MACROECONOMIC INDICATORS AND STOCK MARKET RETURNS IN EMERGING ECONOMIES:

THE CASE OF VIETNAM

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Abstract

The prime contribution of this research is that it provides various empirical results regarding the bivariate and multivariate causality and cointegrating relationships between Vietnam's stock market returns and macroeconomic variables, specifically those pertaining to economic growth (GDP), consumer price index (CPI), broad money supply (M2), interest rates (IR – including deposit rate DR, lending rate LR, and refinancing rate FR), foreign exchange rate USD/VND (EX), and foreign direct investment (FDI).

The robustness of Vector Autoregressive (VAR) and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) frameworks were tested for Vietnam, which is a new emerging market. Using an updated data set of 161 monthly observations collected for the period from August 2000 to December 2013, a unique equation that represents the linkage among variables of interest was established. Particularly, a wide range of techniques, including unit root tests, Johansen cointegration tests, Granger causality tests, dynamic analysis (impulse response function and variance decomposition) were employed, which demonstrated that the VN-Index corresponds to long run, and also short run, path of selected macroeconomic variables. Furthermore, taking the volatility clustering into account, GARCH (1,1) models reveal the predictability of stock market volatilities using previous shocks (i.e. those originating from GDP, CPI and EX) rather than the previous volatility itself. The discussion of empirical findings has additionally been substantiated and corroborated via a field questionnaire, which gathered views of experts who are directly or indirectly involved with Vietnam's stock market.

The empirical results, along with the outcome of the empirical survey, provide the basis for policy and investment implications, emphasizing that using macroeconomic indicators would be beneficial to policy-makers, as well as securities investors, in promoting the development of Vietnam's stock market. The addition of external shocks (i.e. global crash 2007-2008) and/or other portfolios of stocks (VN30-Index, HNX-Index, HNX30-Index, UPCoM-Index) could be considered in further research.
Declaration

I hereby declare that this PhD thesis entitled “Macroeconomic Indicators and Stock Market Returns in Emerging Economies: The Case of Vietnam” was carried out by me for the degree of Doctor of Philosophy. This thesis is the result of my own investigation, except where otherwise stated. Other sources are acknowledged by footnote giving explicit references. A bibliography is appended.

I further declare that this work has not been accepted in substance of any other degree and is not being concurrently submitted for any other degree.

I give consent for my thesis, if accepted, to be available for inter-library loan and photocopying, and for the title and abstract to be made available to outside organizations.

Signed

Thuy Thu Nguyen

Date 30 June 2016
Dedication

This thesis is dedicated to my parents for their unconditional love, care and support throughout my life. They always stand by me; give me guidance and inspiration anytime I needed.

This thesis is also dedicated to my gorgeous husband for his love, constant encouragement, patience, and understanding throughout the years I conducted my research despite the geographic distance.

This work is especially dedicated to my wonderful little son for simply being there for me throughout the entire doctorate program.

Last, but not the least, I dedicate this thesis to my parents-in-law for their kindness and support.

There is no doubt in my mind that without the stimulus and inspiration from my whole family, I would never have been able to complete this work.
Acknowledgements

It is a great pleasure to acknowledge the debt I owe to many people for their help over the last three years. First of all, I would like to express my gratitude to my Director of Studies, Dr. Kadom Shubber, and my supervisor, Dr. Keith Luo, and thank them for their enthusiastic guidance and inspirational support on my research project. I would like to acknowledge their fully instruction, critical review and detailed feedback for every single chapter of my thesis that help me to accomplish my project in timely manner.

My sincere thanks are also given to Prof. Don Harper, Prof. Eleri Jones, Prof. Nandish Patel, Prof. Peter Abell and all the staffs in the Research Degree Center at London School of Commerce and Cardiff Metropolitan University, who provided many useful sessions and workshops during my doctoral course. Besides, I would like to thank all my course-mates, especially all the members in Peer Support Network, who are not only willing to share their ideas, advice, but also their encouragement and enthusiasm during the entire program.

I would like to acknowledge the financial assistance that I received from the Vietnam International Educational Department (VIED), Ministry of Education of Vietnam. I would also like to acknowledge the great support from all my colleges in Faculty of Banking and Finance- Foreign Trade University of Vietnam during the time I worked on the doctorate program.

Finally, thanks are due to my loving parents, my husband, my parents-in-law, my son, my brother, my sister-in-law, and all my close friends for their encouragement, understanding and inspiration throughout the last three years. There are no words to express how grateful I am to have them by my side for all the time.
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<tr>
<td>ADF</td>
<td>Augmented Dickey Fuller</td>
<td>HNX</td>
<td>Hanoi Stock Exchange</td>
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<td>AFTA</td>
<td>ASEAN Free Trade Area</td>
<td>HOSE</td>
<td>Ho Chi Minh Stock Exchange</td>
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<td>AIC</td>
<td>Akaike Information Criteria</td>
<td>HSTC</td>
<td>Ho Chi Minh Securities Trading Center</td>
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<td>APT</td>
<td>Arbitrage Pricing Theory</td>
<td>GARCH</td>
<td>Generalized Autoregressive Conditional Heteroskedasticity</td>
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<td>ARDL</td>
<td>Autoregressive Distributed Lag</td>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>ARIMA</td>
<td>Autoregressive Integrated Moving Average</td>
<td>GNP</td>
<td>Gross National Product</td>
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<td>ARMA</td>
<td>Autoregressive Moving Average</td>
<td>GSO</td>
<td>General Statistics Office</td>
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<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
<td>GSP</td>
<td>Gross Social Product</td>
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<td>ASEM</td>
<td>Asia-Europe Meeting</td>
<td>IAS</td>
<td>International Accounting Standard</td>
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<td>BRIC</td>
<td>Brazil, Russia, India and China</td>
<td>IFS</td>
<td>International Financial Statistics</td>
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<td>CAPM</td>
<td>Capital Asset Pricing Model</td>
<td>IMF</td>
<td>International Monetary Fund</td>
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<td>CFR</td>
<td>The Council on Foreign Relations</td>
<td>IPI</td>
<td>Industrial Production Index</td>
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<td>CIVETS</td>
<td>Colombia, Indonesia, Vietnam, Egypt, Turkey and South Africa</td>
<td>IRF</td>
<td>Impulse Response Function</td>
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<td>CPI</td>
<td>Consumer Price Index</td>
<td>KPSS</td>
<td>Kwiatkowski-Phillips-Schmidt-Shin</td>
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<td>DDM</td>
<td>Dividend Discount Model</td>
<td>M&amp;A</td>
<td>Merge and Acquisition</td>
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<td>ECT</td>
<td>Error Correction Term</td>
<td>MPI</td>
<td>Ministry of Planning and Investment</td>
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<td>EMH</td>
<td>Efficient Market Hypothesis</td>
<td>MSCI</td>
<td>Emerging Market Index</td>
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<td>EX</td>
<td>Foreign Exchange Rate</td>
<td>NIID</td>
<td>Normally and Independently Distributed</td>
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<td>FDI</td>
<td>Foreign Direct Investment</td>
<td>NPL</td>
<td>Non-performing Loan</td>
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<td>FEVD</td>
<td>Forecast Error Variance Decomposition</td>
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<td>NYSE</td>
<td>New York Stock Exchange</td>
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<td>ODA</td>
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<td>OECD</td>
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CHAPTER 1:
THE NATURE AND SIGNIFICANCE OF THE RESEARCH

1.1. INTRODUCTION

1.2. RESEARCH BACKGROUND

1.3. RESEARCH MOTIVATION

1.4. RESEARCH AIM AND OBJECTIVES

1.5. RESEARCH CONTRIBUTIONS

1.6. STRUCTURE OF THE THESIS
1.1. INTRODUCTION

Innovation and development of the stock market has marked an essential progress in the global financial markets. The stock market provides an important channel to raise capital for the economy and to stimulate growth. However, at the same time it poses potential risks to the economy. The world has witnessed a number of stock market crashes as well as large volatility of stock market returns through financial crunches, such as the Asian crisis of 1997-1998 and the global financial crisis of 2007-2008. Such crashes cause a decline in corporate profits, and an increase in business failures substantially impacts on economic growth.

Among the various concerns about the diverse scope of the stock market, both academics and practitioners have investigated the determinants of stock returns as well as the causes of stock return volatility from a macroeconomic perspective (Chen et al., 1986; Fama and French, 1989; Hsing, 2011; Kuwornu, 2012; Zakaria and Shamsuddin, 2012). Although their outcomes vary according to different markets and time periods, they enable investors to make better financial decisions, assist policy-makers in adjusting financial policies, and benefit all researchers and financial analysts who desire to have a better understanding of the stock market movement and explore new advanced frameworks for the development of this market.

The benefits in terms of outcome explain why the topic on the nexus between macroeconomic factors and the stock market remains attractive not only for developed but also for developing economies. However, more recent projects have paid intensive attention on the performance of stock markets in emerging economies where they have been newly established and seem to be more vulnerable in comparison with those in developed economies (Abugri (2008), Rahman et al. (2009), Victor and Kuwornu (2011), Bapci and Karaca (2013), etc.). Having conducted a literature review on emerging markets, the thesis investigates Vietnam, which has been recognized as a new emerging market in South East Asia and has rapidly developed since political and economic reforms in 1986 (WB1). In

spite of many potential opportunities for investors, the Vietnam’s stock market remains highly fragile (IMF, 2010).

Research is therefore needed to gain further insights into promoting and stabilizing the performance of the Vietnam’s stock market. The following sections present the research background and research motivation, also clarify the aim and objectives of the research. The contributions of the research are later provided to express how the empirical findings can enhance the knowledge about the linkage between numerous macroeconomic indicators and the Vietnam's stock market. The structure of the thesis is provided in the last section to explain how the research is organised.

1.2. RESEARCH BACKGROUND

A stock market or equity market refers to a place where different types of financial instruments (shares, bonds, and derivatives) are issued and traded (including bought and sold) through stock exchanges and/or over-the-counter (OTC) markets. Via different dimensions, the stock market benefits all financial participants, from individual investors to corporations, and eventually the whole economy.

In particular, individual investors not only have the possibility of receiving reasonable dividend payments if they invest in stocks but also have the chance to gain from buying and selling securities through this high liquidity market. Even though the stock market can be seen as a riskier investment channel than normal savings or any investments in the money market and other fixed-rate instrument markets (for example, bonds), nowadays strict regulatory framework as well as more tools and techniques are provided to diversify portfolios and limit risks for individual investors (i.e. analyzing cash flow, using the bottom line, setting stop-loss points).

For corporations, the stock market is functioned as an efficient platform where new capital can be raised to enhance and expand the firms’ businesses.

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2 Specific stock market terms can be found at [http://www.nasdaq.com/investing/glossary/](http://www.nasdaq.com/investing/glossary/)
Publicly listing on the stock market not only strengthens the corporations’ public profile (i.e. by enhanced transparency in information closure and better firm valuation), but also facilitates the further development of the corporations (i.e. via merger and acquisition (M&A) activities).

Perceiving several benefits of the stock market to individuals and corporations, several empirical studies have proven its importance to the wider economy. For example, Arestis, Demetrades and Luintel (2001) utilized a vector auto-regression methodology to prove the power of stock markets – together with financial institutions – to support the long-run economic growth for five developed economies: Germany, the US, Japan, the UK and France. Similar results were indicated by Boubakari and Jin (2010) when they explored the correlation between equity market development and economic growth for five European countries and confirmed the long-run causality for advanced bourses (i.e. the UK, France and the Netherlands).

Another supportive result is found for the case of developing economies; Niblock, Heng, and Sloan (2014) empirically express the prospects of local stock markets in South East Asia as a vital part of further economic reform, financial liberalization, and market integration.

As the stock market has such a significant influence on the economy, it is rational to try to find out the reasons behind stock price movements or the volatility of market returns in order to make investment decisions as well as appropriate forecasts. A number of papers have concentrated on which factors affect stock market returns and then have examined both microeconomic and macroeconomic aspects.

On the microeconomic side, most papers have concentrated on dividend yield, book-to-market ratio and firm size to explain stock market returns (Kothari and Shanken, 1997; Lam, 2002; Jiang and Lee, 2007; Morelli, 2007). On the macroeconomic side, different sets of variables have been used, primarily focusing on monetary policy (interest rate, money supply) (Zakaria and Shamsuddin, 2012; Trivedi and Behera, 2012); economic activities (Gross Domestic Production – GDP,
Gross National Production – GNP, Industrial Production Index – IPI (Wongbangpo and Sharma, 2002; Abugri, 2008; Pilinkus, 2010); and price levels (inflation rate, gold prices, oil prices) (Park and Ratti, 2008; Bapci and Karaca, 2013).

However, since this research acknowledges the primary role played by macroeconomic elements into the development of emerging markets, especially for the case of Vietnam’s economy, the following sections focus on the influences of macroeconomic perspective’s on the Vietnam’s securities market. The link between macroeconomic factors and the share market is worth examining in order to stimulate the development of both important fundamentals (macroeconomic environment and stock market) of the entire economy.

By looking at stock market behavior, it is realistic to suggest that macroeconomic indicators correlate with equity returns. First of all, stock market returns depend on the combined returns of all individual stocks in that market. Meanwhile, individual stock returns rely on the confidence of investors to invest capital into the corporation, or in other words, their expectations regarding future cash flows or dividend payments. The shareholders’ confidence is then normally reflected by the expected performance of the business or the expected profit, which is significantly influenced by changes in the macroeconomic environment. For instance, fluctuations in interest rate policy can impact a corporation’s profit margin through a direct effect on their two main activities: raising deposits and borrowing funds. The process that presents how macroeconomic environment impacts stock market performance is illustrated in Figure 1-1.

Second of all, large stock market volatility may cause or be followed by instability in several economic conditions. A decline in the equity market can have a direct impact on corporations’ business operations through the difficulties that may arise in raising capital due to investors’ loss of confidence in the market. For example, the crash of the US stock market in 2007-2008 is considered to be the main cause of the Great Recession (Farmer, 2013), which went on to have a severe impact on numerous economic aspects, not only in the US but also in many economies worldwide.
In terms of theoretical frameworks from which to view the association among macroeconomic indicators and stock market returns, the background is founded on the efficient market hypothesis (EMH), initially presented by Eugene F. Fama (Fama, 1965), alongside the categories of weak form, semi-strong form, and strong form in Fama’s (1970) empirical findings. According to Fama (1970), market efficiency relies on how fully stock prices reflect all of the available information about that stock, including both public and private one. A number of models have been established from the EMH to pursue clarifying how the stock prices change over time. Through the twentieth century, various asset-pricing theories were devised; notably known amongst them were the dividend discount model (DDM) or present value model (Miller and Modigliani, 1961), the capital asset pricing model (CAPM) (Sharpe, 1964; Lintner, 1965), and arbitrage pricing theory (APT) (Ross, 1976).

Under these specific frameworks, macroeconomic forces are suggested to be exceptionally vital factors in explaining economic phenomena, especially stock market behavior. Via the APT framework (also known as the multi-factor model),
Chen et al. (1986) uncovered a systematic impact of innovations in macroeconomics on stock market returns in the US, using a data sample from January 1978 to November 1983. This project in turn prompted a number of further researches about the link between macroeconomic dynamics and securities market returns. In specific, the current literature provides evidence of this underlying relationship that has been produced in various dimensions, typically differing in terms of macroeconomic data set, methodology and research markets.

The macroeconomic variables examined have varied between studies. A few specific macroeconomic areas have been investigated separately (Kanas, 2002; Hondroyiannis and Papapetrou, 2006; Park and Ratti, 2008) but most have been examined in combinations with others (Ibrahim, 1999; Flannery and Protopapadekis, 2002). No conclusive findings on which variables are best to use have yet been achieved. From the literature, the macroeconomic indicators that have been used can generally be classified into two main groups: internal variables (including economic output; price level; interest rate; money supply; and other internal factors) and external variables (including foreign exchange rate; global oil price; the world stock exchange index; and other external factors).

The methodologies used in the literature have depended on their popularity at the time each study was undertaken; some well-known approaches that have been employed include: regression models (Hussainey and Le, 2009; Tangjitprom, 2012), vector auto-regressive (VAR) framework (Pilinkus, 2010; Trivedi and Behera, 2012; Tangjitprom, 2012; Bapci and Karaca, 2013), Granger Causality Tests (Pilinkus, 2010; Tangjitprom, 2012), and GARCH framework (Hsing, 2011; Zakaria and Shamsuddin, 2012).

In terms of the research contexts investigated, these can be divided into developed markets and developing markets. For instance, Kearney and Daly (1998) illustrated the substantial relationship between their selected set of variables and the conditional volatility of Australian stock market returns during the period between January 1972 and January 1994. Another analysis was made
by Liljeblom and Stenius (1997) to show the bi-directional linkage between equity market and several factors (industrial production, money supply, inflation, terms of trade) in Finland from January 1920 until 1991. Ratanapakorn and Sharma (2007) found positive relationships between stock price index of the US (S&P 500) and major macroeconomic variables (industrial production, short-term interest rate, money supply, and inflation) for the span from January 1975 till April 1999.

On the other hand, Menike (2006) focused on Ghana – a developing country – and showed significant relations between equity prices and various macroeconomic variables, spanning from Sep 1991 to Dec 2002. Recently, applying the cointegrated vector autoregressive (VAR) framework for the monthly data from September 1997 to March 2011, Trivedi and Behera (2012) exposed the substantial link between the Bombay Stock Exchange (BSE) Sensex index and six selected macroeconomic factors.

Within the above context, the current research project aims to pay most attention to Vietnam as an exemplar of emerging economies, covering a variety of macroeconomic aspects using different techniques within the proposed methodology. The selection of variables and methodology under the research are developed from the classifications of macroeconomic factors and methodologies in previous studies, which will be further provided in the literature review – delivered in Chapter 3.

1.3. RESEARCH MOTIVATION

Nowadays, the terminology “emerging markets” is commonly used across the world to classify new developing economies and attractive investment destinations. As defined by HSBC Global Asset Management (HSBC USA, see the website https://www.emfunds.us.assetmanagement.hsbc.com/default.fs), an emerging market is a country with low-to-middle per capita income as measured by the World Bank. They are usually considered to be in a transitional phase toward developed market (i.e., industrialized) status and in the process of building liquid equity, debt and foreign exchange markets.
The terms BRIC (Brazil, Russia, India and China), firstly used by O’Neill (2001), and CIVETS (Colombia, Indonesia, Vietnam, Egypt, Turkey and South Africa), coined by Robert Ward (2009) (Global Forecasting Director for the Economist Intelligence Unit) (“The World in 2010”, The Economist blogs, posted on 26 November 2009), have also been used more and more to present new generations of dynamic and diverse economies all over the world.

