividend policies for our shareholders are significantly high, up to 15 – 20%. It is due to that our company lets the market determine the stock prices, we have not taken any action to intervene it. Some companies would like to increase their stock prices even when their finance is not

good, so they have intervention. But we do not, absolutely not. Because we pay very high dividends for our shares, and it is still financially secured, but the dividends are paid in cash. The stock price is not accurate."

In addition, the interviewee VNSM01 provided his response:

"I think that this point is a bit one-sided and a bit mechanical. Because there are several angles to evaluate a business. The market price is usually only a corner, only a part for people who want to invest in stock. It is not true to say it is not great, but it is not too great either."

"*It is slightly over half. It is incorrect that it is below 50%. It is slightly more than 50% but not much. In my opinion, an enterprise is like a body, including many things related to the market, human resources, and other things. It does not reflect too much on the market value."*

He added that the shareholder structure was important to the assessment:

"In a joint stock company, the shareholder structure is greatly important because it controls many things. Currently, Vietnam National Shipping Lines owns 75%, a foreign company owns over 20% and some small companies and investment individuals owns approximately over 4%. Therefore, the price does not properly reflect all. If the quantity is not enough, the quality will not change. The assessment is slightly lame. In other words, for the company in which two shareholders own 95%, the assessment is a bit lame. It is easier to evaluate any enterprises in which shareholders own it evenly with low proportion. The higher the liquidity, the easier it is. I think the assessment is not entirely accurate."

The findings from the responses of the 10 interviews consistently showed the significant contribution of the stock prices to the market valuation in the Vietnamese stock market. Furthermore, it was dominantly believed that the market value of your company was fair and reasonable because the market price was based on the market supply and demand. Among the managers, the interviewee VNSM04 and the interviewee VNSM05, the managers of the listed companies on HOSE added that the market valuation of their listed companies based on their stock prices was adequate and relatively accurate. Meanwhile, the interviewee VNSM01 and the interviewee VNSM02, the managers of the newly listed companies on HNX, claimed that it was required to investigate the other factors in addition to the stock prices to comprehensively assess their company values.

Appendix 6.4: Reasons for differences in market efficiency of two stock exchanges

There are three primary reasons explaining why HOSE is more efficient than HNX. Firstly, HOSE delivers better performance and more stricter standards than HNX. In addition, the differences of their market efficiency depend on the size and the goals of the companies listed on the stock exchanges.

Firstly, the interviewee VNSM07, the interviewee VNSM08 and the interviewee VNSM10 consistently approved that the performance on HOSE was more vibrant and better than that on HNX, so it attracted more investors and greater listed companies. In particular, the interview VNSM07 strongly claimed:

> *"HOSE has ever been a vibrant stock exchange, and it has attracted the foreign investors, especially funds. Its market capitalisation is also massive and concentrating on HOSE sets a precedent. The important thing is that there are many indices and multiples on which the investors would base to calculate the indices and on which the foreign investors base to calculate the ratios. Thus, it is also the reason."*

> *"Because there are indices and sets of indicators and indices that support it to promote its brand better and to raise needed capital faster and other things."*

> *"There are not many indices on HNX, and there are a lot of exchange trade funds on HOSE but not on HNX."*

> *"Now, the securities market of our countries is not only in the domestic scope but also in the foreign and international scope. It is not widely recognised as an emerging market yet, but if it is internationally recognised as an emerging market in the near future, it will catch lots of attention. Among the stock exchanges, the most dynamic stock exchange will achieve the attention of the foreign countries. The attention is almost an intangible asset. If a business is good, it will be valued several times greater."*

With respect to the better performance on HOSE, the interviewee VNSM08 added:

> *"It regards the transaction volume as well as transparent information and businesses run efficiently."*

In addition, the interviewee VNSM10 totally agreed:

> *"And the information of the companies listed on HOSE is usually updated and reflected on the stock prices faster and more sensitively than the information of the companies*

listed on HNX. Several companies on the HNX want to develop and increase their credibility and safety, so they have transferred listing from HNX to HOSE."

Secondly, the interviewee VNSM08 and the interviewee VNSM10 stated that there were better and stricter standards and listing conditions on HOSE, so it obviously gained more trusts and interests from the investors, the listed companies, and the other market participants. The VNSM08 declared:

"Usually, the companies listed on HOSE must meet the standards to enter HOSE. The standards on HNX are lower, so its efficiency is obviously not as good as that of the companies on HOSE. Therefore, the investors are less interested. It is obvious."

He also explained:

"That is right, the standards are higher in terms of information quality and businesses. The companies will be listed on the stock exchange only if the companies do business well. If it does bad business, it will be kicked off the stock exchange and it will list on the HNX."

The interviewee VNSM10 entirely went along with this opinion and said:

"On HOSE, the listing conditions are stricter, and the price limit is greater, so the filter on HOSE is tighter and more reliable. And the investors as well as the listed companies have more trust and interest in HOSE than HNX."

On the other hand, the interviewee VNSM07 and the interviewee VNSM09 thought that there was almost no difference in the quality of information on the stock exchange and the information disclosure requirements on the two stock exchanges. The interviewee VNSM07 said:

"Regarding the information, I think the quality of information on the stock exchanges is similar."

Moreover, the interviewee VNSM09 supported:

"The information disclosure requirements of HNX and HOSE are almost the same."

In his opinion, the only difference referred to the capital size of the listed companies and it led to greater performance and better information disclosure, so more investors devoted their attention. In particular:

"The only difference refers to the capital size of the listed companies (the UPCOM of HNX requires less information disclosure). However, because the large companies listed on HOSE have better capacity and conditions, their information disclosure is more sufficient and more detailed than the companies listed on HNX, thereby attracting more attention of investors."

The interviewee VNSM07 entirely agreed that all large-cap, good, and reputable companies were listed on HOSE. He added that the companies decided to list on HOSE because it was a practical way to bring benefits for their shareholders, and they might strive towards raising capital, promoting their brands, and creating leverage of going abroad. In particular:

"In fact, all large-cap companies, good companies, and reputable companies are listed on HOSE."

"It depends on the board of directors, and they decide to list on which stock exchange in them. They list on the stock exchange that they can control or list on the stock exchange for accomplishing their mission. They list on the stock exchanges for something. However, listing on HOSE is often for the benefits of shareholders and it is a practical way."

"Why do some stocks on HNX not develop even though they promote very well, why? Because they could not need to raise capital or promote its brand yet. When transferring listing from HNX to HOSE, it reveals whether the company is healthy or whether the foreigners accept it or not."

"Even when listing on UPCOM, it is also required to provide audited reports or comply with other regulations. Many better businesses still do not want to transfer. It may be due to that they do not have goals to achieve yet, but some other companies strive for creating leverage of going abroad."

In summary, their responses consistently affirm that HOSE has better market efficiency than HNX. It results in that HOSE significantly attracts more concerns and participation of listed companies and investors than HNX does.

Appendix 6.5: Opportunities and advantages

There are five major opportunities and advantages from listing, trading, and complying with the current regulations. They refer to branding, business management and development, capital mobilisation, information transparency, as well as trust and confidence of investors.

- **Branding**

With reference to branding, the interviewee VNSM05 claimed that the brand of his bank widely expanded thanks to listing, trading, and conforming to the current regulations in the stock market. In particular:

"The first thing refers to automatically promoting the brand to expand the network. I think my network increased by 40%, around 30-40% in 5 years ago."

Furthermore, the interviewee VNSM06, Deputy Director of Transaction Supervision Department of HOSE, totally agreed with him. He stated:

"It is clear that the company information as well as the brand are naturally promoted to not only domestic investors but also foreign investors when listing on the stock exchange. The international investors know about the business and then they use its products. It is an objective factor for the enhancement. When companies are listed in Vietnam, it can also be listed in foreign countries, and it raises the capital not only in the country but also in the foreign countries. In addition to the business development, it also supports for the development of the economy."

The interviewee VNSM07 was of the same mind on this regard:

"When there is good information, people will devote attention to our stocks and buy and sell them. In parallel, if there is good information of our company, many investors will pay attention to it. As a result, our brand value will grow quickly, and we will be able to raise capital better."

The interviewee VNSM09 went along with the opinion. He responded:

"*Create a reputation in the market, thereby easily accessing better business opportunities."*

The interviewee VNSM10 approved, and it was evident from his response as follows:

"When it is listed on the stock exchange, the company brand is also promoted and developed further."

The dominant point noted in the provided responses refers that the listed companies could gain huge opportunities and advantages in their brand promotion thanks to listing, trading, and abiding by the regulations in the stock market.

- **Business management and development**

The findings from the responses of five interviewees consistently showed that the listed companies achieved significant opportunities and advantages in terms of their business management and development from engaging in the stock market. The interviewee VNSM01, Head of Finance – Accounting and also the authorised person to disclose information of the newly listed company on HNX, gave his opinion as follows:

"Firstly, the most important thing of the stock market is that it makes our business change itself."

Further, when being asked whether the participation in the stock market would support his company to understand its competitors or other companies in its same industry or not, he responded:

"Yes, it does. It supports us as well as them when participating in the stock market."

"We discover them, so that we would find the way to make us better."

Moreover, the interviewee VNSM04, Chief Executive Officer of the listed company on HOSE, stated that participation in the stock market supported the decision-making process of his company.

"Actually, the opportunity and capabilities for investment and development is mainly determined by the internal factors of the board of directors and the executive board. Because we had the view about the general market like that, we decided to invest as well as develop. The information on the internet and the listing information on the stock exchange is a channel to examine whether our decision-making abilities are proper or not."

Moreover, the interviewee VNSM09, General Director of the newly listed company on HOSE and also an acknowledged expert in this field, added:

"Improve the professionalism and quality of management."

In this regard, the interviewee VNSM05, the manager of the bank listed on HOSE, pointed the growth in the equity of his bank since listing on the stock market and in recent years in particular. He stated:

"The equity is increased by 100% compared to 10 years ago."

The interviewee VNSM10 also entirely agreed with his opinion and claimed:

"A lot of businesses operate more efficiently and rapidly increase their scale by taking advantage of the stock market to raise the capital and promote their brands."

The findings from the mentioned respondents significantly indicate that the engagement in the Vietnamese stock market could help to improve their professionalism and efficiency of management and stimulate their business development.

- **Capital mobilisation**

On this subject, five participants consented that listing and trading on the stock exchanges enabled and facilitated the businesses to raise funds. The interviewee VNSM01 declared:

"Secondly, trading always needs capitals."

"You mean capital mobilisation."

"As I said, we mobilised capital once. If we are able to join Lien Chieu port in the near future, we will continue to use this channel to raise capital. Previously, we raised our charter capital by 50%. Our charter capital was 660 billion, and then it increases by 330 billion to 990 billion. If we have Lien Chieu project, our capital could be significantly raised because it is larger project. I hope that there is a significant probability to get success with our current market or what we are having. I really like that we take part in a big game when we list on the stock exchange."

In this respect, the interviewee VNSM03 claimed that his bank easily raised the capital thanks to listing on the stock market. He said:

"When it comes to the stock market, it is a huge advantage for the banks and especially credit institutions. They easily mobilise the capital. The second thing refers to that they want to issue more stocks or raise the capital. For the stock market, the shareholders and stockholders feel that the information in the stock market is good, and their value is great. Thus, it is very easy for them to issue more shares to raise the capital or make

investment. Additionally, when they become listed companies and they are public, everyone knows them. For the unlisted companies, they must contact and look for investors when they want to do something. When they are listed on the stock exchange, they could access to the investors via the stock exchange and general meetings of shareholders. Thirdly, when they are listed on the stock market, peer-to-peer organisations could value the bank. To identify strong banks and weak banks. They have comparisons in either the charter capital, the market, or the market share. Those comparisons help the investors investigate which banks have the advantages. They could classify banks in group A and banks in group B. When the credit institution goes public, its gains are much more than its losses. The trend of the State is to compel all credit institutions. Credit institutions are developed by money of the people, not money of the owners. In fact, the owners do not have plenty of money. Take, Asia Commercial Bank (ABC), for example. Their charter capital is only 16,000 billion, but they mobilise the capital to 70,000 – 80,000 billion. It means that they effectively mobilise to obtain the capital of 70,000 – 80,000. The capital is from the money of the people, but not the money of the owners. Thus, their expenditures and their ways to spend money are supervised."

The interviewee VNSM06, the manager of HOSE, strongly agreed with this perspective. He stated:

"In fact, it is obvious that listing on the stock exchange brings a lot of advantages. Firstly, the company will mobilise capital from the whole economy. Mobilising the capital in the power of people is called as drilling the power of people. In other words, the first thing aims to mobilise the capital for the economy and ensure the greater development of businesses instead of borrowing capital from banks. The capital flow is stronger with lower costs than bank loans and it is also more active than the bank loans."

Additionally, the interviewee VNSM07 supported:

"We will be able to offer and be investigated by professional and experienced investors, investors and funds and they will provide capital for us. If I want to release something or have any plan, someone will provide funds for us."

With reference to attracting the investors and the capital, the interviewee VNSM10 expressed:

"According to me, the first benefits of listed companies are that it is easier to raise capital. The company has access to new capital raising channels and mobilises the capital from

the investors through the issuance of shares. Listing on the stock market also allows the businesses to approach both domestic and international investors through their trading activities and shareholder meetings. Raising capital of the listed companies is much more advantageous than unlisted companies."

In summary, it is consistently demonstrated that listing and trading on the stock market allows the businesses to approach the investors, and it is regarded as an important channel to raise capital. The capital mobilisation of the listed companies is much more advantageous than that of the unlisted companies. Furthermore, building an efficient and vibrant stock market not only improves capital allocation in the economy but also stimulates the long-term economic growth of the emerging economy.

- **Information transparency**

The interviewee VNSM06, the interviewee VNSM07, and the interviewee VNSM10 claimed that the listed companies have the benefits of information transparency thanks to listing on the stock market and regulatory compliance of the listed companies. The manager of HOSE stated that participation in the stock market helped to enhance the information transparency and there had been an improvement in the regulations on HOSE in recent years. In particular:

"The second thing is enhancing the transparency of the business for investors as well as for the economy."

"In terms of the regulations, the regulations are always updated and changed so they can better support the listed companies, provide more transparency to the market, and bring more freedom and fairness for the investors who buy and sell shares. According to me, the current regulations are too good and follow the international practices, especially they follow European practices. The Vietnamese regulations follow European practices, and the listing conditions and the information disclosure conditions are extremely sufficient. And I think it is getting more and more rigid and many countries are not as good as us. We are extremely fair, so there are now billion-dollar trading sessions in Vietnam, and it is not less than other countries in the region."

The interviewee VNSM07 also emphasised the importance of the information transparency for the listed companies. In specific:

"When we have transparent information, it will be a good condition for us. Firstly, when being transparent, shareholders will choose our company more."

The interviewee VNSM10 was of the same opinion on this subject, and he stated:

"In addition, when there is good information about the company, the news is easy to spread, and it brings more positive effects on the listed company."

Overall, the listed companies grasp tremendous opportunities and advantages related to the information transparency thanks to listing on the stock market and regulatory compliance. When being transparent, the companies attract more investors and shareholders.

- **Trust and confidence of investors**

Some respondents claimed that listing, trading, and complying with the current regulations strongly supported the listed companies to gain trust and confidence of the investors. The interviewee VNSM07 stated:

"Because we are transparent and meet our commitments, many investors place trust. Since then, our brand value has increased and a lot of people devote attention to us, so we can do anything, increase the capital, and expand more."

The interviewee VNSM08 also went along with this idea and declared:

"Regarding the advantages of the company, if the company is transparent, investors will trust it. If investors trust it, the long-term investors will more stick to it. That is for sure. For example, the company publishes all quarterly and monthly reports regularly, discloses profits regularly, and distributes dividends regularly. The long-term investors will intend to base on them to make the long-term investment. If the business does not provide accurate, regular, and transparent information, the investor will only make the surfing investment. That is, when there are the cash flows in, they invest and then withdraw but not invest for a long time. It is a reciprocal factor. If the stock is reputable like Vinamilk, the stock will be very good. For example, the long-term investors always like Vinamilk, they invest for the long term and of course they never suffer a loss. Every year, it has positive sales, it pays dividends, and the stock grows. That is why they like it."

Furthermore, the interviewee VNSM09, the professional expert and the top manager of the newly listed company on HOSE said that one of the benefits from listing and disclosing information fully and transparently referred to *"Attract more investors".*

In general, the provided responses indicate that listing, trading, and conforming to the current regulations in the stock market obviously offer a plenty of tremendous opportunities

and advantages to the listed companies. The crucial opportunities and advantages refer to promoting their brands, boosting their efficiency of management and business development, facilitating them to mobilise their capital, enhancing their information transparency, as well as gaining trust and confidence of the investors. The current regulations better support the listed companies, bring more transparency to the market and the economy, as well as allow more freedom and fairness for the investors.

Appendix 6.6: Limitations and challenges

The participants are divided into two groups. The first group includes the interviewees showing that no limitations or challenges really exist. The other group consists of the interviewees proving the inevitability of limitations and challenges.

1. No limitations and challenges

It is required to mention some limitations and challenges that the listed companies could encounter from participating in the stock market. The interviewee VNSM04, VNSM05, and VNSM09, the managers of three listed companies on HOSE, responded that there were no limitations and challenges. Particularly, the interviewee VNSM04, Chief Executive Officer and the member of the board of directors of the consumer discretionary company listed on HOSE, strongly stated:

"Actually, all the information and data as well as the publications on the stock exchange are very transparent now. Therefore, we almost comply with them. There is no problem at all."

Moreover, he firmly assured:

"There are no difficulties and limitations. Yes, I am satisfied with the current regulations."

Furthermore, the interviewee VNSM05, the manager of the bank listed on HOSE, was in utter agreement with his opinion:

"No. I think there are no difficulties or limitations. We comply with the regulation. In terms of complying with the legal regulations, our bank is always the best one. And we are recognised by The Government, The Prime Minister, The Politburo Bureau, or industry leaders or in conferences that Vietcombank is a standard brand and our compliance with regulations is almost excellent."

Additionally, the interviewee VNSM09, General Director and the member of the board of directors of the newly listed company on HOSE, completely concurred with everything that was said so far. He said:

"No. The current regulations encourage and require more sufficient and more transparent information disclosure."

Although the interviewee VNSM06, the manager of HOSE, also mentioned some challenges that the listed companies could have, he totally agreed that the current regulations

better supported the listed companies, provided more transparency to the market, and allowed more freedom and fairness for the investors. He added:

> *"In terms of the regulations, the regulations are always updated and changed so that they can better support the listed companies, provide more transparency to the market, and bring more freedom and fairness for the investors buying and selling shares. According to me, the current regulations are too good and follow the international practices, especially they follow European practices. The Vietnamese regulations follow European practices, and the listing conditions and the information disclosure conditions are extremely sufficient. And I think it is getting more and more rigid and many countries are not as good as us. We are extremely fair, so there are now billion-dollar trading sessions in Vietnam, and it is not less than other countries in the region."*

The dominant point noted in the provided responses implies that there are no challenges and limitations for the listed companies, especially those on HOSE. Further, the current regulations in the market and especially on HOSE greatly encourage and support the listed companies.

2. Relevant limitations and challenges

From the perspectives of the seven respondents, three major challenges and disadvantages refer to information asymmetry, pressure from information disclosure as well as young stock market and trickery.

- **Pressure from information disclosure**

Some of the interviewees regarded pressure from releasing information as one of the challenges and disadvantages of the listed companies. The interviewee VNSM02, the manager of the newly listed company on HNX, claimed that they felt extremely anxious due to urgently revealing the information, performing huge works, and conducting various relevant procedures related to disclosing the information. She stated:

> *"The first thing is time, the publication time is very urgent, and the information must be clear, transparent and rigid. The procedures of the general meeting of shareholders are complicated. It requires to finalise the list of attendees at least 21 days before the meeting, the proposal of the general shareholders' meeting must be published at least 21 days before the meeting and the meeting minutes must be published within 21 hours. There are many resolutions, and it also requires the release of the financial statements. There is a lot of pressure for staffs working on financial statements and staffs in finance.*

They must publish information and complete the tasks at the right time on the right date and the workload is extremely huge. They must complete the tasks. In the past, I worked as a general accountant. This point was the only thing I hated when the company started to list on the stock exchange, and I only hated it. We are forced to publish information and we are under enormous pressure, otherwise we will be fined. Thus, I only hate publishing information when listing on the stock exchange."

She emphasised that it was one of the greatest challenges for them and added:

"It is currently the greatest effects on us. In addition, it requires to submit several reports to the State Securities Commission. Take, reports, for example. If we did not list on the stock exchange, we would not need to report about industry. The report about industry should be in – depth. I think this point greatly impacts us. If we did not trade in the securities market, we would not mind. The field of securities is extensive, and we must research thoroughly. Sometimes, we achieve this requirement but does not meet the other ones. The field of securities is really comprehensive, and it contains various things."

On this subject, the interviewee VNSM06, the representative of HOSE, supported:

"Regarding to the disadvantages of the listed companies but not the regulations, they must disclose information transparently and they are unable to keep the business secrets because they must be transparent. Secondly, they must disclose their financial statements clearly. It is things that many Vietnamese businesses do not like. Right? The first thing is the information, and the second thing is the financial statements referring to the business financial information. Even their technical and business secrets must be transparent."

"The disadvantage refers that the businesses must disclose information in several forms. Many companies were listed on the stock exchange and then cancelled the listing."