The important role played by emerging markets in the world’s economy has been boosted by their integration into the global markets at both the macro and micro levels, as reported by the European Central Bank3. Particularly, emerging economies’ share of world gross domestic production (GDP) has been growing rapidly, as during 2010-2015 they accounted for about 79% of the global output in terms of purchasing power parity (PPP) measurement – compared to 45% in 2010 and 36% at the beginning of the 1990s (IMF World Economic Outlook Database). Also, in the list of "Global 2000" at www.forbes.com (updated to 10 July 2014), seven of the top 25 largest companies in terms of market value in the world originated from emerging markets. Given the optimistic prospective view from numerous economic sides, the emerging markets have been recognized as significant destinations for the European Central Bank to set up bilateral relationships with the authorities of those emerging markets.

However, due to the typical risk of political and financial instability, emerging markets may suffer from more fragility and more sensitivity to breakdowns in different phases of their economies than advanced economies (IMF, 2015). The Asian Financial Crisis 1997-1998 is one example, which had a direct impact on the economies of many emerging markets in the region, like Thailand, Indonesia, and Malaysia. Among various causes of this crisis, Nanto (1998) reported the main reason as those industrialized economies had been growing quickly without sufficient regulation, oversight, and government controls. Also stated by the Council on Foreign Relations (Sergie, 2014), the crisis stemmed from

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those economies’ dependence on external borrowing, their inadequate financial system – especially banking system, and the weak regulation of their governments.

The Global Economic Prospects (WB, 2014) reported that the economies of emerging markets are possibly more influenced by global than domestic factors. The crisis in the US during 2007-2008, and then the recent global recession has not only impacted the growth of developed economies, but also affected the growth of emerging markets. According to the IMF’s World Economic Outlook (IMF, 2014), while the US was projected to grow at 2.8% in 2014 and the Eurozone recovery was aimed to reach 1.2% of growth, the growth rate of emerging markets was expected to be sluggish at around 4.9% in the same period. Additionally, the ‘tapering’ strategy from the US since December 2013 has a certain impact on several emerging economies, especially in East Asia and Central Asia (Atkins, 2014). Atkins argued that capital flows into emerging markets are majorly affected by external forces. Also, the WB has warned emerging economies of the increasing risk of potential capital flow reversals (Atkins, 2014) as a result of the US Federal Reserve’s tapering measures.

Furthermore, the impact of slow global economic growth, plus the uncertainty inside the global economy, has caused large volatility in emerging stock markets. A variety of big stock market indexes experienced continuous sharp declines in the first half of 2014, such as the MSCI (Morgan Stanley Capital International) Emerging Markets Index, the SHCOMP (Shanghai Composite Index) and HSCEI (Hang Seng China Enterprises Index) (China), and the SBER (OAO Sberbank) and Micex Index (Russia), etc.

Listed as part of the CIVETS group, Vietnam has been developing and becoming one of the most dynamic economies in the region, exclusively after the communist victory in 1975 that followed by the integration of the North and South. Throughout the 2008 global crisis and the subsequent global economic recession until 2012, Vietnam’s annual economic growth has remained stable at 5-6% on average (the World Bank Data4). Individually, the establishment of the stock

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market in August 2000 marked a new stage of the Vietnam’s economic development, towards the trend of worldwide integration.

Over more than 15 years from the launch of its first stock market, which used to the Ho Chi Minh Securities Trading Center (HSTC), the Vietnam's stock market has achieved many successes. At present, Vietnam has two major stock exchanges in Hanoi and Ho Chi Minh City, the country's two economic and political centers, namely the Hanoi Stock Exchange (HNX) and the Ho Chi Minh Stock Exchange (HOSE). Both stock exchanges have had an incredible expansion in terms of the trading volume, trading value, companies listed, and market capitalization (more details will be given in Section 2.4, Chapter 2). Also, Vietnam’s stock market has been attracting more and more foreign investors. The trading volume of foreign investors on the largest stock exchange in Vietnam – HOSE markedly extends to almost 2.4 billion shares at the end of 2012, accounting for 8.46% of the total market trading volume and 14.1% of the aggregated trading volume of Vietnam’s market (HOSE Statistics). Remarkably, Vietnam officially became a member of the World Federation of Exchanges (WFE) from October 2013. It opens more opportunities for Vietnam’s securities market in attracting foreign investment.

In contrast, like other emerging markets, Vietnam’s market has high volatility. Although the country has taken advantage of its considerable political stability, with the market jumping to the highest point in 2008, the market has still experienced to a number of obstacles. These might be resulted from the global economic recession, the country's inadequate legal framework, insufficient external capital flows, and a lack of domestic professional investors. Besides these factors, it is suggested that another element that cause considerable fluctuations in Vietnam’s stock market can be macroeconomic environment.

After officially become a member of the WTO in 2007, Vietnam gained notable success in trading activities and attracted more capital from other countries. The period 2007-2008 was a prosperous period for the whole economy
when the stock market was booming with the VN-Index reached a high of 921.07 points for the first time (HOSE Statistics).

However, the uncertainty in the economy, including both the banking and financial system, was exposed from the end of 2008. The national macroeconomic environment faced remarkably high volatility in the inflation rate (which reached a peak of 23.1% in December 2008, and climbed up to 18.6% in 2011) and the interest rate during 2011 (deposit rates reached 13-15% while lending rates peaked at 19-20% per annum as of the end of 2011) (GSO Database). At the same period, the equity market also experienced an extraordinary downward trend. The VN-Index hit a bottom of 235.5 points in February 2009, reached the lowest level in the Vietnam equity market’s trading history.

Theses current evidences suggest the possibility of a connection between macroeconomic forces and the securities market within the context of Vietnam. As the Vietnam’s stock market was established recently and was still under developing, a study to improve its performance is likely to be imperative. A variety of analyses have recently examined the impact of macroeconomic indicators on equity returns but there has been no definitive conclusion regarding emerging markets, particularly for the case of Vietnam – which it is not a fully functional market due to the risks of asymmetric information and inadequate investment regulation. There is therefore a gap in the literature for a comprehensive study into how the performance of an emerging equity market as Vietnam might be improved by looking for the influences of macroeconomic indicators on its stock market returns.

1.4. RESEARCH AIM AND OBJECTIVES

Different academic researches have pursued means to improve the stock market performance by studying various determinants originated from macroeconomic perspective. Despite the significance of this issue specifically within a context of an emerging economy as Vietnam, the current literature reveals a lack of investigation about the linkage between macroeconomic indicators and its newly established securities market. Consequently, the central aim of this research
The project is to conduct empirical research into the influence of macroeconomic indicators on Vietnam’s stock market returns and its volatility.

The macroeconomic factors considered consist of economic growth rate (GDP), consumer price index (CPI), broad money supply (M2), interest rates (refinancing rate – FR, deposit rate – DR, and lending rate – LR), foreign exchange rate (USD/VND), and changes in implemented foreign direct investment (FDI). Excluding consumer price index, other variables are studied in real terms (i.e. real economic growth (RGDP), real money supply (RMS), real interest rates (RIR, including RFR, RDR, RLR), real foreign exchange rate (REX), and real foreign direct investment inwards (RFDI)).

To achieve this aim, the research proposes five key objectives as follows:

- **Objective 1**: Examine the relevance of theoretical frameworks, including the efficient market hypotheses (EMH) and arbitrage pricing theory (APT) within the context of Vietnam’s stock market.

- **Objective 2**: Assess whether the vector autoregressive (VAR) framework is appropriate for estimating the influence of macroeconomic variables, as defined by contemporary literature, on Vietnam’s stock market returns.

- **Objective 3**: Apply GARCH-based parametric model in estimating the influence of macroeconomic factors on the volatility of Vietnam’s stock market returns.

- **Objective 4**: Rank macroeconomic factors with regard to their influence on Vietnam’s stock market returns and its volatility.

- **Objective 5**: To identify perception of Vietnam’s stock market participants on the impact of macroeconomic variables on Vietnam’s stock market returns to develop a set of recommendations for policy makers and investors.
The research premises the six main hypotheses that will be tested under the VAR framework and GARCH models in order to fulfill the central aim and objectives.

- **H₀ᵃ**: All of the variables within the study are stationary.
- **H₀ᵇ**: There is no cointegrating relationship between VNI and macroeconomic indicators i.e. RGDP, CPI, RMS, RIR, REX and RFDI, neither in bivariate nor multivariate perspectives.
- **H₀ᶜ**: There is no bidirectional or unidirectional causality between VNI and macroeconomic indicators i.e. RGDP, CPI, RMS, RIR, REX and RFDI, neither in bivariate nor multivariate perspectives.
- **H₀ᵈ**: Vietnam’s stock market returns within this research do not have volatility clustering.
- **H₀ᵉ**: There is no statistically significant impact of macroeconomic indicators individually on the volatility of Vietnam’s stock market returns.
- **H₀ᶠ**: There is no statistically significant impact of macroeconomic indicators as a group on the volatility of Vietnam’s stock market returns.

### 1.5. RESEARCH CONTRIBUTIONS

This research intends to improve the validity of various econometric methods, including the Johansen cointegration tests, Granger Causality tests and GARCH models, in explaining the macroeconomic influences on equity returns and its volatility within the context of Vietnam – a new emerging market.

The research firstly employs Johansen cointegration tests (Johansen 1988; 1991; 1995) under the VAR framework to study the existence of cointegration between macroeconomic indicators and returns on VN-Index for both long- and short-run dimensions. The Granger Causality tests are followed to clarify the direction of any existing interactions and to verify the results of cointegration (Granger 1969; 1983). Furthermore, since one stylized character of economic time
series is that its volatility changes over time rather than remaining constant, further statistical analysis applies GARCH models (Engle (1982) and extended by Bollerslev (1986)) to measure the volatility of stock market and then to investigate the determinants of the stock market volatility from macroeconomic perspective.

The combination of these advanced models is therefore expected to comprehensively broaden the picture of the nexus among macroeconomic elements and stock market performance. The literature has shown the use of the mentioned frameworks, mostly used separately, taking into account the emphasis of specified projects on the value of variables, or the variation of variables. So far, this is the first study to apply the Johansen method combined with the Ganger Causality and GARCH models using Vietnam economic data to estimate the macroeconomic influences on stock market returns and its volatility.

Secondly, the research project proposes its unique multivariate model, which consists of six key macroeconomic indicators as independent variables and Vietnam’s stock market returns and its volatility as dependent variables. Amongst a number of previous studies about the topic of the Vietnamese capital market, examination of the specified macroeconomic factors and the equity market for Vietnam has been yet limited and incomplete. Hence, this research is projected to expand the knowledge of the stock market under the impact of macroeconomic performance for Vietnam, covering a wide range of Vietnam’s macroeconomic aspects. More specifically, it is important to note that together with widely-used macroeconomic factors; the project further takes foreign direct investment (FDI) into account and considers its influence on the performance of VN-Index. No research has as yet been undertaken on the influence of FDI on the Vietnam’s stock market.

Thirdly, in order to enhance the precision of the results, this thesis utilizes the longest period in the literature so far and an update data set, run from the first days of trading on the Vietnam’s stock market till end of the year 2013. Additionally, this research attempts to access data on a monthly basis, through a
variety of official sources, as most macroeconomic data in Vietnam are typically published annually or quarterly.

Fourthly, the outcomes of this study are expected to be of direct importance to Vietnamese policy-makers. The capability of macroeconomic indicators to explain the movement of Vietnam's stock market returns may suggest appropriate amendments to macroeconomic policies to improve the health of the Vietnam capital sector and vice versa, and afterwards accelerate the development of the Vietnam financial sector. Furthermore, the expected outcomes offer benefits to other current participants or perspective participants in the Vietnam capital market, from practitioners (such as investors; portfolio managers; financial consultants) to academic researchers and financial analysts.

Last but not least, this research project contributes to the existing literature on the knowledge of developing countries, specifically emerging markets. In much of the similar literature, the empirical results on macroeconomic factors and equity returns have been inconclusive. Thus, investigating the link between macroeconomic indicators and stock market returns, particularly for new dynamic markets such as Vietnam, has remained critical, since their stock markets are still developing.

1.6. STRUCTURE OF THE THESIS

The thesis is organized in eight chapters. Chapter 1 provides an overview of the research, covering the research background, research motivation, research aim and objectives, and the research contributions to the body of knowledge.

Chapter 2 delivers a review of the macroeconomic environment of Vietnam after the end of the war in 1975 alongside an overview of the Vietnam's stock market from the first transaction in August 2000 up to December 2013. The background of the Vietnam’s economy as well as the development of its equity market are also discussed to provide initial understanding of Vietnam’s economy and stock market, as well as to exhibit the expected connection between equity market and macroeconomic performance in the country.
Chapter 3 reviews the theoretical background concerning the stock market within various economic phases and highlights recent empirical findings in the literature. The thesis recalls three important theoretical frameworks: Dividend Discount Model (DDM), Capital Asset Pricing Model (CAPM), and Arbitrage Pricing Theory (APT), which are grounded on the Efficient Market Hypotheses (EMH) principle. The literature review is then organized into looking at developed countries and developing countries, with a focus on emerging markets and Vietnam.

Chapter 4 proposes a conceptual framework, in conjunction with hypotheses development, and research methodology. All macroeconomic variables being studied to explore the determinants of stock market returns are validated in this chapter. The conceptual framework is developed based on previous studies from the literature review and after adjusting to the current situation of the Vietnam’s economy. Under the purposes of fulfilling the aim and objectives within the study, six hypotheses are specified that will be tested in later chapters. Afterwards, the chapter clarifies the main methodology, comprising of data collection, cointegration and causality tests, and the GARCH models. Following the measurement of all the candidate variables, the gauges of the Johansen cointegration tests and Granger Causality tests under the VAR framework, and GARCH models are briefly explained.

The statistical results obtained from the selected econometric approaches are presented in Chapters 5 and 6. In particular, within the frameworks of Johansen cointegration and Granger causality, Chapter 5 provides empirical results under bivariate analysis and multivariate analysis and then shows the evidence for any influence of macroeconomic variables as an individual factor or as a group on Vietnam’s stock market returns. Using GARCH models, Chapter 6 takes the volatility of Vietnam’s stock market into account and finds out whether there exists the nexus between macroeconomic variables and the volatility of VN-Index over the sample period 2000-2013.
Chapter 7 discusses the empirical results from Chapters 5 and 6, as well as the rationality of the specified theoretical framework to the context of the research. This chapter additionally compares the empirical outcomes of the current project with those from previous studies of some emerging economies in Southeast Asia. To underpin the special contribution of the research, some questionnaires are distributed to seek the comments from experts for the interaction between macroeconomic indicators and Vietnam’s stock market. Based on valuable opinions from nominated groups and empirical findings, some recommendations for policy implications as well as investment implications are withdrawn for the circumstance of Vietnam under the last section of this chapter.

The final chapter concludes the outcomes of the study and points out any shortcomings that emerge over the course of the research and outlines areas where further work could be done to address these issues.
CHAPTER 2:
REVIEW OF VIETNAM’S ECONOMY AND STOCK MARKET

2.1. INTRODUCTION

2.2. BACKGROUND OF VIETNAM’S ECONOMY 1975-2000
   2.2.1. The Centrally Planned Economy 1975-1985
   2.2.2. The Transition of Vietnam’s Economy to the Market 1986-2000

2.3. MACROECONOMIC PERFORMANCE OF VIETNAM 2001-2013
   2.3.1. Vietnam’s Macroeconomic Performance 2001-2010
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2.4. OVERVIEW OF VIETNAM’S STOCK MARKET 2000-2013
   2.4.1. Historical Review of Vietnam’s stock market
   2.4.2. The Development of Vietnam Stock Exchanges
   2.4.3. Key Indicators of Vietnam’s stock market

2.5. CONCLUSIONS
2.1. INTRODUCTION

Vietnam is a medium-sized country in South East Asia with a population of 88.78 million and an aggregate GDP of 155.8 billion US dollars (2012), as reported by the World Bank Data. After the communist victory and the integration of the North and South in 1975, the Socialist Republic of Vietnam (SRV) – formally the so-called the Democratic Republic of Vietnam (DRV) – officially entered into a peaceful stage in its history with two main missions: to heal the damage caused by the war, and to start to reconstruct the country’s economy.

Vietnam has since become one of the most dynamic economies not only in Asia but also in the whole world. In spite of recent global and regional economic stagnation, Vietnam has maintained annual economic growth of around 6-7% (Vietnam's GSO Database). Furthermore, several remarkable economic advances have been achieved in both economic and diplomatic aspects, such as successfully gaining access to a number of important worldwide organizations like ASEAN in 1995, APEC in 1998, and WTO in 2007, and becoming a lower middle-income country in 2009 after more than 20 years being known as one poorest country in the world.

Although a numerous studies have been undertaken about Vietnam’s economy throughout the post-war period (Kimura, 1989; Dang, 1995; Bui, 2000; Gates, 2000; Schmidt, 2004; etc.), these have been incomplete due to the difficulties working with official Vietnamese statistical resources, which tend to be inadequate, poor-quality or simply unavailable (McCarty et al., 1992). Official data sources from the 1990s can be obtained much more easily, but economic studies of Vietnam’s economy for the whole period from 1976 to 2013 are still sparse. A number of papers that have made an effort to review Vietnam’s economic performance between 1976 and 2013 are therefore low. Nonetheless, it is extremely important to understand the country’s economy in order to obtain the aim of this research as set out in the first chapter. Hence, the research project comprehensively evaluates the economic performance of Vietnam from the time of unification until end of 2013, focusing on macroeconomic aspects between 2000...
and 2013. The Vietnam’s stock market is further reviewed in brief under this chapter.

In particular, the following section is broken down into three sub-chapters: Background of Vietnam’s Economy 1975-2000; Macroeconomic Situation in Vietnam 2001-2013; and Overview of Vietnam’s Stock Market Development 2000-2013.

2.2. BACKGROUND ON VIETNAM’S ECONOMY, 1975-2000

This section provides the overview of Vietnam’s economy during the period from 1975 to 2000. Although this research focuses on the period after 2000, the necessity of understanding the background of the whole economy from centrally planned stage to transition towards the market stage seems to be undoubtedly important.