Additionally, the interviewee VNSM08 expressed his opinion as follows:

"Recently, the transparent regulation of the State always requires all businesses to report business results every three months. It is the core to provide investors so that they capture the information. It is the best one. The only thing is that the business is hesitate when it sometimes runs business at a loss. It is afraid to report quarterly, then semi-annually, and then annually. Everyone does the same when having the problem of loss. The company fears that the bad information will affect its stock price, so they

always intend to conceal the negative information. The company does not want to disclose them. When the company runs business well, it discloses the information every quarter. In fact, the State regulations require to make quarterly reports, which is very good. It supports investors. It also forces the businesses to report the problems because it is transparent. We do not know whether it reports untruly or cooperate with the auditors to cheat. However, it must report and be certified by the auditor whether it makes a profit or loss. Well, it has been regulated by the State already. I think it is enough, there are no other rules. It is the most important thing for investors to know whether this business is transparent or not. The financial statements are the most important, and it is important to make the accurate, transparent, and comprehensive financial statements, so the investors can base on them to make the stock valuation."

Furthermore, the interviewee VNSM10 added that the listed companies would be strongly affected by the influences and diffusion of the negative information in short term. He stated:

"The listed companies also face some challenges. The company face the risk of spreading negative information. When there is bad news, the stock price is strongly impacted because of the influences and diffusion of the information. The stock price slips from its current value for a short time."

- **Young stock market and trickery**

With regard to the challenges and limitations, four respondents mentioned the late establishment of the stock market and some trickeries in the market as the challenges. The findings were evident from the interview responses. In particular, the interviewee VNSM01, who is Head of Finance – Accounting and the authorised person to disclose information of the newly listed company on HNX, stated that the stock market was currently new, so it did not attract significant attention and efforts from all managers. Furthermore, the proportion of state ownership in the ownership structure also impacted their attention and investment. He gave his opinion as follows:

"Firstly, our stock market is currently new. Business managers and leaders even acquire limited knowledge of securities. When they have limited knowledge, their reaction is also limited. When they do not understand it deeply, they do not focus on it too much. Professionals and experts have major responsibilities, and it is important to have an orientation of leaders and managers. Our leaders also orientate but they do not focus on the securities a lot. For example, our company revenue and capital are 1000 billion

and total assets are a few thousand billion. Nevertheless, our shareholders relationship is still concurrent but there is no specific authorised department yet. In other words, there is some attention, but we cannot say that enough attention is paid to it. However, I think it takes time and everything takes time. Firstly, it is new. Secondly, some managers are interested in it, but the other managers do not care a lot. Especially, our company was changed from a state company, so the level of transactions and influences on the stock exchange is not too great. Because one corporation accounts for 75% and another foreign company accounts for over 20%, there are not a lot of transactions. If our stock has a high daily trading level, it will be a different story. Sometimes, we do not check our stock price on the stock exchange for months. We sometimes check our stock price because our stock price does not have huge effects. It might be due to the feature of equitization of state enterprises. The proportion of the state ownership is too large to highly reflect the business charts."

The interviewee VNSM03, who is the representative of the bank listed on HNX, supported that there were still some limitations because the stock market was newly established. However, he acknowledged the improvement in recent years. He claimed:

"Now, the stock market has adjustments due to regulations and policies of the State. In the previous time, the stock market was newly established, so the regulations and policies did not follow the international regulations. After that, our market gradually follows the international regulation. Following the international regulations helps foreign investors trust in Vietnam."

He added that building only one stock exchange like other countries massively contributed to further improvement of the stock market efficiency. He added:

"The State continuously adjusts the policies but there is still a need of improvement. As in the other stock markets, there is only one stock exchange in the foreign countries, but we have Ho Chi Minh Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX). There are several impacting factors."

On the other hand, the interviewee VNSM07 stated that we took advantage of being a later-established market. From his perspective, they could learn from other countries and limit several issues in fact. Nevertheless, it was impossible to completely solve all trickeries even when the regulations in the stock market were really good. He said:

"In fact, regarding the current regulations, Vietnam is a later market, the current regulations gathered from the most quintessential countries and avoid problems that

have already happened in other countries. Usually, it always has more advantages and limits a lot of issues in fact. For example, it limits the unfairness, virtual market, and mispricing. It limits a lot of things. However, in the world, in the United State, the big market, the New York market, which was established thousands of years before us, it still suffers challenges, so our market is no exception. No matter how good it is, we can never completely solve the trickery."

The interviewee VNSM06 mentioned back-door listing as one of the challenges in the stock market even when they continuously improved the regulations and made huge efforts to avoid back-door listing. He stated:

"Several businesses take advantage of the listing on the stock exchange to acquire businesses by the back door or back-door listing. In other words, I have a small business that has not been listed and not been qualified to be listed yet. I invest money in buying a listed company so that I could hold shares to control and use the listed companies to make a resolution of the general meeting of shareholders to acquire the small business. As a result, the small company suddenly becomes a business on the stock exchange to do something. It is called a back-door listing. This problem is not only in Vietnam but also over the world, and people are making efforts to have regulations to avoid back-door listing. Therefore, the back-door listing is the most attracting issue. In addition, the regulations always make efforts to ensure that the companies issuing shares to raise the capital are transparent. It is the most noticeable point. Many listed companies find key conditions and key criteria to request and provide them to managerial agencies such as the State Securities Commission, so the State Securities Commission cannot refuse to issue shares for them to raise the additional capital. They are some slightly negative points. The regulations always follow the market behaviours. You should pay attention to the back-door listing."

- **Information asymmetry**

From the viewpoint of the interviewee VNSM03, the manager of the bank listed on HNX, another challenge referred to information asymmetry. He believed that it would be difficult to get success without the internal information. He responded:

"Secondly, as I know, in the stock market, most people having a lot of information will get success. People without information will not succeed. Thirdly, it mainly follows the crowd, meaning that they buy and sell continuously. It makes the F0 investors feel that they are caught up in the trend. Accidentally, some eagles eat them."

“Without the internal information, it is difficult to succeed.”

According to the above analysis, the current regulations in the market and especially on HOSE greatly encourage and support the listed companies. On the other hand, there are some challenges and disadvantages considered by the experts and the managers of companies listed on HNX.

Appendix 6.7: Impacts of market behaviours on business performance

Four crucial impacts refer to business management and corporate governance, enhancement of funds, financial performance and operational efficiency, as well as value and brand growth.

1. Enhancement of funds

Four participants mainly stated that their capitals had increased by several times since listing on the Vietnamese stock market and especially in recent years. The finding was evident from the interview responses. In particular, the interviewee VNSM02, who is Chief of Supervisory Board of TA9 – the construction company newly listed on HNX, said:

> *"We have mobilised capital several times since listing on the stock exchange. It seems that we increased our charter capital. Our charter capital was 17 billion at the beginning, but we raised the capital and might sell securities out."*

> *"We almost increased our capital from our own capital, but we did not attract external participants a lot. It was mainly equity capital."*

Her statements are assured by the public information and annual reports announced by the stock exchange and the company. The initial charter capital of TA9 was VND 17 billion. It started to list on the HNX on 31 July 2015, and the charter capital was VND 51.158 billion (Thanh An 96 Installation and Construction Joint Stock Company, 2016). According to Decision No.57/QĐ – HĐQT on 04 April 2016, the board of directors consistently decided to issue shares to raise the capital by VND 8.185 billion (Thanh An 96 Installation and Construction Joint Stock Company, 2021a). On 14 September 2018, HNX allowed the company to additionally issue 1,369,977 listed shares with the total value of nearly VND 13.7 billion (Hanoi Stock Exchange, 2018c). Furthermore, it usually paid the dividends by cash and shares in every economic year. As a result, the current charter capital in 2020 was VND 124 billion.

Furthermore, the interviewee VNSM03, the manager of ACB – the bank listed on HNX, also indicated the growth in their capital:

> *"Take, Asia Commercial Bank (ACB), for example. Its charter capital is only 16,000 billion, but it mobilises the capital to 70,000 – 80,000 billion. It means that it effectively mobilised to obtain the capital of 70,000 – 80,000. The capital is from the money of the people, but not the money of the owners."*

The opinion is supported by the information from the annual reports of ACB and the relevant public announcements. From 2011 to 2016, ACB kept its charter capital at VND 9,377 billion, and it increased its capital to VND 10,273 billion by issuing more than 89.6 million shares to pay dividends to its shareholders in 2017 (Dong, 2020). The amount of charter capital continuously grew every year through the payment of stock dividends to its shareholders, and there were four times that the bank raised its charter capital from 2017 to 2020 ***(Figure A6.1)***. After that, it was pursuant to Document No. 5511/NHNN-TTGSNH dated 31 July 2020 of the State Bank of Vietnam to raise its charter capital from VND 16,627 billion in 2019 to VND 21,615 billion in 2020 (Asia Commercial Bank, 2020).

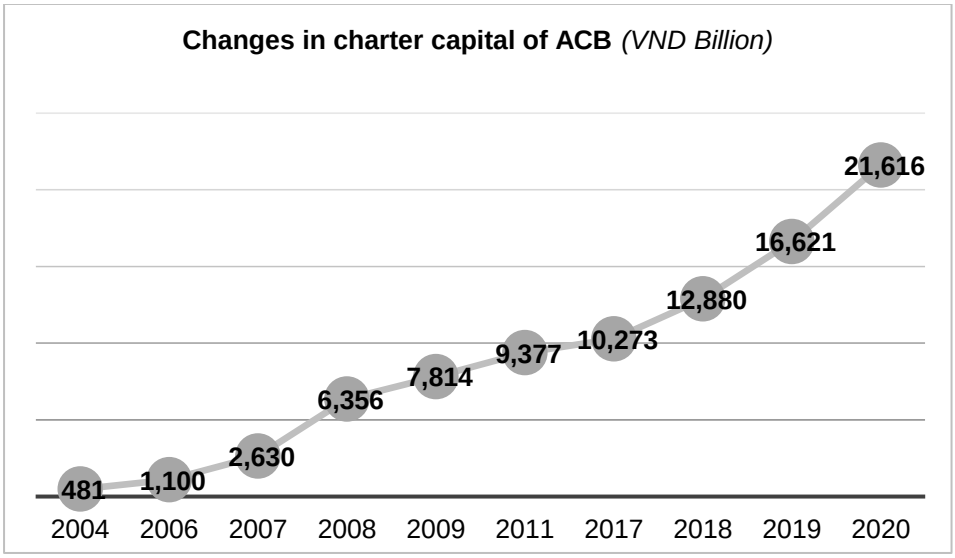


Figure A6.1: Changes in charter capital of ACB

Source: Dong, 2020.

Additionally, the representatives of listed companies on HOSE consistently considered capital mobilisation as one of the positive effects of the market behaviours on the businesses. The interviewee VNSM04, Chief Executive Officer of DRC – the consumer discretionary company listed on HOSE, claimed:

> *"The increase is extremely massive. Since listing on the stock exchange, the capital has increased from over one hundred billion to one thousand and few hundred billion as I remember rightly."*

His statement is strongly supported by the information provided in the annual reports of DRC. In 2006, this company started to officially be listed on the HOSE with over VND 92 billion (Danang Rubber Joint Stock Company, 2021). Since then, there has been eight times that DRC enhanced its charter capitals ***(Table A6.1)***.