2.2.1. The Centrally Planned Economy, 1975-1985

After the war, credited to the leadership of the Communist Party based on the Marxist/Leninist principles of socialism, the Vietnamese government implemented a centrally planned model for the whole country, formally operated in the North from the 1950s. The second and the third five-year plans (1976-1980 and 1981-1985) were executed, undertaking the policies of the Fourth and Fifth Congress of the Vietnamese Communist Party.

However, the country’s economic performance was below expectations. The state budget relied heavily on external sources, mainly from the former Soviet Union and some East European countries. There were also low rates of Gross Social Product (GSP)\(^5\) and downward trends in both the agriculture and industrial sector in the late 1970s. Even though agricultural output improved, GSP showed a dangerous downward trend from 1978 until 1980 (Figure 2-1).

---

\(^5\) Gross Social Product (GSP) was used instead of Gross Domestic Product (GDP) during the post-war period in Vietnam, similar to other socialist countries at that time; GDP data was not available.
Although it is an agricultural country, Vietnam encountered a spreading shortage of food in the late 1970s, alongside a drop in living standards. The breakdown of all other segments of the economy drastically revealed the shortcomings of the inefficient subsidized scheme. This forced the government to start an economic reform in the early 1980s. Particularly, a partial decentralization of economic management in agriculture and industrial state enterprises was first processed by removing the monopoly position of the state and recovering the economy from the desperate situation.

Numerous positive signs regarding the economy in the early 1980s showed that the effort of the Vietnamese government to overcome the macroeconomic crisis in 1979 had paid off. After 1981, the GSP growth rate posted a quick recovery from 1.9% in 1981 to 7.6% in 1982 before peaking at 10% in 1984 (Figure 2-1). Over 1980-1981, new record highs were achieved in both agricultural and industrial output growth, jumping from 4.4% and 1% in 1981 to 11.3% and 8.7% in 1982, respectively. Additionally, there was a drastic increase in trade activities, with volumes of imports and exports growing from -29.1% and -15.6% in 1980 to 20.6% and 0.2% in 1981, respectively. Noticeably, the growth rate of export volumes of goods and services peaked at 45.3% in 1982 (Figure 2-2).
The reform policies revealed many shortcomings, followed by slow adoption by citizens and macroeconomic instability. A number of difficulties continuously challenged the government in consecutive years, which can be summarized as follows:

✓ Collectivized private agriculture was restarted in the South in 1982, which resulted in a severe drop in agricultural output. It fell from 8% in 1982 to 3.3% in 1983, finally bottoming out at 1.8% in 1985.

✓ The slow and unsteady development of domestic production was not able to attain the basic consumer demands of the population, which was growing fast after the war. The Statistical Publishing House (1996) stated that GDP met only 80–90% of consumer needs. To meet this shortfall, Vietnam imported a large volume of goods from foreign countries, even rice, clothes and other common necessities.

✓ To address its high proportion of foreign debt and aid (22.4% of the state budget, or 28.9% of domestically mobilized capital on average over the period 1981-1985), which led to a large budget deficit, the Vietnamese government had to
issue more banknotes. However, this resulted in high inflation for several years after.

The state promulgated a renovation - so called “Price-wage money” - in the mid-1980s, which was later recognized as the biggest mistake of the period. The program led the inflation rate rising continuously and out of the government’s control, peaking at 453.54% in 1986 (Figure 2-3). This slightly decreased in the two subsequent years of 1987 and 1988 to 316.71% and 374.35% respectively but remained extremely high. This was another hyperinflationary crisis in Vietnam’s economic history.

![Figure 2-3. Annual Inflation Rate in Vietnam, 1975-1990 (%)](source:

Source: The World Economic Outlook Database (IMF Data and Statistics, 2013)

2.2.2. The Transition of Vietnam’s Economy to the Market, 1986-1999

Major failures of the Second and the Third Five Year Plans led to a stressful period in the country both economically and politically. The Sixth Party Congress, therefore, was conducted from 15 to 18 December 1986 in order to relieve the stagnant economy. It was underlined as “a confessional for high level inadequacies and policy misjudgments” (Stern, 1987).

One primary cause of Vietnam’s unsuccessful decade was determined as incorrect assessments of the socio-economic condition, leading to unrealistic goals and targets in terms of technical construction, social renovation and economic
management. The Sixth Party Congress decided to introduce a more comprehensive reform program called “Doi Moi” (Reform or Renovation), with numerous vital adjustments in the policies covering agriculture, industry, trade, finance and investments, and fiscal and monetary policy.

The reform campaign marked a progressive change in the Vietnamese government's perception, adaptable to the trend of global economic growth. The agenda of the next Five Year Plan (1986-1990) was introduced at the National Party Congress, primarily emphasizing increasing production of food, consumer goods and exportable items; pursuing a multi-sector economic structure; strengthening economic management capabilities; reorganizing the state management apparatus; and improving party organization capabilities, leadership and cadre training (Stern, 1987:p.359). Such improvements were later obtained in a number of economic aspects.

✓ The average annual growth rate of gross domestic product (GDP) of Vietnam reached about 4.5% for the period 1985-1989 (Figure 2-4). Though it was still low in comparison with other Asian countries, it was considered as an optimistic recovery sign of the Vietnamese economy.

Figure 2-4. Annual Growth Rate of Gross Domestic Product (GDP) in Selected Asian Countries, 1985-1989 (%)

Source: The World Bank Data,
http://www.data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG
A number of adjustments in foreign trade policies were also carried out, such as reducing quotas and tariffs on many products, applying a floating foreign exchange rate and eliminating subsidies on exports and imports. These improved the value of the country’s exports and helped to lower the trade balance deficit in the subsequent years.

After the approval and official implementation of the Foreign Investment Law in 1987-1988, together with the “open-door” policies, Vietnam became an attractive destination for foreign investors. According to the Statistical Publishing House (1996), the number of projects granted in Vietnam rose from 37 in 1988 to 70 in 1989 then jumped to 111 in 1990, representing 371.8 million US dollars, 582.5 million US dollars and 839 million US dollars respectively (Table 2-1).

Table 2-1. Vietnam’s Foreign Direct Investment, 1988-1994 (mil. US$)

<table>
<thead>
<tr>
<th>Year</th>
<th>Commitments (mil. USD)</th>
<th>Disbursements (mil. USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>371.8</td>
<td>-</td>
</tr>
<tr>
<td>1989</td>
<td>582.5</td>
<td>100</td>
</tr>
<tr>
<td>1990</td>
<td>839</td>
<td>120</td>
</tr>
<tr>
<td>1991</td>
<td>1,322</td>
<td>213</td>
</tr>
<tr>
<td>1992</td>
<td>2,165</td>
<td>260</td>
</tr>
<tr>
<td>1993</td>
<td>2,861</td>
<td>300</td>
</tr>
<tr>
<td>1994</td>
<td>3,765</td>
<td>1,048</td>
</tr>
</tbody>
</table>

Source: Gates (2000, p.26)

The country's economy development was interrupted at the end of the 1980s, partially as a result of the collapse of the former Soviet Union and some Socialist countries in Eastern Europe. However, through policy adjustments as well as more comprehensive reforms in several economic sectors to overcome the economic instability, Vietnam navigated the recession successfully and resumed its growth track in 1991. Notably, GDP climbed from 5% in 1990 to 5.8% in 1991.

Griffin et al. (1998) explains the large difference between the amount of commitments and disbursements as the fact that loans from foreign principals to the local receivers were included in the amount contracted, the net equity investment by the foreign counterpart was referred to the real FDI received.
8.59% in 1992 and 9.54% in 1996 – a comparatively high figure compared with other Asian countries (Table 2-2).

From 1991, the Vietnamese government put more efforts into enhancing the stability of the macroeconomic environment and boosting economic growth. The major aim, which included the “Strategy for socio-economic stabilization and development until the year 2000” was “to overcome the economic crisis; to stabilize the socio-economic situation; to move beyond the status of a poverty-stricken and under-developed country; to improve the living standards of citizens; to strengthen the national security and defense; and to create favorable conditions for more rapid development in the early twenty-first century. Gross domestic product (GDP) by the year 2000 can double as compared with 1990.”

Table 2-2. GDP Growth Rate in some Asian countries, 1994-1999 (%)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>7.5</td>
<td>8.4</td>
<td>7.6</td>
<td>4.7</td>
<td>-13.1</td>
<td>0.8</td>
</tr>
<tr>
<td>Malaysia</td>
<td>9.2</td>
<td>9.8</td>
<td>10.0</td>
<td>7.3</td>
<td>-7.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Myanmar</td>
<td>7.5</td>
<td>6.9</td>
<td>6.4</td>
<td>5.7</td>
<td>5.9</td>
<td>10.9</td>
</tr>
<tr>
<td>Philippines</td>
<td>4.4</td>
<td>4.7</td>
<td>5.8</td>
<td>5.2</td>
<td>-0.6</td>
<td>3.1</td>
</tr>
<tr>
<td>Singapore</td>
<td>10.6</td>
<td>7.3</td>
<td>7.6</td>
<td>8.5</td>
<td>-2.2</td>
<td>6.2</td>
</tr>
<tr>
<td>Thailand</td>
<td>9.0</td>
<td>9.2</td>
<td>5.9</td>
<td>-1.4</td>
<td>-10.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Vietnam</td>
<td>8.8</td>
<td>9.5</td>
<td>9.3</td>
<td>8.2</td>
<td>5.8</td>
<td>4.8</td>
</tr>
</tbody>
</table>


The annual growth rate of Vietnam’s GDP posted a downward trend after 1996 due to the financial crisis across the region. The Asian crisis initially exploded from Thailand, when the central bank floated the baht after failing to protect the currency against a speculative attack in 1997. A number of economies were influenced, most severely Indonesia, Malaysia, Singapore and Hong Kong, with sharp drops in GDP growth rates over two consecutive years. In Thailand, the
annual rate of GDP over 1998-1999 hit the bottom of -10.5%, while in Indonesia this rate was even worse at -13.1%. Vietnam was not unscathed by this depression, however it suffered a lesser impact than the others. Vietnam’s GDP continued to grow before and after the crisis but lower than in previous years (5.8% in 1998 and 4.8% in 1999).

Another achievement of the Vietnam government was an adequate inflation control by implementing two major policies - exchange rate devaluation and interest rate spread (Fforde and de Vylder, 1996:p.296). Both measures involved absorbing excess liquidity in the economy. Although inflation reached 81.82% during 1991-1992 under pressure from the large fiscal deficit and slacker monetary policies, this condition was eased by further government effort to reduce expenditure as well as increase state revenues. After 1991, the inflation rate continuously fell off, and fluctuated by a single digit over the whole period from 1992 to 1999, except for a slight increase to 16.93% in 1995. By the end of the 1990s, the inflation rate in Vietnam was 4.11%. Conversely, this started a period of deflationary fear for the coming years.

In terms of external relations, with the orientation of “commercialization” and “open-door” policies, by 1999 Vietnam had extended its commercial relations to over 170 countries and regions across the world, as recorded by the National Politic Publishing House (2004:48). One year after the US lifted its embargo on Vietnam, on 28 July 1995, Vietnam officially became the seventh member of the Association of Southeast Asian Nations (ASEAN) with the commitment of the ASEAN Free Trade Area (AFTA). Also during the same year, the country submitted its application to join the World Trade Organization (WTO), marking a momentous in the country’s diplomatic history.

2.3. MACROECONOMIC PERFORMANCE OF VIETNAM, 2001-2013

The economy has been enhanced dramatically, from both internal and external perspectives. In order to attain a better assessment, the following section will be divided into two main phases in accordance with the plans set out by the Vietnamese government: Overview of Macroeconomic Performance 2001-2010 and Updates of Macroeconomic Performance 2011-2013.

2.3.1. Overview of Vietnam’s Macroeconomic Performance, 2001-2010

As planned by the Vietnam National Assembly, there were two key objectives of the whole period 2001-2010 for the country: (i) developing Vietnam into a modern-oriented industrialized country by 2020, based on improving people’s material, cultural and spiritual life; (ii) becoming a socialist-oriented market economy, based on the development of human resources, infrastructure, scientific and technological capacities, economy, defense and security.

In general, by 2005, the country had successfully overcome the socio-economic crisis from the end of the 1990s; most of its economic targets had been achieved, represented by considerable virtuous performances of economic growth and other macroeconomic factors (Appendix 2-2).

Economic Growth: Before the global financial crisis in 2007, the economic growth of Vietnam was well maintained stably at the rate of around 7-8%, and hit the highest number at 8.46% in 2007 (Fig 2-5). However, the financial crisis that originated from the US and then spread to the entire world from 2008, followed by the global depression, had a negative impact on Vietnam, an active emerging market in the region. Economic output fell to 6.3% in 2008 and reached a bottom of 5.4% in 2009 before just slightly recovering to 6.4% in 2010.

Economic Structure: The country’s economic structure continually shifted along the targets of “industrialization and modernization”, as planned by the Communist Party and the government of Vietnam. A positive result was achieved when the average proportion of the agricultural sector within the wider economy decreased (remaining near 21%) whilst that of the industrial and services sectors increased (reached 41% and 38%) during the period 2001-2010 (Fig 2-5).
**Savings/investment:** Although there were slight fluctuations over the period 2001-2010, a good rate of growth in savings and investment was maintained. The average ratio of savings to GDP during this time was around 30%, which was adequate capital for investment for development. There was little improvement in savings during the global financial crisis in 2008, as the government had to increase its expenditure to implement economic stimulus programs, but it quickly recovered in the following years. Likewise, by improving the investment environment by introducing “open-door” policies at the beginning of the 2000s, total investment increased gradually each year and accounted for 34.4% of GDP on a ten-year average. Impressively, the year 2007 marked a massive influx of funds from foreign investment after Vietnam officially became a member of the WTO. Specifically, the percentage of total investment in GDP accelerated to its peak at over 39% in 2007, equivalent to over 532 trillion VND in aggregate (MPI, 2011).

**State Budget:** Both budget revenue and budget expenditure were improved in terms of level and composition, surpassing planned targets. The budget revenue remained constantly at around 5.2% of GDP on average over the ten-year period 2001-2010 (Fig 2-6). The ratio of total budget revenue to GDP over 2001-2005 reached 24.4% while this figure over the subsequent period 2006-2010 was
28.3%. In 2010, the aggregate budget revenue gained 5.59 trillion VND (accounting for 28.2% GDP) - six times higher than that of 2000 (over 0.9 trillion VND). The main revenue sources had shifted from being external (which was considerably unstable, such as import-export activities) to internal, enhancing the stability of the total revenue growth.

On the other hand, budget expenditure grew at 21.7% per annum, and hit nearly 3.4 trillion VND in 2010. Total expenditure for the five years 2006-2010 expanded to 2.4 trillion VND - 2.6 times higher than that of 2001-2005. The proportion of expenditure to GDP also rose year by year, reaching 29% during 2001-2005 and increasing to 33% during 2006-2010 on average. The focus of the expenditure however changed to development, economic growth, education, and healthcare. Expenditure on development during the period 2006-2010 was more than double that of 2001-2005, although the average proportion of that decreased to 29% for the five-year period 2006-2010, compared to 30.6% for the previous period. Furthermore, debt repayments as a proportion of total expenditure started to increase from the later period, and sat at approximately 10% over the five years 2006 – 2010.

**Figure 2-6. State Budget Balance in Vietnam, 2001-2010**

*Source: Reports of National Assembly and Ministry of Planning and Investment of Vietnam for the period 2001-2010*
Inflation: Although the period began with the threat of deflation, when inflation rate remained low after 1999 (just 4.11% in 1999), CPI began to increase from 2004 (at 7.8%) and surged to a high of 23.1% in 2008. This could initially be explained by external factors. Nguyen and Nguyen (2010) indicated that accession to the WTO in 2006 deepened the integration of Vietnamese economy within the whole world economy; hence, domestic consumer prices became more influenced by international prices, which had an upward trend during the latter half of the 2000s.

Additionally, the fast and huge amount of foreign investment flowing into Vietnam also put pressure on the stability of the national currency, pushing up demand for the VND to counteract the foreign currencies arriving and to stabilize the exchange rates. The State Bank of Vietnam injected a large amount of VND into the economy and, consequently, pushed average consumer prices up rapidly.

Furthermore, stress on the domestic CPI also came from the unfavorable conditions of the 2008 global financial crisis, when the breakdown of the Vietnam’s stock market shifted investment funds to other markets, such as gold and real estate, in turn increasing the prices of goods and services in general and putting more pressure on inflation.

Monetary activities: The period 2001-2010 saw many significant changes in the monetary system, such as growth in money supply, credit and deposits, interest rates volatility and the development of the banking system (Table 2-3), especially during the latter half of the period.

Money supply and credit growth: According to the assessment of the implementation of the 2001-2005 plan by Vietnam National Assembly, on average for 5 years, annual growth of the money supply (M2) hit 22.5% while the annual credit balance rose 27.6%. During this period, both deposit and lending interest rates were kept liberalized at around 6.32% and 9.74% on average, ensuring positive real interest rates. Additionally, from 2001 to 2005, a low US deposit rate and a considerably stable VND/USD increased enterprises' loans to invest in business and prompted repayment of loans that had been secured at higher
interest rates. As a consequence, the ratio of loan repayment was much improved; the bad debt ratio was only 4% of the total credit balance until the end of 2005 - much lower than the previous period.

**Table 2-3. Growth of Money Supply, Credit, CPI and GDP, and Ratio of M2/GDP 2005-2010 (percent per annum)**

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth of M2</td>
<td>29.7</td>
<td>33.6</td>
<td>46.1</td>
<td>20.3</td>
<td>29.0</td>
<td>33.3</td>
</tr>
<tr>
<td>M2/GDP</td>
<td>75.6</td>
<td>86.9</td>
<td>108.1</td>
<td>100.4</td>
<td>115.7</td>
<td>129.3</td>
</tr>
<tr>
<td>Growth in Credit</td>
<td>25.50</td>
<td>53.90</td>
<td>25.40</td>
<td>39.60</td>
<td>32.40</td>
<td>14.40</td>
</tr>
<tr>
<td>CPI Growth</td>
<td>8.3</td>
<td>7.1</td>
<td>8.3</td>
<td>23.1</td>
<td>5.9</td>
<td>6.4</td>
</tr>
<tr>
<td>GDP Growth</td>
<td>7.5</td>
<td>7.0</td>
<td>7.1</td>
<td>5.7</td>
<td>5.4</td>
<td>6.4</td>
</tr>
</tbody>
</table>


From 2006-2010, the credit and money supply growth rates were kept high, above 20% on average per annum. This could be considered a main factor that supported the rapid development of the Vietnamese economy, reflected in the increase in the annual GDP growth rate. In 2007, both money supply and credit reached their highest numbers, at 46.1% and 8.5% respectively, while GDP peaked at 7.1%. In contrast, in macroeconomic terms, the incessant increase of the money supply and credit growth could also have contributed to the pick-up in the consumer price index (CPI).