Table A6.1: History of capital increase of DRC until 2020

History of capital increase		
Time	**Event**	**Total charter capital** *(VND)*
2006	Officially be listed on HOSE	92,475,000,000
2007	Issue additional shares to pay dividends	130,385,520,000
2008	Issue bonus shares to shareholders	153,846,240,000
2010	Issue additional shares to pay dividends	307,692,480,000
2011	Issue additional shares to pay dividends	461,538,650,000
2012	Issue bonus shares and shares to pay dividends	692,289,450,000
2013	Increase charter capital through paying stock dividends at the ratio of 35%	830,738,490,000
2015	Issue additional shares to pay dividends	913,800,030,000
2016	Issue shares to increase share capital from equity capital	1,187,926,050,000

Source: Danang Rubber Joint Stock Company, 2021.

In 2016, the charter capital massively increased by VND 274.13 billion as compared to 2015 ***(Figure A6.2)***. From 2016 to 2020, the total number of shares was 118,792,605 shares and the current charter capital was approximately VND 1,187.93 billion, which was nearly 12.9 times higher than that in 2006 and 1.3 times higher than that in 2015 (Danang Rubber Joint Stock Company, 2021).

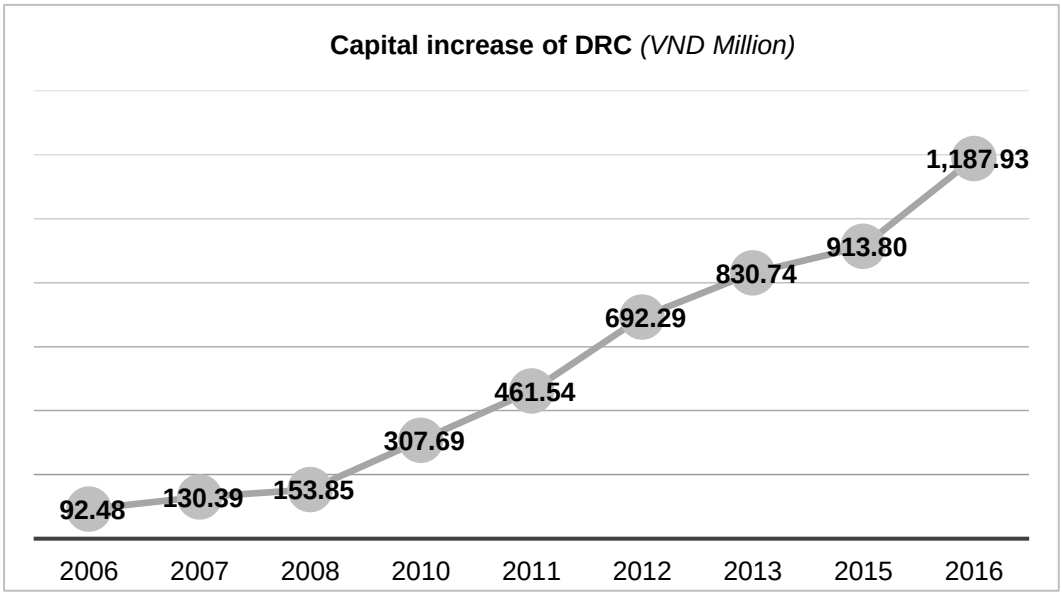


Figure A6.2: History of capital increase of DRC

Source: Danang Rubber Joint Stock Company, 2021.

On this subject, the interviewee VNSM05, a manager of VCB – the bank listed on HOSE, indicated an enhancement of its equity capital. stated that:

"The equity is increased by 100% compared to ten years ago."

It is consistent with the data provided in the annual reports of VCB and other publications. According to the annual reports, there was a constant growth in the shareholders' equity of VCB over the past ten years (Vietcombank, 2016; Vietcombank, 2021). ***Figure A6.3*** refers to the shareholders' equity of the bank from 2010 to 2020. In 2020, the shareholder's equity of VCB reached VND 94,095 billion. It increased by 354% as compared to the equity in 2010, and it went up by 108% as compared to the equity in 2015. As compared to 2019, it grew by VND 13,141 billion, equivalent to nearly 16.2% over the previous year.

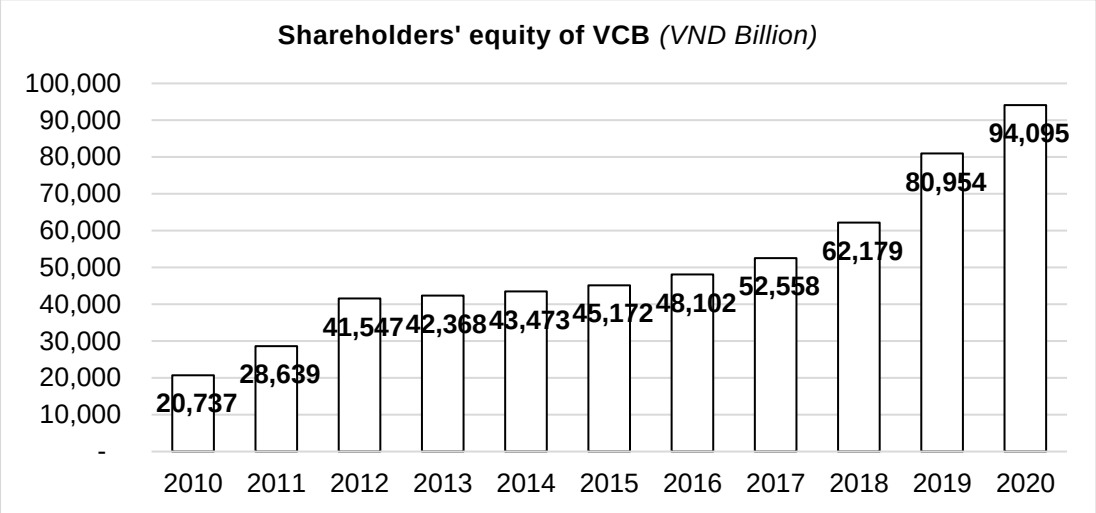


Figure A6.3: Changes in shareholders' equity of VCB

Source: Dong, 2020.

Additionally, its charter capital massively increased over the years. In 2008, the charter capital of VCB was nearly VND 12,101 billion, and the total number of shares was 1,210,086,026 shares (Vietcombank, 2021). Since listing on the Vietnamese stock market and especially in recent years, the capital of VCB has significantly changed. The history of its capital increase is provided in ***Table A6.2***. On 28 December 2018, VCB received approval from the Government and the Governor of the State Bank of Vietnam to raise its charter capital through the sale of shares to the foreign investors, including GIC and Mizuho, with a total transaction value of VND 6,168 billion (Vietcombank, 2020). Mizuho Bank is a leading global bank with one of the largest customer bases in Japan and GIC is an investment fund controlled by the Singapore Government. This transaction contributed to the prestige, position, and potential of VCB. Moreover, it demonstrated the confidence and interest of international investors in Vietnam. The charter capital of VCB went up to VND 37.1 trillion (equivalent to USD 1.6 billion) (Vietcombank, 2020). The capital growth contributed to the business development as well as a higher capital safety standard for VCB and resulted in an increase of VND 3,783 billion for the State budget (Vietcombank, 2020). In 2020, VCB became the

stock with the largest market capitalisation on the Vietnamese stock market with an equivalent of USD 17 billion (Vietcombank, 2021).

Table A6.2: History of capital increase of VCB until 2020

History of capital increase			
Time	**Event**	**Number of shares issued**	**Total number of shares post issuance**
06/02/2008	Officially transformed into Joint Stock Commercial Bank for Foreign Trade of Vietnam	1,210,086,026	1,210,086,026
30/06/2009	Shares listed in HOSE		
08/06/2010 - 16/8/2010	Offer shares to existing shareholders at the ratio of 9.28% at par value	112,285,426	1,322,371,452
16/12/2010 - 15/2/2011	Offer shares to existing shareholders at the ratio of 33% at par value	436,382,579	1,758,754,031
20/07/2011	2010 dividend payment in shares at the ratio of 12%	211,050,483	1,969,804,514
2012	Issue additional 15% of the total shares to strategic shareholder Mizuho	347,612,562	2,317,417,076
2014	Issue bonus shares at the ratio of 15%	347,603,258	2,665,020,334
30/11/2016	Issue bonus shares at the ratio of 35%	932,748,241	3,597,768,575
04/01/2019	Issue additional 0.55% of the total shares to strategic shareholder Mizuho and 2.45% of the total shares to GIC	111,109,873	3,708,878,448

Source: Vietcombank, 2019.

In summary, there was a massive growth in the capitals of the listed companies thanks to listing and trading on the stock market. The Vietnamese stock market is recognised as an effective and efficient channel for mobilising resources for the economy and facilitating the businesses to raise funds predominantly through equity.

2. Business management and corporate governance

Among the respondents, three interviewees indicated that the market behaviours contributed to the efficiency of business management and corporate governance in the listed companies. The interviewee VNSM01, Head of Finance – Accounting and the authorised person to disclose information of CDN – the transportation company listed on HNX, described the changes in his companies as follows:

> *"Firstly, the governance model was changed greatly. Even the operation also follows the securities regulations. The governance model must be constantly changed and innovated. Regarding reporting, transparent information, and operation, regulations of the State also guide the businesses to conduct more modern governance models and the control of public is also good. As a result, I think the business will be more civilised. Very good."*

Furthermore, listing and conforming to the current regulations in the stock market helped the managers of CDN understand its competitors and enhance its competitive advantages. The financial manager responded:

"We discover them, so that we would find the way to make us better."

It is in alignment with the information given in the annual reports of CDN in recent years. In 2019, CDN focused on building a corporate governance model, rearranging departments in an efficient manner, and reducing middle-level leadership (Danang Port Joint Stock Company, 2020). Additionally, the operation and management methods were improved to increase responsibility and capacity of leaders, boost its business performance, and enhance its competitiveness (Danang Rubber Joint Stock Company, 2021). In parallel with domestic training, the company sent a lot of employees to participate in seminars abroad in order to improve its competitiveness and international integration (Danang Port Joint Stock Company, 2019). The company strictly supervised implementation and disclosure of information in accordance with provisions of the current laws and regulations in the securities market (Danang Port Joint Stock Company, 2021).

Moreover, the interviewee VNSM03, the manager of the bank listed on HNX, claimed that the treasury stocks not only acted as incentives for the employees to work more devotedly but also encouraged their long-term commitment and inspired their intense loyalty. As a result, they contributed to the growth of the company value and its stock price. He claimed:

"Secondly, they also would like to have favourable conditions when issuing stocks and bonds. They would like to issue incentives for employees. Thirdly, when they need some technical things called treasury stock to buy and sell. When the businesses need money and they want to invest, it is more efficient to invest in themselves instead of investing in another organisation. Simply using the treasury stock. The employees are rewarded by issuing the treasury stocks. When the senior managers want to stay with the company, they will issue the treasury stocks. Over 5 or 7 years, the shares will vest, and they are used to motivate the employees to work. The employees also want to do their best to keep the stock value stable and then their value is increased. It is a type of savings."

It is consistent with the information provided in the annual reports and other publications of the company. The equity in 2020 increased by 28% as compared to 2019 and reached VND 35,448 billion, of which charter capital climbed by 30% mainly from paying a 30% stock dividend and selling VND 100 billion of treasury shares (Asia Commercial Bank, 2020). The

bank provided specific benefits and incentives for managers, such as transportation allowances, employee stock ownership plan stocks, annual health check-ups at high-quality clinics, and overseas holidays (Asia Commercial Bank, 2021).