**Monetary policies:** The long-term vision of Vietnam focused on three primary objectives: macroeconomic stability, inflation control and economic growth. Which of these took priority could be re-ordered over time to adapt to the current socio-economic situation. Particularly, the main objective of 2006-2007 was economic growth, through the state’s efforts to keep official interest rates stable (7.5% applied for deposit interest rate and 11.2% applied for lending interest rate on average) as well as the nominal exchange rate VND/USD (around
16000 VND against 1 USD). However, as mentioned earlier, the accession of Vietnam to the WTO in 2007, which attracted huge amounts of foreign currency into the domestic market, in combination with the continuous expansion of money supply resulted in the rapid acceleration of the inflation rate, which saw the CPI peak at 23.1% in 2008.

To prevent the threat of continuously rising CPI, the state tightened its fiscal and monetary policies through reducing public finance and increasing the base rate. These tightening policies alongside the global depression in the outcome of the US financial crisis reduced the CPI growth rate CPI dramatically to 5.9% in 2009. Economic growth was 5.7% in the same year, and even worse the next year at 5.4% - lowest rate in nearly 10 years.

The government then eased off its tightening measures to boost the economy by reducing the base rate, discount rate and refinancing rate. It also introduced interest-supporting package of measures valued at 1 billion USD in the mid- and long-terms. Although the regrowth of the credit and money supply brought GDP growth back to its increasing trend from 2010 onwards, the continuous loosening of monetary policy, a lack of investment and capital flows into asset markets again put pressure back on inflation to increase (Bhattacharya, 2013).

**Banking system:** This was significantly strengthened in Vietnam by improvements in both quantity and quality over the ten years 2001-2010, reflected by growth in asset, credit, number of banks and branches, infrastructure and technology. In particular, over the last century, the total number of banks has expanded dramatically, reaching 101 banks and foreign bank branches, comprising of five state-owned commercial banks, 38 joint-stock commercial banks, 53 foreign banks and foreign bank branches, and five joint-venture banks by the end of 2010 (SBV).

Banks continued to make a stronger profit in Vietnam even during the global depression at the end of the 2000s. The average rate of profits of the top eight banks in Vietnam was recorded at 46%, 59% and 31% in 2008, 2009, and
2010 respectively (VCBS, 2011). Banks’ total assets substantially increased, reaching 128.7 billion USD in 2010 - more than doubled that of 2007 (52.4 billion USD). Furthermore, at the end of 2010, most banks met the minimum capital adequacy ratio (CAR) requirement at 9%, reflecting the efforts of the Vietnamese banking sector to meet international regulations and agreements, such as Basel I, II and III.

However, the rapid development of the banking industry in the country was not sustainable and several shortcomings and risks were hidden. The main problem was liquidity risk, when the average credit growth was always higher than the average growth of deposits over the period 2001-2010 (that were 32% and 29% corresponding). A high non-performing loans (NPLs) ratio also demonstrated weak credit management, prioritizing on quantity targets but lacking quality improvement.

Although the NPL ratio of the banking sector was still safe at 3%, as reported by the SBV, credit risk remained a concern as Fitch Ratings claimed that Vietnam’s NPL ratio was actually closer to 13% after being recalculated based on IAS (VCBS, 2011). In 2010, as a result of the increasing concern about the banking sector’s fragility, several international rating agencies, like Fitch, S&P and Moody’s, consecutively downgraded Vietnam’s credit rating and maintained their negative outlook (Bloomberg, 2010).

In order to improve the health of the banking sector, in May 2010 the SBV promulgated Circular No. 13/TT-NHNN, then amended and supplemented it with Circular No.19/TT-NHNN in Sep 2010 to regulate prudential ratios in the activities of credit institutions. However, the Vietnamese banking sector would have faced more failures unless banking structure reform was taken more comprehensively in the coming years.

**Diplomatic Relations**: Vietnam gained a numerous achievements via its open diplomatic policies, trade activities and FDI- and ODA-attracting strategies. The Vietnamese government persisted in its efforts to “deepen, stabilize and sustain the established international relations”, particularly, to “expand multi-
sided, bilateral and multilateral cooperation with countries and territories, with great importance attached to neighboring and regional countries, major powers, economic and political centers, international and regional organizations on the basis of respect for principles of International Law and the United Nations Charter”, as indicated in the Foreign Policy of Vietnam.

After nearly 25 years of “Doi Moi”, in 2006, Vietnam established relations with 168 countries, held memberships of 63 international organizations and had relations with over 500 non-government organizations worldwide (National Assembly Report, 2006:33). Vietnam currently has diplomatic relationships with 180 of the 193 member states of the United Nations, has trade relations with nearly 230 countries and territories, and has representative offices in 98 countries and territories in all parts of the world.

Furthermore, the country’s role has been increasingly asserted as an active and effective member within more than 70 regional and international organizations, such as the UN Security Council, UNDP, Non-Aligned Movement (NAM), Francophonie, ASEAN, APEC, ASEM and WTO. Remarkably, the country has successfully enhanced its international prestige by assuming the position of non-permanent members of the Security Council for the term 2008-2009 and Chair of ASEAN in 2010.

A number of bilateral and multilateral frameworks and agreements have been signed between Vietnam and other countries as well as organizations within and outside the region, such as the “Vietnam-US Bilateral Trade Agreement”, “Vietnam-China Agreements on the Delimitation of the Tonkin Gulf and Fishery Cooperation”, and “ASEAN Free Trade Area Agreement” (AFTA).

**Exports and imports:** Vietnam’s volume of exports and imports has also increased constantly as a result of it broadening its external relationships (Table 2-4), exceeding all targets. By the end of the period 2001-2005, total export turnover reached nearly 111 billion USD, growing at 17.5% per annum on average while total imports reached over 130 billion USD with an annual growth rate of 18.8% on average. However, both activities’ growth paths were disturbed by the spread of
the global economic crisis in 2008-2009 with negative growth rates at -8.9% for exports and -13.3% for imports. They quickly overcame the stagnation and returned to growth in 2010 while exports hit 26.4%, totaling 280 billion USD over the five years 2006-2010 overall with an average annual growth rate of 17.3%. Imports reached 21.2%, totaling over 343 billion USD in the period with an average annual rate of 18.2%.

Table 2-4. Annual Export and Import Growth in Vietnam, 2001-2010

<table>
<thead>
<tr>
<th></th>
<th>Total export turnover</th>
<th>Growth rate of export</th>
<th>Total import turnover</th>
<th>Growth rate of import</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>Billion USD</td>
<td>%</td>
<td>Billion USD</td>
<td>%</td>
</tr>
<tr>
<td>2001</td>
<td>15.00</td>
<td>3.80</td>
<td>16.20</td>
<td>2.70</td>
</tr>
<tr>
<td>2002</td>
<td>16.70</td>
<td>11.20</td>
<td>19.70</td>
<td>21.80</td>
</tr>
<tr>
<td>2003</td>
<td>20.15</td>
<td>20.60</td>
<td>25.30</td>
<td>27.90</td>
</tr>
<tr>
<td>2004</td>
<td>26.50</td>
<td>31.50</td>
<td>32.00</td>
<td>26.50</td>
</tr>
<tr>
<td>2005</td>
<td>32.40</td>
<td>22.50</td>
<td>36.80</td>
<td>15.70</td>
</tr>
<tr>
<td>2006</td>
<td>39.80</td>
<td>22.70</td>
<td>44.90</td>
<td>22.10</td>
</tr>
<tr>
<td>2007</td>
<td>48.60</td>
<td>21.90</td>
<td>62.80</td>
<td>39.80</td>
</tr>
<tr>
<td>2008</td>
<td>62.70</td>
<td>29.10</td>
<td>80.70</td>
<td>28.60</td>
</tr>
<tr>
<td>2009</td>
<td>57.10</td>
<td>-8.90</td>
<td>69.90</td>
<td>-13.30</td>
</tr>
<tr>
<td>2010</td>
<td>72.20</td>
<td>26.40</td>
<td>84.80</td>
<td>21.20</td>
</tr>
</tbody>
</table>

Source: Reports of National Assembly and Ministry of Planning and Investment of Vietnam for the period 2001-2010

Besides these favorable conditions, Vietnam faced a number of difficulties in its trading activities when the country became more deeply integrated into the global economy, especially when knowledge of Vietnamese enterprises was still inadequate for the country to enter into international transactions. So far, Vietnam has been involved in over 30 anti-dumping cases against Vietnamese exports, mainly in the catfish, shrimp and footwear sectors (Le and Tong, 2009). This not
only led to a severe breakdown in that particular segment damaged the country’s international reputation.

**Foreign investment**: This could be considered to have been an essential channel in Vietnam's economic development, including both foreign direct investment (FDI) and official development assistance (ODA).

For the first period 2001-2005, the total registered capital hit 20.8 billion USD while the total realized capital was 13.8 billion USD; both higher than targeted. Although the percentage of FDI in the country’s total investment during 2001-2005 was lower than the previous period of 1996-2000 (down to 16.6% from 24% on average), it rapidly returned to growth and reached a high of 30.9% of total investment in 2008. Vietnam's accession to the WTO, which led to several important trade agreements from 2007 onwards, significantly boosted its FDI, as reflected in the “blooming” period of FDI inflows during 2007-2008. In 2008, with 1557 projects licensed, registered capital peaked at its highest level of 71.7 billion USD, with 11.5 billion USD implemented.

Surges of FDI inflows into the economy greatly contributed to the growth in the country's aggregate investment, as it accounted for nearly one quarter of Vietnam’s total investments on average between 2006 and 2010 (MPI, 2011). However, with the stagnation of the global economy, the share of foreign direct investment in Vietnam’s total state investment declined to 25.6% and 25.8% in 2009 and 2010, respectively (MPI, 2011).

In addition to the contribution of FDI to the country's growth, inflows of ODA from other countries and global organizations also played an important role and accounted for approximately 11% of the total social investment in the country over the period 1993-2007 (*ODA Overview, Portal of ODA in Vietnam*[^7]). After resuming relations with international organization from 1993, Vietnam's donor community expanded to 51 partners (28 bilateral and 23 multilateral) by 2009.

(Cox et al., 2011), with a steady increase in both ODA commitment and disbursement.

During the 2000s, according to the World Bank data, Vietnam was ranked among the top five recipients of ODA worldwide. The total volume of commitments expanded from 2,400 million USD in 2000 to 7,905 million USD in 2010, whereas the total disbursement also climbed up from 1,650 million USD in 2000 to 3,541 million USD in 2010 (MPI, 2011). At the end of the 2000s, Vietnam was excluded from the list countries that are highly dependent on external aid and assistance, with the ratio of actual disbursed ODA to GDP only 3.91% on average over the period 1993-2007 (MPI, 2011) and Vietnam moved from being one of the lowest income countries to being a lower-middle income country. However, the mobilization of ODA remains an important financial channel for a developing country like Vietnam as it contributes significantly to overall “socio-economic infrastructure development, economic growth, economic structure change to industrialization and modernization, socio-economic service improvement and poverty reduction” (ODA Overview, Portal of ODA in Vietnam).

Overall, as evaluated in the “Strategy for socio-economic development 2001-2010”, at the end of 1990s, Vietnam overcame its socio-economic crisis in the late 1980s through a high economic growth rate, a release from blockades and embargos, and with several bilateral and multilateral commercial agreements. Both domestic savings and investment increased, and economic production rose as well, satisfying not only essential consumer needs but also boosting the country’s exports and reserves. The country’s economic structure also shifted positively through industrialization and modernization, with the entire economy striving to become a socialist-oriented market.

However, several weaknesses remained in the economy leading to low efficiency and low development of economic growth despite its potentials. These were due to slow economic structural reforms with unreasonable investment structures, state subsidies and persistent protection, and macro-economic instability, which was reflected in the low quality of financial, banking and
planning systems in combination with an unhealthy investment and business environment. These factors might explain why Vietnam lagged behind other countries in the region.

2.3.2. Updates of Vietnam’s Macroeconomic Performance, 2011-2013

**Economic growth:** As a consequence of the global financial crisis in 2008 and the worldwide economic recession that followed, growth in the Vietnam economy seems sluggish. After a slightly recovery to 6.4% in 2010 from 5.4% in 2009, it decelerated again to 6.2% in 2011, 5.2% in 2012, 5.3% in 2013 (The World Bank Data). Most of sectors that contribute to GDP as well as the total GDP have experienced the slowest pace of growth since the reform of the “Doi Moi” system in the late 1980s, despite the stable macroeconomic environment.

**Inflation:** The inflation rate was kept under control in 2009 and 2010 after a peak of 23.1% in 2008. It surged again to the highest number since December 2008 to 18.7 % in 2011 (WB Data, 2011). Besides some reasons like the budget deficit remaining high, economic growth remaining a priority, the expansion of credit growth and the increasing price of consumption goods and services, the instability of the domestic currency (after several devaluations of the Dong by the SBV) could be considered as one of the key factors that have worsened the current situation regarding inflation. It resulted in residents being reluctant to hold the dong, and it being transferred into other markets, like gold and other strong foreign currencies (USD, EUR), which subsequently put more pressure on the currency.

**Monetary policies:** Under high inflation, the SBV responded by increasing all key interest rates (including refinancing rate, base interest rate and discount rate) as well as diminishing credit growth; inflation was successfully under control from 2012 (down to 10%) and stabilized at 6.7% during 2013. At the same time, the tightening of credit policy drove small commercial banks to mobilize funds due to a lack of deposits in the whole economy. The race between banks to attract deposits pushed up interest rates on deposits rapidly, followed by a continuous increase in lending rates. At the end of 2011, while deposit rates reached 13-15%
on average, interest on lending peaked at 19-20% per annum for each loan (SBV), which led to more difficulties for enterprises to access capital, especially small and medium enterprises (SMEs). This high increase in interest rates also added to the pick-up in the inflation rate, which was 18.6% in 2011.

Several important policies have recently been introduced to manage the market of interest rates, such as Resolution 11/2011/NQ-CP, Resolution 13/2012/NQ-CP, Resolution 2/2013/NQ-CP. Additionally, from 2012, the SBV applied caps on the interest rates of deposits in dong as well as on lending rates for some sectors, targeting better control of the interest rate market. Also, excluding the base interest rate, all key interest rates have been cut several times; the discount rate has been kept at just 4.5% while the refinancing rate has been retained at 6.5%. By 2013, interest rates had been considerably eased in terms of both lending rates and deposit rates.

In terms of the banking sector, restructuring is still in progress but a number of risks are hidden. However, initial positive signals of the health of the banking sector improving have been recorded, such as a lower number of banks but greater quality along with the merger and acquisition (M&A) trend, optimistic credit growth, and a decreasing bad debt ratio. As reported by the SBV in December 2013, the non-performing loan (NPL) ratio reduced to 3.6% from 4.7% in October, although this was not as high as the figure announced by Moody’s in February, which was at least 15%. Noticeably, one essential visual effort to tackle the problem of increasing NPLs during recent years has been taken by the government and the SBV. This was the official foundation of the Vietnam Asset Management Company (VAMC) in August 2013 after a long preparation stage from the late 2000s. By December 2013, the VAMC had purchased 38.9 trillion VND worth of NPLs from credit organizations (GSO Database).

**Exchange rate**: The official exchange rate has been relatively stable. The average interbank exchange rate on VND/USD was kept at 20,828 from 2011 to June 2013. After that, the SBV devalued the dong by 1% against the US dollar; the dong has depreciated by 1.6% in total over the last 12 months (updated by the
World Bank in July 2013). The exchange rate currently remains stable at VND 21,036 (SBV, 09/04/2014).

**Exports and imports:** Both exports and imports seem to have slow down growth rates over the period of the early 2010s. Export growth reached a peak at 34.2% in 2011, dropped to 18.2% in 2012, and then picked up at 16% in the first half of 2013. Meanwhile, import value grew moderately at 6.6% in 2012. However, 2012 was the first that the Vietnam trade balance reached a surplus result since 1992. This significantly contributed to the country's current account. In particular, from a current account deficit of 11% in 2009, it jumped to a surplus of 5.9% in 2012 and was expected to remain in surplus in 2013 (The World Bank Data).

**Foreign investment:** With favorable economic conditions, such as low wages, its ideal location and a stable political context, Vietnam is still one of the most attractive destinations for foreign investors in the region and worldwide (WB, 2013). Particularly, foreign direct investment (FDI) retains a high figure of disbursement, reached 10.5 to 11 billion USD over the period 2010-2012. However, its share of the economy decreased to only 7% in 2012 from 10% in 2010, due to the lower weighting of foreign investors in Vietnam’s total economic growth. This result not only originates from the problems connected to the recession in investors’ countries themselves, but also may from their afraid of host country's instability macro-economy.

### 2.4. OVERVIEW OF THE VIETNAM’S STOCK MARKET, 2000-2013

A concise history and development path of Vietnam’s stock market are delivered in the following sub-sections, over the period from its first trading session in August 2000 to 2013. Selected important indicators in the stock market are also provided, including the movement of VN-Index, the variations of trading volumes and market capitalization. The linkage between Vietnam stock market index and some macroeconomic variables is further visually captured, strengthening the motivation of conducting this current research.
2.4.1. Historical Review of the Vietnam’s stock market, 2000 - 2013

In order to improve performance as well as to diversify capital mobilization channels into the economy, the government of Vietnam has been taking a number of efforts to reorganize all of the country’s financial markets. The preparation process, including researching and designing, for setting up a stock market initially started from 1993 under Decision No. 207/QD-TCCB.

In November 1996, the State Securities Commission (SSC) was established as a governmental agency, under Decree No.75/CP signed by the prime minister, in charge of managing and supervising the operations of the whole securities market (Law on Securities of Vietnam). The main duties of the SSC are facilitating the fund mobilization process, ensuring “the orderly, safe, transparent, equitable and efficient operation of the securities market”, and “protecting investors’ legitimate rights and interests” (SSC Portal, Functions and Tasks).