In this regard, the interviewee VNSM04, Chief Executive Officer and the member of the board of directors of the consumer discretionary company listed on HOSE, absolutely agreed with the mentioned opinions. It was evident from his response:

> *"Extremely different. Because our company is actually a listed company. The second thing is that the information is mass information. Therefore, almost all the activities related to production and business activities as well as finance are required to be public and accurately reflect. To deal with the data, in addition to the information from internal sources, our company invites several companies to examine the information to be published and the data before they are published on the stock exchange. It is forced to have the independent companies to do. It leads to great development in the management process as well as the corporate governance. It shows a very high level of transparency."*

Moreover, when it was asked whether the information on the stock exchange supported the decision-making of the managers or not, he strongly affirmed:

> *"Yes, it does. It is right."*

Subsequently, the provided responses predominantly reveal that the business management and the corporate governance of the listed companies are substantially improved thanks to the impacts of the market behaviours.

3. Financial performance and operational efficiency

The responses majorly manifest significant enlargement in the financial performance and the operational efficiency of the listed companies. In particular, the interviewee VNSM01, the financial manager of the newly listed company on HNX, stated:

> *"It is different. Greatly different. In 2014, before equitization, our revenue was around 478 billion and our profit was over 90 billion. After 5 years, our revenue is nearly 1000 billion and our profit is nearly 300 billion. In this year, our profit is about 260 billion. Previously, our revenue was 478 billion and our profit was 93 billion. I mean consolidating revenue and profit and consolidation also includes several subsidiaries joining together with parent company. In this year, the revenue of our parent company*

is 920 billion and its profit is 260 billion. It has been 6 years since we started equitization and I think it is extremely good."

"The total production quantity in 2014 was approximately 6 million tonnes. In this year, it is nearly more than 11 million tonnes. It implies that our total production quantity increased by around 1 million tonnes per year on average."

Additionally, he claimed that there was a development in services of the company because it focused on the core services as well as adopted a vertical growth strategy. He added:

"We do not enhance the services, but the number of customers goes up. I mean the product lines of the services rise. We currently follow internal growth strategy; we focus on our core services, and we employ a vertical growth strategy but not horizontal growth strategy. The increase of our total production is mainly thanks to focusing on our core products, including containers, bulk cargo, and cruise ships. Last year, we lost all tourists due to COVID, but we still develop."

His declarations are supported by the financial information in the annual reports from 2014 to 2020. The company started to be officially listed on HNX on 30 November 2016. ***Table A6.3*** indicates a significant upward trend of production quantity, net revenue, profit before tax, profit after tax, and basic earnings per share of CDN since listing on the stock exchange. The financial performance and operating efficiency after listing on the stock exchange constantly and hugely developed as compared to before listing on HNX. The total quantity in 2020 was almost 11.42 million tonnes (Danang Port Joint Stock Company, 2020). It was approximately 1.9 greater than the quantity in 2014, before equitization and nearly 1.78 greater than that in 2015, before listing on the stock exchange. The total production quantity of the company went up by around one million tonnes per year on average. In addition, the company made great efforts with the right orientation by focusing on container services, cruise ships, and large tonnage vessels, thus bringing about encouraging results and setting the stage for development of the company in the following years (Danang Rubber Joint Stock Company, 2021). As a result, the net revenue in 2020 was nearly VND 904 billion, which was almost 3.59 higher than that in 2014 and approximately 1.58 higher than that in 2015 (Danang Rubber Joint Stock Company, 2021). Even during the pandemic of COVID, the net revenue in 2020 increased by VND 80.64 billion, equivalent to an increase of 9.79% as compared to the previous year. Additionally, there was a gradual growth in its profit scale after listing in the stock market. In general, there was a continuous development in the production and the

services of the company, resulting in an enormous and constant growth of its financial performance from 2016 to 2020.

Table A6.3: Overview of production quantity and financial performance of CDN

Overview of production quantity and financial performance (2014 - 2020)							
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Quantity *(Million tonnes)*	6.02	6.40	7.25	8.03	8.65	10.46	11.42
Net revenue *(VND million)*	251,577	573,239	553,291	601,116	694,742	823,758	904,396
Profit before tax *(VND million)*	55,794	167,987	160,119	162,144	183,385	227,458	260,199
Profit after tax *(VND million)*	40,750	124,981	127,605	131,566	147,484	184,160	209,382

Source: Danang Port Joint Stock Company, 2016; Danang Port Joint Stock Company, 2018; Danang Port Joint Stock Company, 2020; Danang Port Joint Stock Company, 2021.

Moreover, the interviewee VNSM02, the manager of the construction company newly listed on HNX, was of the same mind on this regard. She responded:

> *"It developed significantly, it developed. In other words, compare to few years ago or the previous time, our company do not have to develop rapidly but it enters the stable stage, and it does not go backwards. In 2013-2014, our production value and revenue might be higher. At the present, they are lower than the indicators at that point of time. The reason is that the construction industry was on the rise at that point of time, so I reached the peak. However, it is not easy to achieve our current production value and revenue at the present. We compare objects at the point of time, but we do not compare with the previous years and then give conclusions. However, in the challenging stage of the construction sectors, some businesses go bankrupt or face difficulties, while our business still exists. It is regarded as development."*

Her declaration is supported by information from the annual reports of TA9. The company was listed on the HNX from 31 July 2015, and ***Table A6.4*** provides an overview of its business performance between 2013 and 2020. As compared to 2013 and 2014, the net sales and profit of TA9 sharply jumped after listing on the stock exchange. In 2015, the net sales were VND 2,342 trillion and it rose by VND 790 trillion as compared to 2014. The net sales in 2015 were approximately 1.5 times higher than that in 2014 and nearly 2.2 times higher than that in 2013. The profit before tax and profit after tax in 2015 were significantly greater than the profit scales in 2013 and 2014. The net sales and profit scales of TA9 continued to grow in 2016. The net sales and profit in 2017 decreased because its production in 2017 was lower than 2016 since the production value and the revenue from construction and installation activities in 2017 were lower than those in 2016 (Thanh An 96 Installation and

Construction Joint Stock Company, 2018). In 2018, the net sales and profit scale significant dropped as the State capital for basic construction was limited, and there were much fewer jobs for construction enterprises in this year (Thanh An 96 Installation and Construction Joint Stock Company, 2019). From 2018 to 2020, there was a gradually upward trend of net sales and profit scale. In 2020, the net sales went up by VND 188 trillion, equivalent to a growth of 14.7% as compared to the previous year (Thanh An 96 Installation and Construction Joint Stock Company, 2021b). The board of directors, managers, and staffs made huge efforts to overcome difficulties in the construction sector under the impacts of the COVID and save costs to achieve efficient business performance and operating efficiency during the pandemic (Thanh An 96 Installation and Construction Joint Stock Company, 2021b). Thus, there was a development of its financial performance and operating efficiency after listing on the stock exchange, and it gradually recovered even in such challenging stage of the construction sectors in recent years.

Table A6.4: Overview of financial performance of TA9

Overview of financial performance (2013 - 2020) *(VND million)*								
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Revenue	1,072.81	1,551.27	2,341.63	2,695.99	2,027.34	1,230.43	1,280.28	1,468.35
Profit before tax	20.85	30.45	42.87	52.11	45.75	27.43	28.44	29.39
Profit after tax	15.63	23.68	33.33	41.69	36.59	21.94	22.67	23.31

Source: Thanh An 96 Installation and Construction Joint Stock Company, 2016; Thanh An 96 Installation and Construction Joint Stock Company, 2018; Thanh An 96 Installation and Construction Joint Stock Company, 2021b.

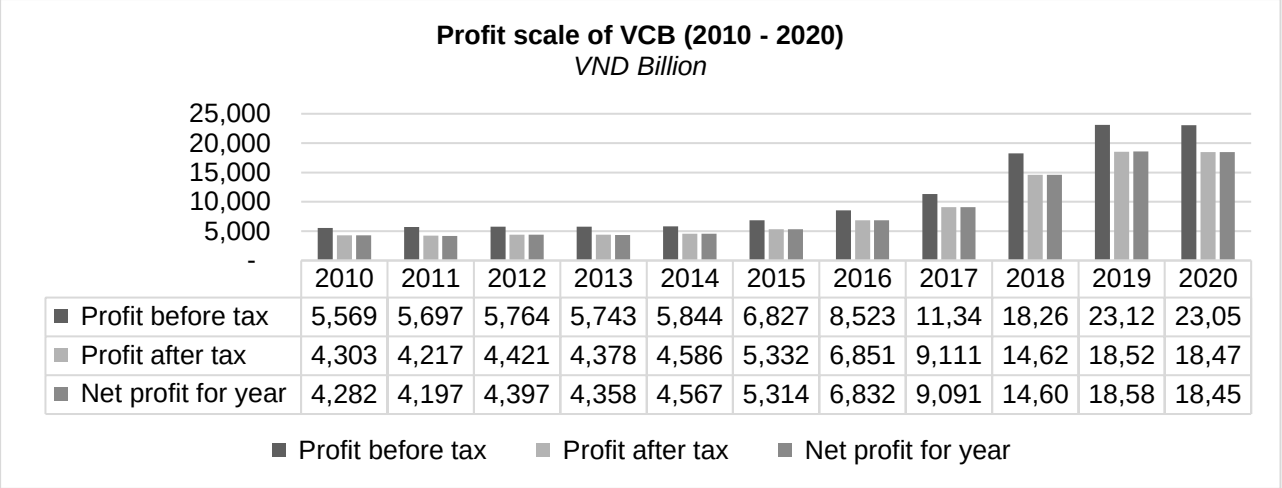
In this regard, the interviewee VNSM05, the manager of the bank listed on HOSE, strongly went along with the mentioned opinion:

> *"It is compared to itself before equitization, before equitization only. Before equitization, there were two stages. If it is compared to itself before equitization, it will be greatly efficient and outstanding. Secondly, it has had a foundation since it was a state-owned bank and the foundation in these 7 – 8 years was very solid. In 2014, 2015, 2016, and 2017, our profit is much higher. Two levels. Our bank started listing on the stock exchange in 2010. In the year of 2016 or in 2015-2016, our level excelled after every five-year period."*

Furthermore, he additionally explained that the success of VCB was attributed to the focus on the core business areas and compliance with the provisions of the law. It was evident from his explanation as follows:

"We focus on our core business areas. We have expertise and experience. Our success refers to focusing on the core business areas and complying with the provisions of the law. Other banks and other organisations expanded into other fields and raced to the temporary taste of the market. Finally, they failed and now they are hiding a lot. We do not have any external participation and we do not take part in any joint venture, capital contribution, cooperation, or establishment in other areas."