The initial remarkable milestone on the path of Vietnamese financial market development afterwards was the agreement on the launch of two securities trading centers (STCs) in the country’s two main economic centers, Hanoi and Ho Chi Minh City, under Decision No. 127/1998/QD-TT in July 1998. Ho Chi Minh Securities Trading Center (HOSTC) was designed as a centralized securities market, to be developed towards a “fully-automated securities trading, market surveillance and information disclosure systems” whilst Hanoi Securities Trading Center (HASTC) was established as a market for transactions involving small and medium-sized enterprises (SMEs), and then could be developed into an OTC market.

The first trading session in Ho Chi Minh Securities Trading Center was formally opened on 28/07/2000 with only two listed stocks: Refrigeration Electrical Engineering Joint Stock Corporation (REE) and Saigon Cable and

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Telecommunication Material Joint Stock Company (SACOM). During March 2005, the other trading floor was officially opened in Hanoi with six listed companies and only one trading method available was negotiation. Also during 2005, the prime minister announced Decision No. 189/2005/QD-TTg to establish the Vietnam Securities Depository (VSD). VSD is operated as an independent body in order to support stock market activities under the recent context of the rapid growth of the financial markets.

To adapt to the robust development of the trading centers in Ho Chi Minh and Hanoi, both venues were upgraded to stock exchanges in 2007 and 2009, respectively.

2.4.2. The Development of Vietnam Stock Exchanges

• Ho Chi Minh Stock Exchange (HOSE or HSX)

From two listing types of stocks in 2000, after twelve years of development, as of 31 Dec 2013, there were 301 stocks listed on HOSE, together with 2 fund certificates and 38 bonds (HOSE Annual Report 2013). The total market capitalization of HOSE reached over 842 trillion VND (approximate 39.8 billion USD, accounting for 23.5% of GDP in 2013). At the end of 2013, with 91 securities companies registered to be members of HOSE, the whole charter capital gained above 34 trillion VND.

Moreover, the total number of investor accounts registered in members of HOSE steadily increased over years, extending to 1.26 million accounts in 2012 (an increase of over ten times as compared with 2006). The year 2012 also remarked the first recovery year of the VN-Index after three years of continuous plunging, with a spread of 18.21%. The VNI jumped from 350 points at the beginning of 2012 to 413.73 points on 28 December 2012. The index continuously followed the upward trend in 2013, reached 504.63 points on 31 December 2013 (increase of 21.97% compared to the end of the previous year).
These positive signals of the Vietnam’s stock market were attributed to the efforts of the government as well as the struggles of HOSE’s board of directors with the stagnant global economy. For instance, they were successful in introducing the VN30 Index from February 2012 (comprising 30 blue chip stocks on HOSE, accounting for 80% of the market capitalization with 60% of the market trading value), extending trading hours (i.e. into the afternoon from June 2012 and by 45 minutes from July 2013), officially applying market order from October 2012, and raising daily trading limits for stocks and fund certificates from ±5% to ±7% from January 2013.

As results of improving technology and developing product ranges, followed by higher liquidity and enhanced trading services in the exchange, both trading volume and value significantly rose to 161.1 million shares and 265.8 billion VND, compared to 84.3 million shares and nearly 116 billion VND at the end of 2012 (equivalent to 15.11% and 20.98% increase, respectively).

• **Hanoi Stock Exchange (HNX)**

Distinctive from HOSE, HNX was launched to explore a trading floor for public medium and small enterprises and to run two other main activities: share auctions and bond biddings in order to mobilize capital for the state budget. Hence, HNX not only regulates the listed stock market but also operates government bond market and the unlisted public company market (UPCoM).

Seven years after its first session, the development of HNX was highlighted with a series of improvements, such as the appliance of an order matching method, instead of only one traditional method such as negotiation, to both listed stock market and UPCoM, and the introduction of an online trading system based on a modern technological structure instead of placing orders directly.

In 2010, HNX officially became a member of the Asian and Oceanian Stock Exchanges Federation (AOSEF) and was awarded a Second-Rank Labor Medal by the President for its excellent business achievements, as well as its contribution to building Socialism and national defense.
The years 2012-2013 marked the progress of the HNX with improved information closure, launching a number of new advanced products to the market (such as the HNX 30 Index, an odd lot trading system, a corporate information management system (CIMS), an automatic bidding system, and a secondary treasury-bill trading system). Overall, as of 31 December 2013, the HNX listed 396 stocks with a total volume of 8.75 billion shares, equivalent to the value of over 87.5 billion VND (both grew by around 2.31% compared to that of the end of 2012). At the same time, there were 142 UPCoM stocks trading on the HNX with a volume of 2.04 billion shares, equivalent to a registered value of 20.42 billion VND (increasing by 4.15% compared to 2012). The total market capitalization on the HNX correspondingly reached high numbers, at over 106.87 billion VND by listed stock market and nearly 25.75 billion VND by unlisted public companies market.

2.4.3. Key Indicators of the Vietnam's stock market

Over nearly one and a half centuries, from being a very small securities market with a limited number of investors and types of stocks, Vietnam’s stock market has drastically expanded and become one of the most active markets in the region. It has been significantly helped by the efforts of the Vietnamese government in order to comprehensively integrate with the global market, as highlighted in the introduction of the “Strategy for Development of the Securities Market up to 2010” in 2003, the improved legal framework with promulgations and amendments to the Law of Credit Organizations, Enterprise Law, Law of Insurance Business, Bankruptcy Law and Securities Law, and the engagement in numerous agreements on improving information technology for the entire securities market. While Ho Chi Minh Stock Exchange operates as the leading securities market in Vietnam, the following sections pay more attention to some key indicators performing in this exchange.

- **Listed Companies in Regulated Market**

  Alongside the expansion of the Vietnam’s stock market and the development of two stock exchanges (HOSE and HNX), the number of companies listed has been rising considerably year-by-year (Table 2-5).
### Table 2-5. Number of Listed Companies in Vietnam’s stock market 2005-2013

<table>
<thead>
<tr>
<th>Year</th>
<th>HOSE</th>
<th>HNX</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>28</td>
<td>13</td>
</tr>
<tr>
<td>2006</td>
<td>86</td>
<td>101</td>
</tr>
<tr>
<td>2007</td>
<td>123</td>
<td>128</td>
</tr>
<tr>
<td>2008</td>
<td>155</td>
<td>184</td>
</tr>
<tr>
<td>2009</td>
<td>203</td>
<td>259</td>
</tr>
<tr>
<td>2010</td>
<td>279</td>
<td>356</td>
</tr>
<tr>
<td>2011</td>
<td>309</td>
<td>393</td>
</tr>
<tr>
<td>2012</td>
<td>314</td>
<td>396</td>
</tr>
<tr>
<td>2013</td>
<td>303</td>
<td>378</td>
</tr>
</tbody>
</table>

Source: Annual Reports of HOSE and HNX from 2005 to 2013

In 2005, there were only a moderate number of listed companies in both Ho Chi Minh and Hanoi trading centers (28 and 13 respectively). After eight years, there were 303 companies listed in HOSE and 378 in HNX. However, this started to decline as the global economic recession spread. The year 2013 was the first year that witnessed a decrease in the total listed companies by 29 companies in the entire market, compared to 2012. A few of them announced voluntary delisting decisions while some were forced to leave the market due to their severe violations of information disclosure regulations. Despite the decrease in the number of listed companies and the reluctant of new listed companies recently, the progress of the Vietnam’s stock market can still be seen in the efficiency and transparency of its information disclosure regulations.

- **Total Market Capitalization**

With more companies listing on the Vietnam's stock market, there was a remarkable increase in market capitalization. The aggregate market capitalization reached record highs of more than 680 trillion VND in HOSE and 106 billion VND in HNX on the closing date of 2012 (equivalent to approximately 33 billion USD and 5 billion USD).
Figure 2-7. Market Capitalization of Listed Companies in Ho Chi Minh Stock Exchange 2003-2012  (billion US$)

Source: The World Bank Data
(https://data.worldbank.org/indicator/CM.MKT.LCAP.CD)

Figure 2-8. VN-Index and Trading Volume 2000-2013

Source: Ho Chi Minh Stock Exchange (HOSE) Statistics
• **Vietnam’s stock market Index (VN-Index)**

Over 14 years from the first trading session, VN-Index has affirmed its role as one vital indicator to reflect the performance of the whole economy. As can be seen from Figure 2-8, the two years 2007-2008 experienced a booming of the Vietnam’s stock market, with rapid development of the whole economy. In 2008, the VN-Index reached its historical high at 921.07 points. However, the latter period witnessed the downward trend of the stock market as a result of the global recession. The VN-Index hit the bottom during 2009 but has been recovering until the present. On 31 December 2013, the VN-Index closed at 504.6 points, 21.97% up on the previous year (Figure 2-8).

• **Trading Volume and Trading Value**

During the same period, the trading volume has surged dramatically, with a significant contribution from foreign investors. Notably, in spite of the drastic decline of the VN-Index, 2009 closed with 70.4 billion shares trading on the Ho Chi Minh Stock Exchange, with the total trading value peaking at 3 trillion VND. However, this amount decreased nearly 50% in the next year due to the ongoing domestic macroeconomic instability as well as the global economic difficulties. At the end of 2013, the trading volume on HOSE was 61 million shares, valued at 869.5 billion VND, with nearly 39.8 billion shares on HNX, equivalent to 275.9 billion VND.
Figure 2-9. Trading Volume (number of shares) and Trading Value (mil. VND) in Ho Chi Minh Stock Exchange 2006-2013

Source: HOSE Trading Board (http://www.banggia2.ssi.com.vn/)

- **Foreign Investors in the Vietnam’s stock market**

Recently, the performance of the Vietnam's securities market has benefited from greater participation from foreign investors. In 2013, the trading volume of foreign investors on HOSE reached nearly 2.4 billion shares, accounting for 8.46% of the total market trading volume and 14.1% of the whole market’s trading value (HOSE Statistics). The join of foreign investors, including both individuals and corporations, is shown in the table below.

**Table 2-6. Number of Foreign Investors in the Vietnam's stock market (2006-2013)**

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>3,050</td>
<td>8,607</td>
<td>11,844</td>
<td>12,439</td>
<td>13,393</td>
<td>13,845</td>
<td>14,022</td>
<td>14,461</td>
</tr>
<tr>
<td>Corporations</td>
<td>239</td>
<td>536</td>
<td>889</td>
<td>1,151</td>
<td>1,442</td>
<td>1,724</td>
<td>1,979</td>
<td>2,270</td>
</tr>
</tbody>
</table>

Source: Annual Reports of HOSE from 2006 to 2013
2.4.4. Linkage between Vietnam’s stock market and macroeconomic variables

Given the data provided in the above sections, it is suggested that the moving trends of Vietnam stock market index (VNI) and some macroeconomic factors are linked to each other. Figure 2-10 gives an outstanding example for the linkage between VNI and two macroeconomic dynamics (consumer price index and interest rates) during the period 2005-2010.

From the Figure 2-10, the biggest change of macroeconomic environment is captured between the years 2008-2009, when the Vietnam’s economy suffered from the spread of global economic stagnation. Due to the slowdown of the economy, inflation rate and interest rates rose drastically. At the same time, the VN-Index also hit its bottom. This graph suggests the converse direction of Vietnam’s stock market index and nominated macroeconomic variables (i.e. consumer price index; interest rates).
Figure 2-10. CPI (%), Interest Rates (%), and VN-Index in Vietnam 2005-2010

Source: General Statistics Office (GSO) of Vietnam and HOSE Statistics
2.5. CONCLUSIONS

To summarize, this chapter has provided a concise outline of the development of Vietnam’s economy after reunification in 1975 and of the Vietnam’s stock market from the first day of trading in 2000 until 2013. In respect of Vietnam’s open door policy, the country’s economy has turned to a new phase of development. The establishment of Vietnam’s stock exchange in mid-2000 was one remarkable progress of the economy. Noticeably, the movements of the VN-Index, trading volumes and market capitalizations are likely to have considerable links to macroeconomic events, through the integration of the country within the global economy and through different periods of development. Grounded on these understanding of the Vietnam’s economy and its stock market, the following chapter will subsequently present the existing literature review and theoretical framework. A comprehensive conceptual framework will be later developed, based on these fundamentals from literature, to investigate whether or not there exists any correlation between the stock market and macroeconomic factors within the context of Vietnam.
CHAPTER 3:
THEORETICAL FRAMEWORK AND LITERATURE REVIEW

3.1. INTRODUCTION

3.2. THEORETICAL FRAMEWORK ON THE BEHAVIOR OF STOCK MARKET RETURNS

3.2.1. Efficient Market Hypothesis

3.2.2. Dividend Discount Model

3.2.3. Capital Asset Pricing Model

3.2.4. Arbitrage Pricing Theory

3.3. LITERATURE REVIEW ON MACROECONOMIC VARIABLES AND STOCK MARKET RETURNS

3.3.1. Review of Macroeconomic Variables and Stock Returns in Well-Developed Countries

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3.4. MACROECONOMIC VARIABLES AND STOCK MARKET RETURNS IN VIETNAM

3.4.1. Review of Efficient Market Hypotheses in Vietnam

3.4.2. Macroeconomic Variables and Stock Market Returns in Vietnam

3.5. CONCLUSIONS
3.1. INTRODUCTION

Regarding to the Efficient Market Hypothesis (EMH), if a market is efficient, stock prices can adjust instantly to new announcements and available information (Fama, 1965). In other words, stock prices are capable to reflect all information relevant to those stocks. This implies that no excess returns can be gained consistently in the long term. Moreover, investors generally make capital market decisions based on their expectations of future corporate earnings and for future economic growth, which is eventually reflected in the stock prices of corporations. Meanwhile, corporate earnings are normally affected by economic performance. Therefore, better economic predictions should generate better investment decisions. Based on these profound assumptions, it is rationally suggested that economic states and economic indicators can be useful means to explain the fluctuations of stock market indices, and subsequently stock market returns.

Also supported by several relevant theoretical frameworks, such as the Dividend Discounted Model (DDM), Capital Asset Pricing Model (CAPM), and Arbitrage Pricing Theory (APT), economic variables can be expressed as significant leading indicators of stock market returns. Under the APT framework, a notable study of Chen et al. (1986) concluded that equity returns were systematically influenced by macroeconomic variables. Azeez and Yonezawa (2006) also used the APT model to exhibit empirical evidence that four macroeconomic factors (money supply, industrial production, inflation, and exchange rate) significantly influenced on the Japanese stock market’s expected returns.

The dynamic interaction between economic factors, more specifically macroeconomic indicators, and stock market returns has provided interesting research questions for many academics and practitioners. In fact, the existence of this relationship has been mostly proved in the existing empirical research over the past few decades (Fama, 1981; Chen et al, 1986; Fama and French, 1989; Leon, 2008; Azar, 2010; and Zakaria and Shamsuddin, 2012). However, the results are mixed among different markets. The following section starts with the foundation of theoretical frameworks that support the explanation of stock market behavior, and
then goes through the relevant literature on macroeconomic determinants of equity returns for both developed and developing economies, with a focus on emerging markets and the Vietnam’s stock market.

3.2. THEORETICAL FRAMEWORK ON THE BEHAVIOR OF STOCK MARKET RETURNS

Amongst the theoretical frameworks that have been set up to explain stock price movements as well as the performance of stock market returns, there are three well-known theories: the dividend discount model (DDM) or present value model (PVM), the capital asset pricing model (CAPM) and arbitrage pricing theory (APT).

3.2.1. Efficient Market Hypothesis

It is important to recall that one important background behind CAPM, APT and other investment theories is the principle of efficient market hypothesis (EMH). The definition of an “efficient market” was initially introduced by Eugene F. Fama – who believed that prices of securities market follow a random walk (Fama, 1965). The first to originally define the term “efficient market hypothesis” alongside the spread of market efficiency from weak form to strong form was Harry Roberts (Roberts, 1967). However, the EMH became more extensively popular with the classification of the empirical findings of Fama (Fama, 1970). In respect to Fama’s (1970) study, the market is so-called efficient when all of the relevant information about the securities themselves can be fully reflected through their prices. The market is therefore classified into three distinct levels of efficiency: (i) weak form, (ii) semi-strong form, and (iii) strong form.

(i) **Weak form efficiency**: Stock prices incorporate historical information. Excess returns cannot be achieved by technical analysis, or the chart of past price movements.

(ii) **Semi-strong form efficiency**: Stock prices incorporate publicly available information. Excess returns cannot be predicted by fundamental analysis.
More specifically, investors are not able to consistently generate higher returns than the risks they get involved.

(iii) **Strong form efficiency:** Stock prices incorporate all relevant information, even privately held information. If the market is satisfied to be the highest level of efficiency, excess returns are rarely gained even by trading on inside information.

The acknowledgement of whether or not a market is efficient and how efficient it is can be considered as a very important stage to understand stock price behavior, and to explain what influences stock market returns. In fact, a number of analyses about the linkage between macroeconomic factors and stock market returns rely on the background of EMH before developing empirical tests (i.e. Ibrahim, 1999; Alam and Uddin, 2009; Gay and Robert, 2011). The empirical results from these studies will be further reviewed in the following sections.

### 3.2.2. Dividend Discount Model

An early contribution to modern portfolio theory was from Irving Fisher. In two well-known publications “The Rate of Interest” (1907) and “The Theory of Interest” (1930), Fisher introduced the concept of the internal rate of return – a key factor for the development of modern valuation framework afterwards. The definition of intrinsic value was later applied to common stocks by John Burr Williams (1938), which can be presented mathematically as follows:

\[
P = \sum_{t=1}^{\infty} \left( \frac{D_t}{(1 + R_t)^t} \right)
\]  

(3.1)

Where \( P \) denotes the intrinsic value (or the fair value) of the common stock, \( D_t \) denotes the estimated cash dividend in period \( t \), and \( R_t \) represents the appropriate discount rate (later defined as required rate of return) in period \( t \).

It asserts the basic idea of the dividend discount model (DDM) that a stock today is priced as the present value of all expected cash flows to this stock.
The simplest form of DDM was the so-called Gordon Growth Model (popularized by Myron J. Gordon (1962)) – also known as the constant-growth model, assuming that the dividends of a firm grow at specific percent periodically (normally on an annual basis). Mathematically, the formula is given as:

\[ P = \frac{D_0(1+g)}{R-g} = \frac{D_1}{R-g} \]  

(3.2)

Where \( P \) represents intrinsic value of the common stock; \( D_1 \) represents the next year dividend; \( R \) is required rate of return by investors (also known as capitalization rate); and \( g \) denotes for dividend constant growth rate.

The Gordon model is developed on the assumption that the rate of return demanded by investors is greater than the growth rate for dividends \( (R > g) \) and that the growth rate for dividends remains constant. Hence, it suits any firm with a stable growth condition. However, the assumption of a constant dividend growth rate seems to be unrealistic when most firms have non-constant growth in future earnings and dividends. Therefore, the DDM was later modified to make use of multistage models. They assume that firms will go through different growth phases, implying that the growth rate is varied for specified periods. There are three common forms of multistage model: the classic two-stage model, two-stage h-model, and three-stage model.

The classic two-stage model is appropriate for firms that expect high growth rates for initial years (rapid growth stage) before returning to stable growth thereafter (constant growth stage). The value of a stock is formularized as follows:

\[ P = \sum_{t=1}^{n} \frac{D_0(1+g_S)^t}{(1+R)^t} + \frac{D_0(1+g_S)^n(1+g_L)}{(1+R)^n(R-g_L)} \]  

(3.3)

Dividends are assumed to grow at \( g_S \) (short-term growth rate) during the first stage, and to grow at \( g_L \) (long-term growth rate or perpetuity growth rate) during the second stage.
The two-stage model is suitable for firms that initially take specific advantage of the existing market, and then rapidly expand with high profit margins. It implies that these firms have two clear growth periods – high growth and stable growth. The limitations of this model are the difficulty defining the length of a growth period and the unrealistic assumption of a precipitous transformation from high growth to lower stable growth (which should be normally adjusted gradually over time).

A modified form of the classic two-stage model is the H-model introduced by Fuller and Hsia (1984). The two-stage H-model assumes that the high-growth periods equal 2H years and stocks with longer high-growth periods and greater high growth rates will have higher values. The essential feature of this model is that the dividend rate of the firm is gradually decreasing from high growth during the few first years to stable growth in the subsequent stage.

$$P = \frac{[D_0(1+g_L)] + [D_0H(g_S-g_L)]}{R-g_L}$$

(3.4)

where $H$ is the half-life of the high-growth period in years; $g_S$ is the short-term growth rate in the first stage; and $g_L$ is the long-term growth rate or perpetuity growth rate in the second stage.

Even though this overcomes the shortcomings associated with a sudden change of position in the growth rate of dividends, as suggested in the general two-stage model, this model is still subject to the problems of defining the length of the growth period and the impracticable assumption of an equal dividend ratio applying for both phases of growth.

The most applicable model for many firms with different dimensions of growth for dividends is broadly known as the three-stage model. The firm is assumed to have three phases: high growth in an initial period (growth phase), a declining growth in a second period (transition phase), and perpetual stable slow growth in a third period (mature phase). In other words, the three-stage model is a combination of the general two-stage model and the H-model.
Although this model is useful to value the stock of a firm that has a changing dividend growth rate over time, its main limitation is the requirement of a larger number of inputs, including growth rates, year-specific payout ratios, and the required rate of returns.

Generally, there is no doubt that the dividend discount model is one of the primary valuation methods. Nonetheless, the use of the dividend discount model to value equity has been a critical issue in empirical research because of its simplifying assumptions. The valuation of an underlying stock depends on estimating growth, calculating the required rate of returns, and forecasting dividends (Mishkin and Eakins, 2006). Any inaccuracy in estimating a growth rate or required rate of returns by investors can lead to incorrect results in intrinsic value for the stock.

Several techniques have been developed to take into account the required rate of return estimation, and furthermore to precisely price an underlying asset. The two sound theories in this line are acknowledged as the capital asset pricing model (CAPM) and arbitrage pricing theory (APT), which will be deliberated in the following sections.

3.2.3. Capital Asset Pricing Model

The capital asset pricing model is a well-known framework to estimate the required rate of return – that is what an investor expects to receive from an investment, in order to purchase an underlying security. Brigham and Gapenski (1996) use the security market line (SML) to demonstrate the determinants of the required rate of return on a specific security. Specifically, the required rate of return or expected rate of return for investors on a stock or a portfolio can be computed by the rate of return on the risk-free security plus the market risk premium. The SML represents an original interpretation of a famous theory, the capital asset pricing model (CAPM), which was first mentioned in an unpublished manuscript of Jack Treynor (1962), but was generally known as a theory of William F. Sharpe once he was awarded the Nobel prize for his paper “Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk”, published in
1964. John Lintner (1965) also contributed to this model, with one parallel study on the valuation of risk assets.

As each individual asset in a portfolio entails both systematic and unsystematic (also known as specific) risks, the investors only encounter systematic risk if they hold the market portfolio, because the specific risk can be diversified away. Briefly, the significant contribution of CAPM is that it provides a benchmark to compute the systematic risk of a security in the market portfolio.

The Sharpe-Lintner CAPM equation is formulated as:

\[ E(R_i) = R_f + \beta_{iM}[E(R_M) - R_f] \]  \hspace{1cm} (3.5)

To measure the expected return of asset \( E(R_i) \), the CAPM formula inserts three inputs, including the rate of return of a risk-free asset \( R_f \), the expected rate of return on the market portfolio \( R_M \), and the asset's market beta \( \beta_{iM} \). The expected return on any asset, according to the Sharpe-Lintner CAPM, can be estimated by the risk-free rate of return plus a risk premium. That is, equals the beta of the asset, \( \beta_{iM} \), multiplied with the premium per unit of beta risk, \( E(R_m) - R_f \). In short, the CAPM infers that beta is a single explanatory variable that can explain the real return of an investment. However, based on severe simplicity assumptions, the debate of validating CAPM implications has mainly revealed that the CAPM is not a complete model to measure the precise returns of individual assets. An early criticism was raised by Roll (1977), who indicates several reasons to reject the testability of the CAPM in practice. It is further supported by the work of Fama and French (2004). They expose the weaknesses of the theory by reviewing the failure of previous empirical studies to test it. This can only be expected as the model that requires a number of unrealistic assumptions, such as complete agreement and no restrictions on short sales of any assets.

3.2.4. Arbitrage Pricing Theory

The CAPM is empirically proved as an imprecise framework to estimate the cost of capital for an investment, since it suggests that only systematic risk factors
can explain the expected rate of return. This leads to a rational assumption that more than one factor influences the expected returns of an underlying security. A substitution for the CAPM that formulated by Stephen Ross (1976) is the arbitrage pricing theory (APT), also known as a multi-factor pricing model. This also demonstrates the relationships between risk and return in asset pricing; however, the APT differentiates from the CAPM by inserting more explanatory indicators. The equation of APT can be represented as:

\[ E(R_i) = R_f + \beta_{i1}R_1 + \beta_{i2}R_2 + \cdots + \beta_{in}R_n = R_f + \sum_{j=1}^{n} \beta_{ij}R_j \]  

(3.6)

Where \( E(R_i) \) is the expected return of asset \( i \); \( R_f \) is risk-free rate of return; \( \beta_{ij} \) is the sensitivity of the security to factor \( n \); \( R_j \) is the risk premium or the standardized factor score in that it has zero mean and unit standard deviation.

Under the theory of arbitrage pricing by Ross (1976), several papers have been constructed using different sets of macroeconomic factors to estimate stock returns. The pioneering work that supports for the APT was conducted by Chen et al. (1986). Wherein, stock market prices were systematically driven by innovations in economic state indicators. Employing the same framework as in Chen et al. (1986), Shanken and Weinstein (2006) developed the APT model to set up the relationship between expected returns and five macroeconomic factors (industrial production, unanticipated inflation, expected inflation, the excess return of low grade corporate bonds over long-term government bonds, the excess return of long-term government bonds over T-bills with 1 month to maturity). However, the only significant linkage was obtained for the industrial production factor, mostly positively. Expanding the APT, Rjoub, Tursoy and Gunsel (2009) modeled the Istanbul stock market returns by six macroeconomic factors – interest rate, unanticipated inflation, money supply, exchange rate, unemployment rate, and risk premium, in which the risk premium was estimated by the CAPM equation. Excluding no evidence for exchange rate and unemployment rate, the remaining factors were found to insignificantly influence stock market returns in a number of different portfolios.
3.3. LITERATURE REVIEW ON MACROECONOMIC VARIABLES AND STOCK MARKET RETURNS

Perceiving the importance of determining the influences of economic factors on stock market returns, a variety of papers have been executed for both developed and developing countries. Initially, more studies on the determinants of stock returns concentrated on well-developed markets. Academic attention then turned to developing countries, especially emerging economies, with their rapid development in capital markets. However, it is also valuable to review the previous contributions on these markets before exploring the existing literature on emerging markets.

3.3.1. Review of Macroeconomic Variables and Stock Market Returns in Well-developed Markets

At the first stage in general literature, most studies employ data from the US, which was the original context used to construct the EMH; it is also the country with the largest and strongest capital market in the world. Many empirical results have been studied for this market.

Regarding to the early research of Chen et al. (1986), a systematic impact of macroeconomic news (originating from industrial production, expected and unexpected inflation, change in the risk premium, change in term structure) were found on stock market returns for the US, based on a sample running from Jan 1978 to Nov 1983. This paper specified multifactor pricing model, using simple and intuitive financial theory. However, no significant impact on asset pricing was found from innovations on neither consumption nor global oil price.

Also emphasizing on the response of the US equity market to macroeconomic developments, Li and Hu (1998) paid attention to the responsiveness of four major stock indices (S&P 500 Index, the Dow Jones Industrial Index, the Russell 1000 Index and the Russell 2000 Index) to announcements in the macroeconomic area, covering inflation, money supply, employment, housing starts, and state balances, across different economic states.
The state of the economy, in specific, was classified by monetary regimes and by different variables (industrial production and leading indicators, NBER business cycle turning points, the unemployment rate and discount rate). Employing data set of daily returns from 01 Feb 1980 to 31 Dec 1996, the findings significantly showed the impact of macroeconomic news, not only from a set of real activities (i.e. industrial production, unemployment, and housing starts) but also from individual activities (i.e. M1, inflation rate and discount rate) on equity prices in the US market. They additionally distinguished the responses from small-cap stocks and large-cap stocks in how they respond to new economic information.

Employing a multivariate vector auto-regression (VAR) approach for the post US war period from Jan 1947 to Dec 1987, Lee (1992) investigated the Granger causality and dynamic interactions among returns on the NYSE Index and three macroeconomic factors: real activity, interest rates, and inflation. One Granger causal link was found from stock returns to real activity and real activity was found to have positively response to a shock in stock returns. Furthermore, stock returns could be able to explain substantial variance in real activity while little variance in inflation. No significant result was uncovered between NYSE index and interest rates. Also paid attention on the NYSE portfolio, Balduzzi (1995) re-examined the hypothesis of Fama (1981) for the negativity between stock returns and inflation. Quarterly data set was gathered for four macroeconomic variables, including industrial-production growth, inflation, monetary-base growth, and three-month Treasury-bill rates, during two periods: 1954-1976 and 1977-1990. The outcome of time series techniques revealed weak negative correlation between stock returns and inflation for the selected time spans.

Taking further examination on the NYSE-AMEX-NASDAQ markets, Flannery and Protopapadekis (2002) expanded the number of macroeconomic factors to 17 conditions using a specified GARCH model for daily data over the period from Jan 1980 to Dec 1996. The market returns and their conditional volatility were found to be influenced by six out of 17 selected macroeconomic announcements (i.e. nominal CPI, PPI, monetary aggregate, real balance of trade, employment/unemployment, and housing starts). In particular, PPI and CPI impact
market returns; balance of trade, employment/unemployment and housing starts impact returns’ conditional volatility; and monetary aggregate (M1) impact both returns and conditional volatility. However, no model explicitly time variance in respect of the macroeconomic influences on stock market returns was established.

Under the same context of the US stock market, McMillan (2001) selected S&P500 (as a proxy for the US market index) and DJIA (as a proxy for Dow Jones Industrial Average Index) to analyse their determinants of selected financial and macroeconomic variables (i.e. interest rates (the 3-month T-bill, the 12-month T-bill), unemployment, industrial production, inflation (CPI), and money supply (M1)). Applying a sample from January 1970 to March 1995, the outcomes from the model-free non-parametric estimator showed the predictability of stock market returns using lagged exogenous variables (i.e. interest rates, output measures). Model-free non-parametric methods found the existence of a non-linear relation between returns and interest rates; however, not between returns and the macroeconomic series. The result was also later supported by the estimation of a STAR-type model (STARX). That was, by successful estimation of nonlinear form, the series of interest rate appears in both regimes whilst the series of macroeconomic is only found in one regime. Additionally, the non-linear models seemed to outperform the linear model either using in-sample or out-of-sample, and the forecast gain was discovered to be marginal but statistically substantial via the test of predictive accuracy.

Ratanapakorn and Sharma (2007) examined the linkages between S&P 500 (as a proxy for the US stock price index) and five major macroeconomic factors (industrial production, long-term and short-term interest rates, money supply, and inflation) in long- and short-run. Running quarterly data during the period from Jan 1975 to Apr 1999, the paper revealed that the index was positively related to most of the selected macroeconomic indicators, except for the long-term interest rate. Additionally, macroeconomic influences were found on stock prices by the Granger causality tests, later supported by the outcomes of the variance decomposition analysis, but only in the long run. Meanwhile, short-run Granger
causality relationships were found in the reverse direction, from stock prices to interest rates, inflation rate, money supply and exchange rate.

Recently, a relatively new statistical approach – the maximum overlap discrete wavelet transform (MODWT) – supported Hamrita and Trifi (2011) to observe three-month American Treasury securities (as a proxy for interest rate), the USD/EURO exchange rate and the closing S&P500 (as a proxy for stock price) for the time span from Jan 1990 to Dec 2008 in order to find out the multi-scale interaction between these factors in the US. There were three key findings from the research: firstly, interest rate and exchange rate were not substantially related at all leads and lags and at all scales; secondly, stock price and interest rate had a remarkable relationship only at the highest scales; and finally, stock price and exchange rate were related to each other only at low frequencies.

Developing the topic to the three most active stock exchanges in the world (the US, the UK, and Japan), Kanas (2002) investigated the effect of the exchange rate volatility on the volatility of stock returns and vice versa. The study used EGARCH to model the relationship between daily closing stock values in local currency (DJIA, FT all share price index, and Nikkei 25) and the Bank of England trade-weighted exchange rates. The empirical evidence revealed a significant and positive determinant in the form of the volatility of exchange rate changes in all three industries. Additionally, the findings suggested integration among these three financial markets since the impact of stock market on exchange rate was found to be symmetry in all selected markets.

Maysami and Koh (1998) investigated the existence of equilibrium between Singapore’s stock market index and a series of macroeconomic factors as well as between this index and the Japanese and the US stock indices. The VECM approach (including Johansen’s technique for multivariate cointegration analysis) was used for monthly-end data from Jan 1988 to Jan 1995. Changes in real economic activities (i.e. industrial production and trade) were found to not correlate at the same order as changes in stock market prices. In contrast, changes in stock market levels cointegrated with changes in price levels, money supply, changes in short-
(not significantly) and long-term interest rates, and changes in exchange rates (significantly). Interestingly, the Singapore market was suggested to be sensitive to interest and exchange rates. Moreover, the Singapore stock market was discovered to be significantly and positively cointegrated (positive long-run equilibrium relation) with the equity markets of Japan and the US via a tri-variate model.

Amongst prior literature, some papers have also paid attention to the subject of macroeconomic indicators and equity returns for other developed countries with competitive investment environments. For example, in order to expose the effects of financial and business cycle factors (i.e. industrial production, inflation, money supply, interest rates, and the current account deficit) on stock market conditional volatility for Australia, Kearney and Daly (1998) observed monthly frequencies from January 1972 to January 1994 then applied both a Generalized Least Squares (GLS) estimation of the ARCH model as well as Hendry general-to-specific modeling strategy. The results illustrated a substantial relationship between the selected set of variables and the conditional volatility of Australian stock returns, excluding the foreign exchange rate. Specifically, the statistical evidence showed that inflation and interest rate directly impacted the conditional volatility of the stock market, whilst indirect effects were found from industrial production, money supply, and the current account deficit.

Also collecting data from Australia, Vaz, Ariff and Brooks (2008) drove their concern to the movement of stock prices in 51 banks under the influence of interest rates over a 15-year period from Jan 1990 to Jun 2005. Their findings disclosed inconsistent results to the research of Balduzzi (1995) (as mentioned above), since there was no evidence for the negative effect between interest rate increases and Australian banks’ stock prices. An increase in cash rate was found to have little positive effect only in short term.

In Liljeblom and Stenius (1997), two approaches were used to find out the transmission of the changes of macroeconomic volatility to stock market volatility in Finland, including weighted-average lagged absolute errors and GARCH models. The data set covered the period from January 1920 until 1991 based on monthly
intervals. The results from VAR estimations proved the bi-directional nexus between stock market and macroeconomic variables (comprising of industrial production, money supply, inflation and terms of trade), by the evidence that one-to-six to more than two-to-three of the movements of equity market volatility could be influenced by the volatility of macroeconomic factors. In addition, the paper exposed insignificant negative interactions between the volatility of stock market and the growth of trading volume.

3.3.2. Review of Macroeconomic Variables and Stock Market Returns in Emerging Markets

The world economy has expressively changed with a pronounced trend towards integration among countries and regions. As an important part of this, emerging countries have exposed their increasing role in international activities and become more attractive to both domestic and foreign investors through their emphasis on the progress and expansion of financial markets. This explains the increasing number of studies on macroeconomic indicators and stock market returns in such contexts, which are expected to support investment management activities. The following sections will review the impact of macroeconomic determinants on stock returns based on various methodologies, such as regression models, VAR, VECM, and GARCH models.

Empirical Findings via Regression Models

The basic framework that has been utilized is the regression model. In one study by Tangjitprom (2012) for the Thailand stock market during the time span Jan 2001 – Dec 2010, the outcome of the regression model, after adding lags to unemployment rate and inflation rate, illustrated that stock returns were definitely determined by macroeconomic variables, including inflation rate, unemployment rate, interest rate, and exchange rate.

Zakaria and Shamsuddin (2012) studied the nexus between the volatility of stock market returns (Bursa Malaysia Composite Index) and the volatility of macroeconomic factors (i.e. GDP, inflation, exchange rate, interest rates, and
money supply). The result from multi-regression model illustrated that stock return volatility significantly correlated with money supply volatility, but not with macroeconomic factors as a group. This issue might be originated from the insufficient institutional investors and the presence of information asymmetric problem amongst investors.