His responses are consistent with the financial data in the annual reports of his company. ***Figure A6.4*** provides an overview of VCB's profit scale from 2010 to 2020. According to the annual report in 2015, its profit before tax after provision in 2015 reached VND 6,827 billion. It climbed by 16.83%, and the growth rate of profit in 2015 was the highest in the five consecutive years (Vietcombank, 2016). In 2015, the profit after tax went up by 16.27% as compared to 2014. As the bonus and welfare funds were appropriated at the year-end, the net profit was revised to deduct the amount appropriated to bonus and welfare funds of the corresponding year ended 31 December. As a result, its net profit in 2015 increased by 16.36% as compared to 2014. Since 2015, the profit before tax, profit after tax, and net profit had risen significantly and gradually. In 2019, VCB continued to achieve impressive breakthroughs and new records, becoming the first Vietnamese bank to reach VND 23,122 billion (equivalent to USD 01 billion) in profit and to be listed in the Global Top 200 profitable financial and banking groups (Vietcombank, 2020). It was an increase of 26.56% over 2018 and approximately 3.4 times higher than the profit scale in 2015. In 2020, it achieved various impressive results exceeding the targets assigned by the general meeting of shareholders and continuously led the banking system in terms of profit scale and asset quality (Vietcombank, 2021). The achievements in 2019 and 2020 indicated that VCB was on the right track with its business transformation strategy that focused on three key pillars, including retail, services, and investment to achieve the goals of high growth, safety, efficiency, and sustainable development (Vietcombank, 2020). In addition, VCB made accurate, timely, and complete disclosure of information related to financial health and business performance for the investors in the context of unpredictable patterns of the COVID epidemic (Vietcombank, 2021). By that way, the investors and shareholders understood the operation situation as well as the plans and strategies of VCB in this volatile context, thus continuously placing trust and confidence in this bank (Vietcombank, 2020; Vietcombank, 2021).



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Profit before tax	5,569	5,697	5,764	5,743	5,844	6,827	8,523	11,34	18,26	23,12	23,05
Profit after tax	4,303	4,217	4,421	4,378	4,586	5,332	6,851	9,111	14,62	18,52	18,47
Net profit for year	4,282	4,197	4,397	4,358	4,567	5,314	6,832	9,091	14,60	18,58	18,45

Figure A6.4: Profit scale of VCB from 2010 to 2020

Source: Vietcombank, 2016; Vietcombank, 2021

In summary, the responses definitively showed a massive development in the financial performance and operational efficiency of the listed companies. There is a development in the total production and the services as well as a growth in the net revenues and the profit scales of those companies, and mainly focusing on the core business activities contributes to their successes.

4. Value and brand growth

The value and brand growth are regarded a favourable impact of the market behaviours on the listed companies. The dominant point from the responses is that the values of the listed companies are enhanced as well as their brand awareness, recognition, and loyalty are raised thanks to listing on the stock exchange. As a result, they attract more investors and increase their networks. Particularly, the interviewee VNSM03, the manager of ACB, affirmed that the listed companies had more advantages than the unlisted ones. He claimed:

> *"To compare listing on the stock exchange and not listing on the stock exchange, companies listing on the stock exchange easily obtain advantages. Because the companies listing on the stock exchange become public and more people are informed."*

His opinion is supported by the information of the annual reports of ACB. There was a continuous expansion of its market share and branch network in recent years (Asia Commercial Bank, 2020; Asia Commercial Bank, 2021). The network was present in 48 provinces and cities, with 371 branches and sub-branches by year end of 2020 (Asia Commercial Bank, 2020). As a result, the enhancement substantially contributed towards accomplishment of its goals, especially growth of the balance sheet and value creation for its

shareholders (Asia Commercial Bank, 2020). Thus, there have been constant and significant growth and expansion of the bank since listing on the stock market, especially in recent years.

Moreover, the interviewee VNSM04, Chief Executive Officer of DRC, strongly declared that the value of his consumer discretionary company was boosted thanks to the effects of the market behaviours. He responded:

> *"It is partly thanks to it. The important thing is the market. Because the market develops, our company must invest more to develop more. As a result, its value will increase."*

> *"That is right. Because we invest a lot and run a business well, the stock price will go up. When it goes up and it is related to the investors, so people also follow. The information about the rubber sector is naturally developed as a result."*

According to the annual reports of DRC, brand promotion and development was properly invested and focused by the managers, so this company always strengthened and affirmed its position as one of the leading tire manufacturers in Vietnam (Danang Rubber Joint Stock Company, 2020). The brand strongly and widely spread through a system of potential and reputable distributors nationwide (Danang Rubber Joint Stock Company, 2020; Danang Port Joint Stock Company, 2021). Further, it exported a variety of products to more than 40 countries around the world, mainly in Asia, South America, Africa, and Europe (Danang Rubber Joint Stock Company, 2021). In order to achieve such outstanding growth results over the past years, the Board of Management was flexible, closely followed the practices, proactively offered positive and appropriate solutions, promptly grasped market development, as well as applied many flexible policies to boost the revenue and constantly improve and ensure stable and quality products to meet the demand of the market (Danang Rubber Joint Stock Company, 2021). Moreover, the company always supervised and conducted the information disclosure publicly, transparently, and punctually in accordance with the Law on securities (Danang Rubber Joint Stock Company, 2021). The mentioned results not only strengthened the confidence of shareholders, investors, and other stakeholders in the management and the leadership of DRC, but also contributed towards protecting and building its reputation in the market and worldwide (Danang Rubber Joint Stock Company, 2021).

Regarding the brand growth, the interviewee VNSM05, the manager of VCB, indicated the brand growth of his bank in recent years and it was evident from his explanation as follows:

> *"The first thing refers to automatically promoting the brand to expand the network. I think my network increased by 40%, around 30-40% in five years ago."*

His response is consistent with the information provided in the annual reports and other publications of VCB. Thanks to sustained efforts, VCB's investor relations activities in recent years have achieved remarkable results, contributing towards enhancing the value of VCB (Vietcombank, 2021). In the stock market, VCB became the champion of profit as well as Vietnam’s largest bank by market capitalisation in 2020. By the end of 2015, apart from the head office, VCB had 96 branches and 368 transaction offices operating in 50 out of 63 cities and provinces in the country (Vietcombank, 2016). The operation network was significantly expanded domestically and internationally over the past years. As of 31 December 2020, VCB's network comprised its head office, 116 branches and 474 transaction offices, 4 subsidiaries in Vietnam, 1 representative office in Singapore, 1 representative office in the United States, 1 representative office in Ho Chi Minh City, 3 subsidiaries in foreign countries, 2 cash treatment centre, 1 Human Resource Development and Training School and 3 joint venture companies (Vietcombank, 2021). Furthermore, the reputation and brand image of VCB were continuously enhanced, therefore the bank was given many prestigious awards by both domestic and international organisations (Vietcombank, 2020; Vietcombank, 2021). These recent successes boosted VCB to become one of Asia’s 100 strongest banks and one of top 30 strongest bank in Asia Pacific in 2019 and 2020 (Vietcombank, 2020; Vietcombank, 2021). The stock of this bank was continuously coming with the highest trading price among the listed banking stocks in the Vietnamese market, and it was the market leader in terms of market capitalisation, which positively contributed to the VN Index's growth in recent years (Vietcombank, 2021).

Subsequently, the market behaviours of the Vietnamese stock market exert several positive impacts on the business performance of the listed companies. The companies from different sectors are dissimilarly impacted by the market behaviours.

Appendix 6.8: Suggestions and recommendations

There are seven main points in their responses including controlling and improving information quality, enhancing information transparency, improving information disclosure requirements and awareness, improving systematicness, coherence and supervision, increasing self-cultivation of investors, providing better guidance and regulations, as well as strengthening deterrence and compliance.

- **Enhance information transparency**

Five interviewees suggested enhancing the information transparency, which is evident from their responses. The interviewee VNSM04 and the interviewee VNSM10 advised imposing stricter requirements of the information transparency and strengthening the linkages between the listed companies and the stock exchanges. The Chief Executive Officer of DRC claimed:

> *"Actually, it needs to increase linkages between stock exchanges and listed companies. It means that the information should exclude the unofficial information. It needs to have work between the listed companies and the stock exchanges to enhance the transparency with more official information."*

When the interviewer asked whether it was necessary to check the information before publishing or not, the interviewee strongly confirmed:

> *"Yes, we should."*

The senior broker of Mirae Asset Securities went along with the given idea and proposed:

> *"I suggest strengthening the requirements for confidentiality and transparency of the information to enhance fairness in the market. The more detailed and more comprehensive the information is, the better it is. Improving the fairness and the transparency of the information also helps create confidence for investors, especially foreign investors when investing in the companies listed on the stock market."*

Additionally, the interviewee VNSM01, the interviewee VNSM03 and the interviewee VNSM07 supported that good and transparent information disclosure contributed towards building a well-known brand, and gaining attention, trust and confidence of investors, customers, and stakeholders. The Head of Finance – Accounting of CDN, who is also the authorised person to disclose information, claimed:

"Now, it is necessary to enhance the participation of small and independent shareholders as much as possible to become more independent and transparent. It would be greater if we had some critical thinking and measures to become more public."

Furthermore, the manager of ACB declared:

"It is mandatory for the companies to regularly publish and become transparent."

The branch director of Phu Hung Securities Corporation, provided his perspective in this regard as follows:

"In fact, we have made every effort. There are regulations on the information disclosure in the market. For example, in 24h, 4h, businesses publish all information needed to be public and they fulfil all. However, another story refers to whether it is transparent or not. It is not objective to disclose the information transparently. Is it right? Now, go back what we talked. When the companies publish well and do good things, they have a good brand and people pay attention, trust, entrust and so on. According to me, it is a very long way to make the information transparent."

- **Improve disclosure requirements and awareness**

The interviewee VNSM06, the interviewee VNSM07, the interviewee VNSM09, the interviewee VNSM10, and the interviewee VNSM02 strongly advised improving the information disclosure requirements and awareness. The Deputy Director of Transaction Supervision Department of HOSE suggested detailing the objects who were required to disclose the information, specifying the disclosed information as well as providing the information in various languages in a timely and transparent manner. His specific advice was as follows:

"To improve the quality of information, there are some following things. The first thing refers to specifying the information that needs to be disclosed and the more detailed the better. For example, there are 5 or 6 types of information in the enterprise, it is required to concretise the types of information and detail the information that needs to be provided. Currently, the market has integrated, so it should be provided in several languages, for example, in Vietnamese and must be in English, French, Chinese and Korean. The updated information is published in various languages. The information must be timely and transparent."

"Detailing each investment object and each object who needs to disclose information. It implies that the more the better. For example, parents, siblings, children, biological

children, adopted children. Detailing the objects that need to disclose information to ensure the clarity."