Under the Box-Jenkins time-series framework, Victor and Kuwornu (2011) examined the link between stock market returns and a set of four macroeconomic fundamentals (inflation, exchange rate, interest rate, crude oil price) for Ghana. The estimation of the ordinary least square estimation (OLS) model, spanning monthly statistics from January 1992 to December 2008, barely showed one significant linkage between consumer price index (as a proxy for inflation) and stock returns, while there were no considerable impacts from other macroeconomic factors.

Using the random walk theory, Alam and Uddin (2009) firstly implied the inefficiency of the share markets in weak form for a sample of fifteen developed and developing economies. They subsequently applied time-series and panel-regression models to find out the correlation between stock market indices and interest rates, employing monthly time series from Jan 1988 to Mar 2003. Both time series and panel regressions revealed the considerable negative influence of interest rates on share prices (which supported the hypothesis of Fama (1981)). Furthermore, the result that the changes of share prices were negatively influenced by the changes of interest rate was also found for six of fifteen countries.

Menike (2006) run a model for stock prices of 34 companies on the Sri Lankan stock exchange and macroeconomic indicators (i.e. interest rate, money supply, inflation rate, exchange rate and their lags), utilizing monthly data from Sep 1991 to Dec 2002. In spite of mixed results, the research presented a significant linkage between selected macro factors and stock prices. For example, money supply positively related to stock prices in ten companies but negative sign was found in five companies; interest rates negatively linked to stock prices in 14
companies, but positive links were found in two companies; inflation rate negatively related to stock prices in 15 companies but positive relationships were obtained in three companies; and exchange rate negatively related to stock prices in 12 companies but positive sign was obtained in 10 companies. Furthermore, there existed significant links, which were almost negative, between the lagged money supply as well as inflation rate and stock market indexes for almost 23 companies.

✓ **Empirical Findings via Vector Auto-regressive (VAR) and Cointegration**

A preferable and advanced technique to analyze the link between macroeconomic indicators and stock returns is acknowledged as the vector auto-regressive (VAR) framework, which was first empirically introduced by Sims (1980). Under the context of VAR models, cointegration and causality tests, which were developed in a number of studies by C. W. J. Granger (i.e. Granger (1983), Granger and Weiss (1983), and Engle and Granger (1987)), are typically applied to examine economic relations in the long and short-run.

Expressing the vector autoregressive (VAR) model as the most successful, flexible and easy way to estimate multivariate time series, Bapci and Karaca (2013) then employed the model to inspect the interaction between the Turkish stock market index and a set of macroeconomic features (including gold price, amounts of imports and exports, and the US dollar exchange rate), based on 190 observations over the January 1996 – October 2011 period. Four independent variables were regarded as representing seasonal movements. After adjusting to be stationary, the study determined the optimum lag order and found that all variables were able to explain stock market index movements.

Basher, Haug and Sadorsky (2012) investigated the correlation amongst oil market (oil prices and oil supply), the US dollar exchange rates and stock market indices for major emerging economies (such as BRIC and oil-exporting countries) using Structural VAR (SVAR), followed by impulse response functions in two ways (traditional and recent method) over the period from Jan 1988 to Dec 2008. The
paper demonstrated the negative impact of oil price changes on equity prices and exchange rates in the short term. It also exposed the same direction for the changes in stock prices and the changes in oil prices.

Trivedi and Behera (2012) applied the cointegrated vector autoregressive (VAR) framework based on monthly data during the period Sep 1997 – Mar 2011 to investigate the relationship between the Bombay Stock Exchange (BSE) Sensex index (India) and six major macroeconomic indicators, including industrial production index (IIP), wholesale price index (WPI), interest rate (3-month T-bill rate), money supply (M3), foreign institutional investments (FIIs) and the Morgan Stanley capital international world index (MSCIWI). The results from the cointegration tests and error-correction estimation model both illustrated significant evidence of a nexus between macroeconomic factors and equity prices. Besides, the estimated impulse responses results showed that the BSE index had a positive link with upward changes of IIP, M3, FIIs and MSCI world index but a negative link to changes in the WPI and TBR. The paper also employed variance decomposition analysis to discover that shocks in stock prices on the Bombay Stock Exchange could be explained by FII shocks over the medium to long term as well as WPI and MSCI shocks over the short to medium term.

Seeking long- and short-term relationships between ten macroeconomic factors (namely GDP, unemployment, FDI, state debt, harmonized consumer price index, money supply, export, import, trade balance, short-term interest rates) and stock market indices for Baltic states (Lithuania, Latvia, and Estonia), Pilinkus (2010) employed Granger causality test, vector auto-regression (VAR) and Johansen multiple cointegration for the period from Jan 2000 to Dec 2008. A major finding showed that stock indices of Vilnius, Riga, and Tallinn in selected markets were statistically and significantly explained by only their corresponding lagged values. During short term, macroeconomic factors were able to explain 37%, 39.9%, and 36.4% stock market variances in Lithuania, Latvia, and Estonia, respectively. No impacts were found from GDP, import, and state debt to stock market indices whilst other outcomes were diverse among economies due to different monetary and fiscal policies. Notably, a number of macroeconomic factors
(i.e. money supply, FDI, short-term interest rates) added sufficient lag orders were found to have influences on the Latvian stock market. In Lithuania, a long-run linkage was established between macroeconomic variables (excluding unemployment) and its stock index. In Estonia, no statistical significant link with stock market index was found from trade balance and short-term interest rates.

Abugri (2008) examined whether changes of domestic macroeconomic factors (nominal exchange rate, industrial productivity, nominal interest rate, and money supply) and global factors (the US – 3 month Treasury bill rate and the MSCI world index) affect stock returns for four emerging markets in Latin America (including Argentina, Brazil, Chile and Mexico), as well as whether those effects were different across selected markets over the period from 1986 to 2001. Employing monthly data, the results from the six-variable vector autoregressive (VAR) models illustrated significant influence of international and domestic macroeconomic factors on stock market returns for all the countries, but more consistently from two global variables, rather than from the domestic variables. There were evidences that both interest rates and exchanges rates considerably affected returns in stock indices for Brazil, Chile and Mexico; however, the influence of the other domestic factors’ impacts mostly varies in different observed countries.

Also attributed to cointegration and the vector autoregression (VAR) framework, Ibrahim and Aziz (2003) investigated the impact of four macroeconomic variables (real output-Industrial production (IP) index, money supply, price level, and exchange rates) on Malaysian equity market in long and short run, based on monthly intervals from Jan 1977 to Aug 1998. The empirical results implied the existence of a nexus between the variables of interest. The stock prices were positively influenced by IP and the inflation rate, while negatively impacted by the exchange rate either in long run or in short run. Additionally, they were positively affected by money supply in short run but negatively in long run.
Bilson et al. (2001) projected a multifactor regression model to find out whether global factors (the world market return) and local factors (macroeconomic variables, comprising real activity, money supply, good prices, and exchange rates) possibly explained the variation of stock market returns for 20 emerging economies (covering different areas such as Latin America, Asia, Europe, Middle East, and Africa). The time series in the study spanned from Jan 1985 until Dec 2007 on a monthly basis. The exchange rate and the world market returns were found to be the most substantial factors that influence emerging market returns, followed by money supply, then good prices and real activities. The study also examined the degree of commonality between emerging market returns by principal component approach. It found only considerable commonality at the region level, suggesting that international investors can get better benefit from diversifying their fund across rather than within regions.

Collecting data month-by-month over the time span from Jan 1984 to Sep 1999 for Greece, Hondroyiannis and Papapetrou (2001) employed the multivariate vector autoregressive model (VAR) approach, followed by series data and impulse response analysis in order to determine the dynamic interactions among macroeconomic indicators (industrial production, interest rates and exchange rates), real oil prices and stock returns. The results showed that stock returns do not cause changes in real economic activities. On the other hand, changes in domestic macroeconomic activities and foreign stock markets could only partially explain stock market performance. Additionally, the movements of oil prices were able to explain stock price movements and negatively impacted macro activities.

In order to expand the previous research for Greece, Hondroyiannis and Papapetrou (2006) attempted to find any dynamic link between real stock returns and inflation, employing quarterly data from the first quarter of 1984 until the last quarter of 2002. However, the results from their Markov switching vector autoregressive model (MS-VAR) failed to show any evidence of the impact from either expected or unexpected inflation on stock market returns. The study further indicated that real stock return movements were regime-dependent, implying the unpredictable characteristic of the Greece stock market performance.
Exploring the relations between macroeconomic factors and Malaysian stock prices, Ibrahim (1999) employed the cointegration as well as Granger causality tests for the 1977-1996 period based on monthly intervals. The findings of the bivariate error-correction model (ECM), and from multivariate analysis implied the inefficiency of information for this emerging market when there was cointegration between stock prices and the consumer price index, domestic credit aggregate and the official reserves; stock prices responded to deviations from the long-run equilibrium, additionally. The movements of official reserves and exchange rates, furthermore, were also found to Granger cause the Kuala Lumpur Composite Index (KLCI) in short-run.

The same methodology was approached in Kwon and Shin (1999), who attempted to find the linkages between Korean current economic activities and stock market returns over the period Jan 1980 to Dec 1992. The macroeconomic set was comprised of the production index, money supply, foreign exchange rate, and trade balance. The results from the cointegration, following by the Granger causality tests showed the ability of all macroeconomic factors to explain stock price indexes in long-run equilibrium. However, there was no evidence to show the reserve influence from stock price index to economic variables.

**Empirical Findings via Vector Error Correction Model (VECM)**

Under the circumstance that variables within investigation are cointegrated to each other, the vector error correction model (VECM) can be utilized as an alternative to the VAR framework. Osamwonyi and Ebbayiro-Osagie (2012) constructed a sample of six major macroeconomic elements to consider their impacts on the Nigerian capital market index. Using an annual data set from 1975 to 2005, the outcomes of the VECM indicated a significant influence from several indicators (i.e. GDP, inflation, interest rates, exchange rates, fiscal deficit, and money supply) on stock market index in either long- or short-run perspectives. The study proposed that implementing suitable macroeconomic policies was necessary to stimulate the capital market growth for Nigeria.
Using monthly data sample from Apr 1994 to Jun 2011, Naik and Pahdi (2012) explored the empirical nexus between five major macroeconomic variables (industrial production index – IIP, wholesale price index – WPI, exchange rates, money supply, and treasury bills rate) and the Indian stock market index. The findings of the Johansen’s cointegration and then VECM subsequently revealed a long-run equilibrium existed between selected variables and the BSE Sensex. Specifically, there were positive long-run impacts of IIP and money supply on the stock market index, a negative long-run impact of WPI (presented for inflation) on the stock market index, while no significant influence of three month TBRs (presented for short-term interest rate) and the real effective exchange rate on BSE Sensex index. According to the Granger causality tests, the stock price index was found to have a causal impact on the wholesale price index but no reverse direction neither in the long or short run, whereas money supply might affect equity price in the long run but has no effect was found in the way round in both long and short term. Furthermore, there was no significant Granger causality in the long run from interest rate on stock prices.

Rahman et al. (2009) focused on the Malaysian stock market and investigate the determinants of stock return from the macroeconomic perspective. Within the VAR framework, the research tested a vector error correction model (VECM), added the analysis of variance decomposition (VDC) and impulse response function (IRF) to examine the linkage between Kuala Lumpur Composite Index (KLCI) and a macroeconomic set (including money supply, interest rate, exchange rate, reserves, and industrial production index) for the period from Jan 1986 to Mar 2008. There were evidences of a positive impact of reserves and industrial functions, together with evidence of a negative impact from money supply and exchange rate on KLCI in the long run. Furthermore, under the results of the variance decomposition analysis, the paper indicated that the reserves and industrial function interact with stock returns more than three other macroeconomic factors. This study suggested further research for emerging economies and for the nexus between macroeconomic factors and various sectors in the stock market.
Using quarterly data from the last quarter of 1991 to the last quarter of 2006, Acikalin, Aktas and Unal (2008) extended the previous studies of Kwon and Shin (1999), Bilson et al. (2001) and Abugri (2008) to the context of Turkey. The movement of the Istanbul Stock Exchange (ISE) index was investigated under the national and global macroeconomic influences (including production levels, interest rates, foreign exchange rates, and current account deficits). The study firstly revealed the inappropriate use of the OLS method for the case of this research since all the variables were found as non-stationarities. The VECM and Granger causality test were therefore employed and the results exposed the long-run equilibrium between ISE and four selected macro-factors. Moreover, the forecast of the ISE index could be better using historic information of GDP, current account deficit, and exchange rates. A causal link was found from ISE to interest rates, but not vice versa. Based on the major findings, the paper suggested that investors might pay more attention on the economic risk factors in order to improve their portfolio performance in individual markets. Furthermore, a further research was recommended by studying the impacts of external factors on stock market.

Gan et al. (2006) attempted to find out the dynamic linkages between the index of New Zealand Stock Exchange (NZSE40) and seven macroeconomic series (including inflation rate, exchange rate, gross domestic product, money supply, long term interest rate, short term interest rate and domestic retail oil price) in both the long and short-run during the period 1990-2003, based on monthly data. Applying Johansen maximum likelihood and afterward Granger causality tests within the VECM framework, there was evidence to illustrate the effects of interest rate, real GDP, and money supply on NZSE40 index. However, the results from the IRF and FEVD within the innovation accounting analyses found no substantial proof that the stock market index was a leading indicator for macroeconomic movements.

Another examination on the connection between macroeconomic indicators and stock price indices in long and short-run was conducted by Wongbangpo and Sharma (2002), using five stock markets in ASEAN: Malaysia, Thailand, Philippines,
Singapore and Indonesia. The research applied data set from 1985 to 1996 and found significant determinant of macroeconomic factors (including GNP, CPI, money supply, exchange rate, and the nominal interest rate) in the indices of five main stock exchanges of ASEAN in both the long and short term. Likelihood ratio statistics tests were employed to determine the long-run effects and a positive influence on stock prices was found from growth in output, interest rates (only in Indonesia and Malaysia), money supply (Malay, Singapore and Thailand), and exchange rate (Indonesia, Malaysia and Philippines). The reverse results were found from aggregate price index, interest rates (Philippines, Singapore and Thailand), money supply (Indonesia and Thailand) and exchange rate (Singapore and Thailand). On the other hand, the Granger tests within the vector error correction model (VECM) framework also showed several unidirectional causalities between stock price indices and selected macroeconomic factors, such as from stock prices to GNP and CPI (in all observed countries), from stock prices to money supply and the nominal interest rate in Indonesia, Malaysia and Thailand, and from stock prices to the exchange rate in Philippines and Singapore.

 ✓ **Empirical Findings via GARCH Models**

When the research changes its concentration onto the volatility of stock market returns, generalized autoregressive conditional heteroskedasticity (GARCH) models can be considered as a sophisticated option. Türkyılmaz and Balibey (2013) utilized a BEKK–MGARCH modeling approach to explore the volatility spillovers and the co-movements among three crucial macroeconomic variables – interest rate, exchange rate and stock prices for Turkey before the impact of the global economic crisis, grounded on monthly series from 2002-M1 to 2009-M1. The results demonstrated that selected factors under the study were significantly interacted to each other through shocks and volatility. It was likely useful for investors and policy-makers, when there existed the reliance on information amongst different sectors in the markets.

Samadi, Bayani and Ghalandari (2012) applied the GARCH model to estimate the effect of exchange rates, world gold prices, inflation rate, liquidity and
oil price on Tehran stock returns, using monthly data from 2001 to 2011. They found a considerable influence from exchange rates, world gold prices and inflation rate on stock returns but no evidence for a linkage between liquidity and oil price on stock returns.

Adding to the results from regression model (as mentioned above), Zakaria and Shamsuddin (2012) employed GARCH (1,1) models to estimate the volatility of variables and Granger causality tests within bivariate and multivariate VAR framework to examine the relationship of interest. Five macroeconomic variables were selected for the study under the context of Malaysia – an emerging market: GDP, inflation, exchange rate, interest rates, and money supply. Each time series was gathered on monthly intervals, from Jan 2000 to Jun 2012. The outcomes shown weak nexus between selected variables. Wherein, the volatility of stock market return was Granger caused by inflation and interest rate volatilities, not from macroeconomic volatilities as a group.

In their effort to come up with some policy suggestions, Hsing (2011) employed the GARCH model to assess the determinants of eight macroeconomic factors on the Bulgarian Stock Market, based on a data set collected from the fourth quarter of 2000 to the third quarter of 2010. The paper found out that three variables positively had impacts on stock returns, including the real GDP, M2 over GDP ratio and the US stock market index, whereas the converse impacts were originated from other variables – government deficit over GDP ration, domestic real interest rate, BGN/GDP exchange rate, expected inflation rate, and the Euro area government bond yield.

Butt and Rehman (2010) picked up nine different industries in Pakistan and applied the GARCH technique to explore whether or not economic conditions substantially relate to stock returns. Six selected economic factors were constructed in the study, including market return (Karachi Stock Exchange 100 Index), consumer price index (CPI), risk-free rate (RFR), exchange rate (EX), industrial production (IP) and money supply (M2). A number of significant results were indicated, such as stock returns only being positively impacted by market
returns, and the intensity with which economic factors influence stock returns differing across industries.

Erdem *et al.* (2005) contributed to the line of research by proving the existing relationship between macroeconomic indicators (inflation, industrial production, interest rate, money supply and exchange rate) and stock market indexes (IMKB 100 index, financial index, industrial index and services index) on the Instanbul stock exchange, using data collected on a monthly basis from 1991 to 2004. The results of the univariate exponential generalized autoregressive conditional heteroskedasticity (EGARCH) model indicated the negative unidirectional volatility effects from inflation and positive effects from interest rate to all indexes, excluding services index. At the same time, spillovers were also found from money supply to financial index and from exchange rate to IKMB 100 and industrial indexes. By contrast, there was no evidence of volatility spillover from industrial production to any index.

Empirical Findings via Other Approaches

Some uncommon, different methods have also been used to support the current literature. Ozlen and Ergun (2012) selected 45 companies from 11 different sectors in Turkey to test the significance of five macroeconomic series (including interest rate, exchange rate, inflation rate, unemployment rate and current account deficit) to stock returns over the period February 2005 to May 2012, employing the autoregressive distributed lag (ARDL) method. The outcomes indicated that exchange rate and interest rate are the most important determinants of stock returns among different macroeconomic factors in all selected sectors. They also suggested that exchange rate and interest rate were possibly used to predict the changes of stock prices as stock returns are empirically proven to be significantly responsive to the movements of these two variables over different sectors.