Furthermore, the branch director of Phu Hung Securities Corporation claimed that the listed companies should actively raise their awareness and improve their information disclosure. He responded:

"It is impossible to equate that all people do not publish specific and accurate information without any recognition. The listed companies must comply with standards and disclose information according to the Constitution of the State. However, it depends on the business to determine whether the information is official or not. The real businesses will do real things, the virtual businesses will always be virtual. Certainly, even if people do not know it now, the investors will know it later. We cannot say anything, and investors will judge by themselves. It is the regulation, so they must disclose the information and it is impossible to unpublish. However, comparing the real and the virtual, the investors will know the virtual things and then they do not trade it anymore and the company removes itself. The real companies are always real. For example, people always trust to what Vinamilk declares, but not other stocks. People do not listen what stocks at one, two or three thousand declares, and finally they even do not go to the meeting of shareholders anymore. It is about the real and the virtual. It is always difficult to regain the brand. At that time, the companies must change the company, the board of directors, the human resources, everything and even the capital scale, so it would be ok. Thus, the private enterprises must improve the information disclosure itself, and the State always requires doing so. People who do not do it rightly damage their company. Let do what the laws regulate. It is up to the business to decide the real or the fake or whether the information is good."

Additionally, the General Director of VDS – the newly listed company on HOSE, who is a professional and experienced expert in the finance and especially in the Vietnamese stock market, suggested:

"Regarding propaganda and communications: it is necessary to have effective communication, so businesses are aware of and understand the benefits and responsibilities of the information disclosure.

Enterprises: They need to understand and be aware that their responsibilities to disclose information as their obligations, responsibilities and rights, and their benefits when implementing good information disclosure."

Moreover, the senior broker of Mirae Asset Securities entirely agreed with the mentioned idea and stated:

"Further, it is extremely important to increase the awareness of information disclosure of the listed companies. It is a necessary condition to develop the stock market and enhance the benefits for the listed companies."

The Chief of Supervisory Board of TA9 claimed that it would be better to slightly extend the deadline of submitting and disclosing the information. Her response was provided as follows:

"Regarding information, the information must be provided to the shareholders. Is it right? As a result, the shareholders could obtain the updated information, and it is their rights. However, it would be better if there is an extension of deadline because the information is published anyway. It is better to extend time on disclosure of the financial information and information about the general meeting of shareholders. There is no more problem. It means that it should be slightly slower, but it is bound now."

- **Strengthen deterrence and compliance**

The interviewee VNSM05, the interviewee VNSM06, the interviewee VNSM09 and the interviewee VNSM10 greatly agreed that it was important to increase deterrence and compliance to motivate the listed companies to comply with the current laws and regulations. The manager of VCB – the listed bank on HOSE, expressed:

"The legal corridors are massive and abundant, but the deterrence and compliance are not high. Compliance is not high."

"It is deterrent. The legal corridors are massive and abundant like the jungle, but the problem refers to lack of compliance. It seems to be dissembled and people still do not comply."

"The legal corridors are so good. The legal corridors, statutes and regulations are full and sufficient. Our regulations are regarded as the forest and it is very thorough and rigid, but no one complies."

The manager of HOSE definitely adopted consistent perspective regarding to the increase of deterrence and compliance as follows:

"Regulations on sanctioning must be deterrent to ensure that right people are punished for the right crime timely. Avoiding bad information and avoiding the phenomenon making investors distrust and losing investor confidence."

The General Director of VDS, who is the professional specialist in this field, claimed:

"Regarding the State management: it is necessary to strictly and stringently handle companies which do not sufficiently, timely and accurately disclose the information."

The senior broker of Mirae Asset Securities aligned himself with the idea and expressed:

"At the same time, we should have severe and appropriate sanctions for information exploitation to prevent the market takeover and acquisitions based on the information exploitation."

- **Control and improve information quality**

The interviewee VNSM05, the interviewee VNSM06 and the interviewee VNSM08 stated that it was vital to control and improve the information quality as it made huge contributions to the Vietnamese stock market efficiency. The manager of VCB put forward suggestions as below:

"Thirdly, the current information has bandwagon effects and follows the trends. Sometimes, the information which cannot be identified is still provided. The importance is who believes in it, who believes in it. It seems that the information is not inspected, identified, and warned and it seems that the information is unrestrained. The information in foreign countries might not as unrestricted as the information in our country. Therefore, the information which are provided by spokesperson of the listed companies is sometimes unfaithful, unreal, or only information on papers. However, people base on it to predict the price and cause volatility of the market."

Furthermore, the manager of HOSE entirely was in alignment with the given opinion, and he added that the market would be efficient if the information quality were good. He claimed:

"We cannot improve the informational efficiency and we can only improve the quality of information. The efficiency is passive. You see, we cannot do anything to improve the informational efficiency because the efficiency is determined by the investors and the market. We can only improve the quality of the information. If the information quality is

good, the informational efficiency will be good. If the quality is bad, the informational efficiency will be bad."

Moreover, the interviewee VNSM08, who is a senior broker of Phu Hung Securities Corporation, suggested that the State must impose stringent regulations on controlling the information quality. His advice was:

"In order to enhance the benefits for companies listed on the stock market, I think the State should control the information in the market, in all financial channels. The State must make strict regulations so that the public information must be accurate, and it must be not allowed to provide sensation-seeking information to get more likes and boost view count. As you see in journalism, journalists make sensational headlines. For example, it has the right to take the form of a question. In other words, take, the question "Today, does Vinamilk announce a loss of 1000 billion compared to the previous quarter?", for example, and then it puts a question mark at the end of a sentence. This use of the question mark is allowed. It is actually a way to boost the view count. Many people are not professional and do not read the content, they only see the headline and sell-off. It means that they fall into their trap to let them drive the price down to buy-in. It is one way to make the sensational headlines like that. The State should have regulations to control the information of the news agencies and financial newspapers. Several financial websites provide accurate information. However, it should not be allowed to have the sensational headlines like the ones in showbiz. It is impossible to work in the financial industry but use the sensational headlines like the ones in showbiz. Therefore, the investors lose trust and confidence in it. The bad websites can only do it once, twice. People are afraid and they do not dare to read because it is dangerous. Therefore, in terms of the State, they should control the information."

- **Improve systematicness, coherence and supervision**

The interviewee VNSM02, the interviewee VNSM03, and the interviewee VNSM05 advised enhancing systematicness and coherence, reducing laxity and improving supervision to promote the informational efficiency of the Vietnamese stock market. The Chief of Supervisory Board of TA9 suggested increasing the systematic interconnection among the agencies as below:

"In the field of securities, there are the State Securities Commission, Vietnam Securities Depository, and stock exchanges. In other words, we must report to several places. Why do not we merge the Vietnam Securities Depository into the State Securities

Commission as a subsidiary? Thus, we must report to only one organisation. Because a company is now managed by these three organisations. The first is the Vietnam Securities Depository, the second is the stock exchange and the third is the State Securities Commission. It is chaotic. If they were merged, the reports would only be submitted to the State Securities Commission. The company would only submit the reports to the State Securities Commission and then the State Securities Commission would convey to the other organisations."

Additionally, when the interviewer asked whether her opinion referred to enhancing systematicness and reducing procedures or not, she strongly affirmed:

"Yes, it is right. It would be better if we only need to submit reports to the parent organisation and the parent organisation conveys them to its subsidiaries. Thus, we would only focus on requirements of the State Securities Commission. However, we are currently required to meet the requirements of the State Securities Commission and meet the requirements of the Vietnam Securities Depository. We must meet different requirements, criteria, and regulations of these three organisations to fulfil our obligations. It is complicated. That is all."

Moreover, the manager of ACB suggested improving the supervising systems of the State authorities. He expressed as follows:

"There should be supervising systems of the State authorities. They must be supervised to make the investors safe and sound. Now, the companies in the stock market mainly work by themselves without supervision from anyone. When there are any events or something occurs, the investors do not know, and they disappear."

Further, the manager of VCB advised reducing the laxity as well as increasing the strict controlling, supervision, and inspection of the State authorities and agencies. This manager stated:

"The second thing is the laxity of agencies for controlling, supervision and inspection and even auditors and analysis agencies are weak. Agencies in general. Management, analysis, inspection, supervision, and legality were stagnant."

"Now, it takes time and many things. If everyone does right, the agencies for controlling and supervising and the law enforcement agencies implement seriously, thoroughly, rigidly, and fiercely, the market will surely be more stable."

- **Provide better regulations and guidance**

The interviewee VNSM01, the interviewee VNSM09 and the interviewee VNSM03 suggested providing closer, faster, and clearer policy orientation and guidance. The Head of Finance – Accounting of CDN offered his suggestions as follows:

> *"The second point refers to supports from the Government and the State, especially the State Securities Commissions should have a slightly closer orientation. Even the current circulars are a bit rigid and a bit one-sided. In fact, the stock market is extremely dynamic, and finance constantly changes. Thus, the operation and guidelines must be faster instead of being slow like now. Basically, I mostly work with circulars of information disclosure, and it takes 5-6 years to change it and it is just changed now."*

> *"The old circular – Circular No. 155 is replaced by the new one – Circular No. 96. It adds more new objects to limit the previous negativity. What I mean is that the finance and securities should update regularly and faster because it is still a bit slow now."*

The General Director of VDS, who is the member of the board of directors of the newly listed company as well as an experienced specialist in this field, was in complete agreement with the above advice and responded:

> *"Regarding the State management: Provide guidelines and good practices for businesses to follow and implement."*

In addition, the manager of ACB, which is the listed bank on HNX, suggested that the policies should be clearer and more transparent like the international regulations. His suggestions were provided as follows:

> *"According to me, firstly, the securities market must follow the international regulations. It means that how the international regulations are and so are Vietnamese regulations. It aims to that the foreign investors and the Vietnamese investors similarly obtain the information."*

> *"Overall, I think that Vietnam simply follows the international regulations in the foreign countries and so that our stock market will improve. Secondly, the policies must be clear, transparent, and public."*

- **Increase self-cultivation of investors**

The manager of VCB advised promoting self-cultivation of the investors to make efficient decisions in the stock market. He claimed:

> *"It is up to investors to make decisions on learning about the information for themselves. They are proactive. They are investors, so they must have self-learning and self-training skills. Sometimes, investors who are sponsors or billionaires have two or three experts behind them, and we do not know it. They have their own advisory department and I think it is up to each investor. It is not necessary to legislate. If you want to invest in the stock market in foreign countries like Europe, the United States or Canada, you must have certificates. The consultant must have dozens of certificates.*
>
> *"Their regulations are very strict, and they require sub-licences in fact. Everyone must have self-cultivation. No one can manage it. No one regulates that the news is true or untrue. It is up to each person to decide whether the news is right or not. If individuals and organisations who announce the news deliberately cheated, we would bear it."*

The key findings of this research study offer valuable suggestions to the policymakers, the managers, and the practitioners who intend to develop the Vietnamese stock market efficiency as well as enhance the benefits for the listed companies. Furthermore, this research provides implications for management practice in the Vietnamese context and other emerging stock markets.

Appendix 8.1: Research journey

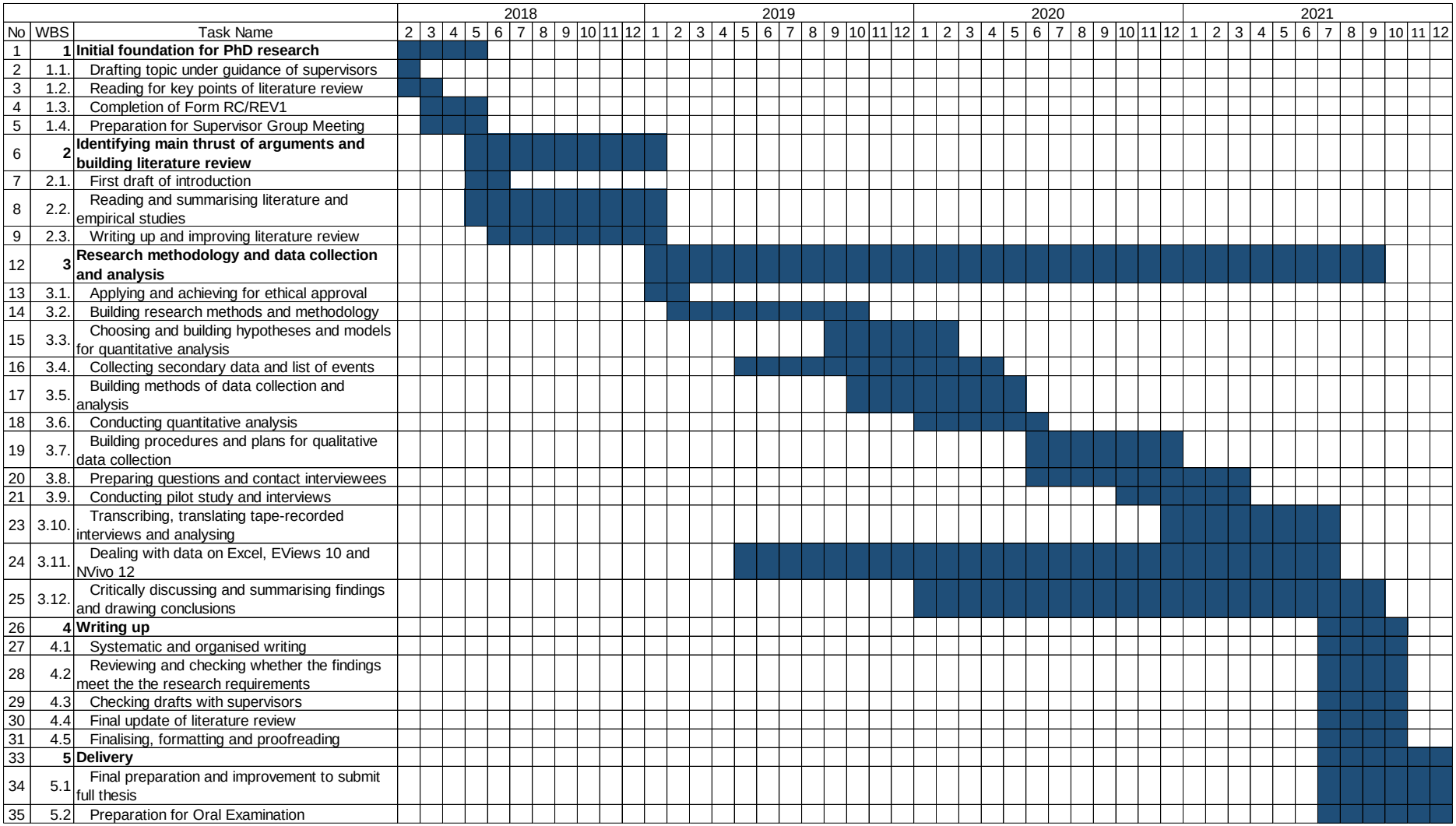
My research journey started from February 2018. The journey for this research project was definitely challenging and it offered me a golden chance to broaden my horizons. The progress to date is provided in the Gantt chart of detailed time plan to completion in ***Table A8.1***.

From February 2018 to May 2018, I focused on initial foundation for PhD research. It included drafting the topic under the guidance of my supervisors, reading for key points of literature review, completion of Form RC/REV1, and preparation for Supervisor Group Meeting.

After obtaining approval from PRDSC, I built up literature review with two chapters. Chapter 2 focused on stock market of Vietnam, and chapter 3 referred to efficient market hypothesis. The gaps found in the literature review opened up the formulation of the research question and objectives in this thesis. During this stage, I not only obtained the overview of the Vietnamese stock market efficiency and operations but also took initial directions of my work. I also learnt from the achievement and the mistakes of other researchers in conducting the relevant studies regarding the efficient market hypothesis in the emerging countries.

In addition, an ethical application was implemented on 16 January 2019, and it was approved on 18 February 2019. From February 2019 to May 2020, I focused on chapter 4 – Research Methodology. Choices of research methodology were based on the research question and objectives. The work depended on the research question and objectives to adopt several methods, different world views, and diversified types of data collection and analysis to best fulfil the research requirements. Furthermore, this chapter discussed the methods of data collection and analysis, and it provided information related to the random walk model, tests for random walk model used in the quantitative data analysis, the use of EViews, and event study. In addition, I collected secondary data and a list of events to conduct statistical tests from May 2019 to April 2020.

Table A8.1: Detailed time plan to completion



No	WBS	Task Name	2018											2019											2020											2021										
			2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	**1**	**Initial foundation for PhD research**																																													
2	1.1.	Drafting topic under guidance of supervisors																																													
3	1.2.	Reading for key points of literature review																																													
4	1.3.	Completion of Form RC/REV1																																													
5	1.4.	Preparation for Supervisor Group Meeting																																													
6	**2**	**Identifying main thrust of arguments and building literature review**																																													
7	2.1.	First draft of introduction																																												
8	2.2.	Reading and summarising literature and empirical studies																																													
9	2.3.	Writing up and improving literature review																																													
12	**3**	**Research methodology and data collection and analysis**																																													
13	3.1.	Applying and achieving for ethical approval																																													
14	3.2.	Building research methods and methodology																																													
15	3.3.	Choosing and building hypotheses and models for quantitative analysis																																													
16	3.4.	Collecting secondary data and list of events																																													
17	3.5.	Building methods of data collection and analysis																																													
18	3.6.	Conducting quantitative analysis																																													
19	3.7.	Building procedures and plans for qualitative data collection																																													
20	3.8.	Preparing questions and contact interviewees																																													
21	3.9.	Conducting pilot study and interviews																																													
23	3.10.	Transcribing, translating tape-recorded interviews and analysing																																													
24	3.11.	Dealing with data on Excel, EViews 10 and NVivo 12																																													
25	3.12.	Critically discussing and summarising findings and drawing conclusions																																													
26	**4**	**Writing up**																																													
27	4.1	Systematic and organised writing																																													
28	4.2	Reviewing and checking whether the findings meet the the research requirements																																													
29	4.3	Checking drafts with supervisors																																													
30	4.4	Final update of literature review																																													
31	4.5	Finalising, formatting and proofreading																																													
33	**5**	**Delivery**																																													
34	5.1	Final preparation and improvement to submit full thesis																																													
35	5.2	Preparation for Oral Examination																																													

Source: Author.

From 1 January 2020 to June 2020, I made attempts to write chapter 5 which focused on quantitative data analysis and discussion on the statistical findings based on these foundations. This chapter referred to quantitatively examining and determining the efficient form of the Vietnamese stock market by testing historical data on the two main stock exchanges. Moreover, it investigated the improvement of the stock market efficiency due to recent regulatory changes in comparison with findings of the existing literature review of the Vietnamese stock market efficiency. In this part, my skills of analysing the quantitative data by the use of EViews 10 and Excel were sharpened and improved.

From June 2020 to July 2021, I built up chapter 6, which discussed qualitative data collection and analysis based on the chapters 4 and5. It focused on semi-structured interviews. The procedure of pilot study and interviews was carried out in an ongoing global pandemic of coronavirus disease 2020 – 2021. The pandemic was not only a health crisis but also an unprecedent socio-economic crisis. It caused devastating social, economic, and political impacts on every economy, every company, and every single individual life. In this situation, contacting potential participants and conducting interviews are challenging. I went back home to conduct the interviews in July, and I had to be quarantined for two weeks. Unfortunately, my hometown, Da Nang, was in lockdown from the end of July to September 2020. After that, several cities and provinces also imposed social distancing and lockdown during the period from December 2020 to September 2021. National and local transportations were reduced and suspended. As a result, the unpredictable spread of the COVID caused some challenges and delays in this interview process.

This research thus involved six months of fieldwork, which took place in Vietnam between October 2020 and March 2021. To overcome these challenges, I had to make flexible use of emails, telephones, or direct meetings to contact and persuade the participants as well as undertake the interviews. The interviews were carried out as soon as the social distancing measures were eased, and the interviewees consented to participate in them. In this procedure, I significantly upgraded my flexibility as well as risk and time management skills, utilised my networking skills to contact super connectors and connect with potential interviewees, and broadened my transferable skills. Additionally, I also had a precious chance to receive constructive advice and tips for the successful interviews from the experts in pilot study. When I was involved in this process, my communication skills were harnessed, and my network was expanded. I met various talented and experienced experts and managers in several fields and industries in Vietnam. The interviewees not only were willing to engage with the interviews but also kindly, actively, and enthusiastically supported me in this research even when we did not know each other beforehand. Furthermore, I had marvellous opportunities to

learn new tools for qualitative analysis – NVivo 12, and the analysis of qualitative data in this study adopted mixed methods. Based on the key points found out by NVivo 12, I deeply discovered and investigated the market efficiency and its impact on the listed companies.

When I was conducting my work, I came across new and emerging themes. In my opinion, they would be worthy of attention and further research. This meant a slight revision in some of my research objectives (please see the Research Objectives). However, this revision did not impact my overarching research question and objectives as I stated previously. Moreover, the literature review was regularly updated during the research process.

From August 2021 to September 2021, I presented key findings, implications, and limitations of this research in chapter 7. This chapter attempted to summarise and discuss the major findings based on the quantitative and qualitative data analysis, identify implications for practice and policy based on the insights obtained from this research, and acknowledge the limitations of this research. Simultaneously, I built up the final chapter to provide conclusions of this thesis, highlight the original contributions to academic literature, as well as provide suggestions for future research.

During this journey, I had great opportunities to attend several training courses and conferences related to my development at the University of Sunderland. For example, I participated in the SPSS computing courses for statistical analysis and NVivo for qualitative analysis to enhance my knowledge and skills. Additionally, I had a presentation “Stock market efficiency responses to strategic stock exchange restructuring: Evidence from Vietnam” in Faculty of Business, Law, & Tourism Research Seminar Series 2019-2020. I attended Accelerating Business Collaboration Training and Development Programme. I participated in “Presenting Your Research: creating Lecture Presentations and Poster Presentations and using PowerPoint.” Furthermore, I also gained precious opportunities to work with my supervisor – Dr. Hamid Seddighi to publish a journal article: Tran, V. N. H., & Seddighi, H. R. (2021). Ho Chi Minh Stock Exchange Market: Operations and Efficiency. *Asian Journal of Economics and Empirical Research*, 8(1), 27-38. I also cooperated with Associate Professor Derek Watson to write another one regarding project management. This research journey and the mentioned activities hugely helped me to improve my critical thinking and analysis, enhance my mindset and knowledge, sharpen my skills, and acknowledge my limitations.