Applied Box-Jenkins ARIMA (autoregressive integrated moving average) model, Gay and Robert (2011) investigated the relationship between stock market index prices and two international macroeconomic variables – exchange rate and
oil price – based on 1,080 time series observations in monthly intervals from Mar 1999 to Jun 2006 for the BRIC countries. However, the results exhibited no significant influence from macroeconomic factors on the stock market exchange prices of four emerging markets. A further study would therefore be suggested to find out the effects of other macro indicators on stock market returns. Besides, the research markets were found as a weak form of efficiency, present and past stock market returns were not significantly related.

Based on monthly intervals from January 2000 to February 2007, Quadir (2012) further employed ARIMA model to examine the influences of treasury-bill interest rate and industrial production on the overall Dhaka stock market returns. Despite a positive relationship was exhibited between macroeconomic factors and stock market returns, the evidence was statistically insignificant.

Employing the full information maximum likelihood estimation, Kuwornu and Victor (2011) investigated the influence of four macroeconomic variables, namely consumer price index (represented for inflation rate), crude oil price, exchange rate and 91-day T-bill rate (represented for interest rate) on the stock market returns in Ghana for the time period between Jan 1992 and Dec 2008. There was no evidence to indicate any influence of crude oil price on Ghana stock market returns, whilst the consumer price index was proven to have a positive effect on stock returns and two other macroeconomic factors, exchange rate and Treasury bill rate, are negatively related to stock returns. Later, the same context was re-examined in Kuwornu (2012), using the Johansen multivariate co-integration procedure instead to find both short-run and long run relations. Few differences were obtained compared to the previous study. In that paper, in the short run, only the Treasury bill rate and inflation rate were found to determine stock returns in the short run while in the long run all factors were shown to have a considerable influence on stock returns; excluding crude oil price, all other variables had a positive impact on stock returns.

Back to India, Tripathy (2011) applied several empirical tests, covering monthly data from January 2005 to February 2011, to explore the nexus between
the BSE Sensex (an index of the Indian stock market) and five major macroeconomic factors in the economy, including 91-day Treasury bills (short-term interest rate), wholesale price index (inflation rate), the S&P500 (represented for international stock exchange), exchange rate and Bombay Stock Exchange (BSE) volume. The following findings were drawn from this paper. Firstly, the results of the Ljung-Box Q statistics and Breusch-Godfrey Serial Correlation LM Test revealed an auto-correlated linkage between macroeconomic factors and the stock market under the context of India. Secondly, the Granger causality test found a number of bi-directional causal links, particularly between stock market and two macro factors (i.e. exchange rate and interest rate) and between BSE volume and two factors (i.e. international stock market and exchange rate). Additionally, unidirectional causalities between international stock market and selected indicators were uncovered, i.e. domestic stock market, exchange rate, inflation rate and interest rate. Thirdly, traders and investors in India might use historical data of equity prices as well as macroeconomic aspects to plan their investment strategy, since the Indian stock market was not found to perform as weak form efficiency.

3.4. REVIEW OF MACROECONOMIC VARIABLES AND STOCK MARKET RETURNS IN VIETNAM

According to the “Business Perspectives on Emerging Markets 2012-2017 Report” prepared by the Global Intelligence Alliance (GIA), Vietnam is ranked seventh in the world’s top emerging markets for 2012-2017, after the BRIC countries, Indonesia and South Africa. Like other emerging markets, the Vietnamese capital market has been developing rapidly and playing a growing role in the country’s economic performance. However, the development of the equity market in Vietnam has been shown to be unsustainable over the years and has hidden a number of shortcomings, i.e. investment policies and changes of macroeconomic elements. This is despite the number of published papers that have emphasized the determinants of equity returns in Vietnam still being limited.
3.4.1. Review of Efficient Market Hypothesis in Vietnam

The study of the EMH within emerging markets has been still a contradictory issue among academics and practitioners. The lowest form of efficiency has been proven for some of them, mainly in well-developed emerging markets, in a few studies. For instance, Nisar and Hanif (2012a) found that the Nikkei N225 (Japan), the Kospi Composite (Korea), the Hang Seng Index HIS (Hong Kong) and the All Ordinaries ASX (Australia) stock exchanges show a weak form of market efficiency, since their successive returns in daily, monthly and yearly intervals do not reject the null hypothesis of the random walk theory. By contrast, the empirical findings mostly showed evidence of inefficiency for emerging markets. In another test of EMH for four emerging Southeast Asian Stock Exchanges, including India, Pakistan, Bangladesh and Sri Lanka, Nisar and Hanif (2012b) failed to find evidence of weak form efficiency for all of the selected markets. An inefficient market in weak form was also found in Patel et al. (2012) for four selected Asian Stock Markets (India, Hong Kong, Japan and China) and Hamid et al. (2010) for 14 Asia-Pacific stock exchanges from Pakistan, India, Sri Lanka, China, Korea, Hong Kong, Indonesia, Malaysia, Philippine, Singapore, Thailand, Taiwan, Japan and Australia.

Conducting the EMH test for Vietnam seems to benefit investors who want to take a chance an arbitrage process in this new dynamic stock market. However, only a few papers have tested the EMH for Vietnamese stock exchanges, and they mainly focus on the Ho Chi Minh Stock Exchange (HOSE). The common conclusion for the Vietnamese market has been so far consistent with previous findings for other emerging markets, which refuse the existence of the efficient market hypothesis in such contexts. Truong, Lanjouw and Lensink (2010) utilized different techniques to examine the efficient market hypothesis in weak form, covering a sample of data from the first trading session (28 July 2000) to 31 December 2004. The results from the autocorrelation test, variance ratio test, and runs test all rejected the null hypothesis of the random walk hypothesis. Therefore, the paper concluded that the securities trading center (representing the Vietnam's stock markets) was inefficient in weak form.
Undertaking a similar methodology as Truong, Lanjouw and Lensink (2010) for the most updated data range based on weekly data from 28 July 2000 until 28 July 2013, the latest study from Phan and Zhou (2014) consistently exposed no significant evidence of weak form efficient market hypothesis for the Vietnam’s stock market. Although it rejected the random walk hypothesis for most cycles of the market, the study suggested the gradual improvement of efficiency in the Vietnam’s stock market over the last century.

### 3.4.2. Macroeconomic Variables and Stock Returns in Vietnam

The typical empirical findings denote the efficiency of the Vietnamese stock exchange in weak form. It may suggest arbitrage opportunities for investors in this capital market. However, to achieve better investment decisions, as well as to provide better indications for policy makers, research on the macroeconomic determinants of stock market returns for Vietnam should be in high demand. There is unfortunately a limited range of studies that have covered this topic. Noticeably, among the different macroeconomic variables selected to investigate their influence on Vietnamese equity returns, most of them are international factors (i.e. USD/VND exchange rate, US real production activity).

Hussainey and Le (2009) attempted to find any linkage between two selected macroeconomic variables (industrial production together with interest rate) and Vietnam’s stock market prices over the period from January 2001 to April 2008 in both domestic and international perspectives. Applying the regression model technique for domestic variables and for both domestic and international variables separately, the research fould out three significant points. The first result showed that industrial production could lead to changes in stock prices. The second finding showed the influence of interest rates (both long-term and short-term) on equity prices in the different direction. The final one found that there was a stronger effect on Vietnamese stock prices from US real production activity than from the US money market.

Recently, by applying a number of statistical tests, including cointegration tests, long-run elasticity, error correction model and parameter stability test,
Narayan and Narayan (2010) intended to model the linkage between two global determinants (oil prices and nominal exchange rates) and Vietnam’s stock market index utilizing daily data over the period 2000-2008. Both oil prices and exchange rates were found to have a statistically substantial positive effect on stock prices in the long run. However, there was no evidence of a nexus between oil prices and equity prices in the short run, consisting to the conclusions of Chen et al. (1986) as well as the later studies of Kuwornu and Victor (2011) and Samadi, Bayani and Ghalandari (2012). Similar same result was found for exchange rate, as it had no impact on stock index.

Besides some formally publishes from official international sources, there are few studies on the same field that collected from local journals (i.e. university journals in Vietnam). They may help providing more adequate view on this topic. Even though, these recent papers have used limited macroeconomic variables and not observed the vital nature of stock market returns – which is volatility clustering.

For example, Huynh et al. (2014) applied two updated frameworks, namely VECM and Granger Causality tests, to find out the long run and short-run effects of macroeconomic time series (including money supply – MS, lending interest rates – ITR, consumer price index – CPI, exchange rate – EXR and industrial production – IP) on the Vietnam’s stock market (VNI) over the period 2001-2013. While MS and IP had a significant negative impact on VNI, ITR and CPI had an opposite influence. Additionally, the results of Impulse Response Function showed that VNI responded to any disequilibrium originated from a shock on macroeconomic variables at a relatively slow pace.

In the most recent research, Le and Dang (2015) utilized the ARDL technique to uncover the interactions between Vietnam’s stock market index and consumer price index (CPI), money supply (M2), exchange rate (E) and short-term interest rates during the time span between Jan 2001 and Dec 2013. In both long- and short-run, the results showed the presence of the linkage between VNI and macroeconomic factors. In particular, M2 and VNI were positively correlated while the remaining of macroeconomic factors negatively impact VNI.
3.4. CONCLUSIONS

The theoretical frameworks (i.e. DDM, CAPM, and APT) suggest different explanations for stock market returns. In the empirical research, the issue of stock market behavior has attracted attention from both investors and researchers to find the best investment or capital allocation solutions. Credited primarily to the multi-factor model under the APT (Ross, 1976), the returns of a securities market can be explained by several economic variables. One notable implication was originated from Chen et al. (1986). The literature has illustrated a number of studies that focus on the linkages amongst macroeconomic elements and stock market returns for both developed and emerging economies all over the world. However, the results have been mixed and inconclusive, given the different sets of macroeconomic factors, methodologies and levels of economic development involved.

The literature in the line of this research topic can be divided into two sections: developed markets and emerging markets. While developed markets was paid more attention in the past, the research context has been recently transferred into emerging economies due to their attraction of investors hence the requirement of stock market development. Nevertheless, there has been no unification in the selection of stock market determinations. Even though number of statistical techniques have also been employed (including VAR, VECM, GARCH, ARIMA, etc.), the literature demonstrates the diversity in the findings.

Vietnam is considered as one of the most rapidly developing capital markets not only in the region but also among all of the emerging markets. Nonetheless, it has not shown particularly sustainable development and poses several risks to investors due to its inadequate infrastructure, incomplete legal framework and problems with information asymmetry (ADB, 2013; WB, 2013). Empirical work to deduce which factors at the macroeconomic level may impact stock market returns for Vietnam appears to be undeniably necessary at present but such studies are still limited. Previous papers have indicated that Vietnamese stock prices can be led by some international variables, such as the USD/VND
exchange rate (Narayan and Narayan, 2010; Hussainey and Le, 2009). Nonetheless, no paper has so far used the combination of the latest advanced frameworks, comprising of VAR and GARCH, to examine the impact of a set of internal macroeconomic variables (i.e. GDP, inflation rate, interest rates, money supply) together with some external factors (i.e. exchange rate, FDI) on the Vietnam’s stock market.

To undertake more comprehensive research on macroeconomic factors and the Vietnam’s stock market, understanding both theoretical frameworks and previous literature are crucial. Based on that, the conceptual framework and methodology of the present research will be proposed in the next chapter.
CHAPTER 4:
CONCEPTUAL FRAMEWORK AND RESEARCH METHODOLOGY

4.1. INTRODUCTION

4.2. RESEARCH PHILOSOPHY

4.3. SELECTION AND VALIDATION OF RESEARCH VARIABLES

4.3.1. SELECTION OF RESEARCH VARIABLES

4.3.2. VALIDATION OF RESEARCH VARIABLES

4.4. CONCEPTUAL FRAMEWORK AND HYPOTHESES OF THE RESEARCH

4.4.1. CONCEPTUAL FRAMEWORK

4.4.2. HYPOTHESES OF THE RESEARCH

4.5. RESEARCH METHODOLOGY

4.5.1. RESEARCH DATA COLLECTION

4.5.2. COINTEGRATION AND CAUSALTIY TESTS

4.5.3. GARCH MODELS

4.6. CONCLUSIONS
4.1. INTRODUCTION

This chapter starts with the philosophy of the research as an essential prescription for conducting the current research. Afterwards, it provides a concise description of variable selection and a detailed explanation of the econometric methodology that is utilized to obtain the aim and objectives of the research proposed in Chapter 1.

Regarding to the background of the Arbitrage Pricing Theory (APT) framework (Ross, 1970) and relevant papers from the literature review, six macroeconomic variables are selected to examine their influences on stock market returns within the context of Vietnam. These macroeconomic indicators are studied in real terms and are comprised of gross domestic product (GDP), consumer price index (CPI), broad money supply (MS), interest rates (IR), exchange rate USD/VND (EX), and foreign direct investment (FDI). The rationale of variables selected for study will be subsequently explored, based on a variety of empirical findings from recent literature.

Furthermore, on the purpose of investigating whether there exists a long-run equilibrium and short-run dynamics between Vietnam’s stock market returns and macroeconomic factors, the research proposes a framework for cointegration analysis using the Johansen approach (Johansen, 1991, 1995). Since the cointegration tests are not able to detect the direction of these relationships, Granger causality tests are employed to explore any causal links between the underlying variables. The methods of testing causality are specified with the description of a traditional Granger causality test and an advanced procedure introduced by Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) (TYDL, hereafter). The matter of dynamic analysis, including impulse response functions (IRF) and variance decomposition (VD) are later focused in this chapter to account for a shock from macroeconomic indicators to the movement of Vietnam stock returns.

Additionally, while stock returns are broadly acknowledged as a series with a volatility-clustering characteristic, it is therefore significant to expand the
research by examining the influence of macroeconomic factors on Vietnam’s stock market return volatility over the sample period. This idea is delivered in the last section of this chapter by introducing the framework of generalized autoregressive conditional heteroskedasticity (GARCH) (initiated by Engle (1982) then elaborated by Bollerslev (1986)). The approach of the GARCH-family expects to fulfill the objectives of the research by enquiring into the associations between macroeconomic variables and Vietnam’s stock market return volatility.

4.2. RESEARCH PHILOSOPHY

With respect to the study of Saunders et al. (2009, p.107), the ultimate value of any research is to develop new knowledge, regardless to its field of pursuing or its ambition of solving a specific issue. Since the development and the nature of knowledge are matters of research philosophy, it is significant to start a research from philosophy background. The benefit of understanding research philosophy is additionally emphasized by Easterby-Smith et al. (2002), while it reveals a substantial association with research design and extremely influences the quality of the research. Creswell (2014) further agreed that the philosophy of the research must be identified because it plays important role in determining the practice of research, despite that the philosophical ideas are not always clearly disclosed in research (Slife and Williams, 1995, cited in Creswell, 2014: p.5).

✔ The Background of Research Philosophy

A plan to conduct social research (which defined as “academic research on topics relating to questions relevant to the social scientific fields”, Bryman, 2012: p.4) has been concerned by a number of researchers. A number of approaches have been introduced. Crotty (1998, p.3) suggested four basic elements of a research process: epistemology (the theory of knowledge), theoretical perspective (the philosophical stance), ethnography (methodology – the strategy process or design), and methods (the techniques and procedures applied to gather and analyse data). From Creswell (2014)’s view, a research design – or a plan to conduct research was framed in a slightly different way. It was narrowed with three major components: philosophy, strategy of inquiry (or research
methodologies), and research methods. Creswell (2014, p.6) utilized the concept “worldviews” referring to “a basic set of beliefs that guide action”, instead of paradigms (Saunders et al., 2009) or epistemology and ontology (Crotty, 1998). In particular, there are four worldviews: postpositivism, constructivism, advocacy/participatory, and pragmatic. These philosophical positions are subsequently able to influence how to approach the research, including strategies of inquiry (research methodology) and research methods.

To build up more clarified process concerning how to conduct research, Saunders et al. (2009, p.108) mapped out different stages of doing research via different layers of an “onion” (Figure 4-1). The outer layer is research philosophy, while five other inner layers subsequently are approaches, strategies, choices, time horizons, techniques and procedures.

**Figure 4-1. The Research “Onion”**

![Image of the Research "Onion"](source: Saunders et al. (2009))
In order to avoid the confusion due to different terminologies used by various researchers when discussing on research philosophy, the further discussion under this research project follows the approach of Saunders et al. (2009). Particularly, research philosophy can be studied through four major categories: positivism, realism, interpretivism, and pragmatism. Each research philosophy position concerns three major elements: ontology (concerning about the nature of reality), epistemology (concerning what constitutes acceptable knowledge), and axiology (concerning the role of values in research). They reflect different views of a researcher, which are consequential to each other and can influence the way to approach a particular study. For instance, the link between ontology and epistemology issues was claimed in Guba and Lincoln (1994). Crott (1998) also advocated that these two issues tend to emerge together, instead of keeping them apart conceptually as in the research literature (p.10).

- **Positivism** is a philosophy approach that a researcher prefers “working with an observable social reality and that the end product of such research can be law-like generalisations similar to those produced by the physical and natural scientists” (Remenyi et al., 1998: p.32, cited in Saunders et al., 2009: p.113). The researcher develops hypotheses from existing theory, which will be later tested and confirmed or rejected. Furthermore, the research is conducted in a value-free way. It is based on the assumption that “the researcher is independent of neither affects nor is affected by the subject of the research” (Remenyi et al., 1998: p.33, cited in Saunders et al., 2009: p.114).

- **Realism** argues that objects have an existence independent of the human mind that opposes to idealism where only the mind and its contents exist. There are two types of realism: direct realism and critical realism. The latter claims involve how to experience the world via two stages: the thing itself and the sensations it conveys, and the mental processing after that. Meanwhile, the prior disputes that the first step is sufficient.
• **Interpretivism** are opposite of positivism, as it debates that the social world of business and management is extremely complex to be theorized in the similar way as the physical sciences. This approach underlines the difference between conducting research among humans as social actors rather than objects. This approach is suggested for business and management research, since the researchers in this field are likely required to explain the social world from their own point of view.

• **Pragmatism** claims that the research question is the most essential determinant of ontology, epistemology, and axiology. This position can be considered as a continuum between two extremes of research philosophy: positivist and interpretivist.

Additionally, Saunders *et al.* (2009) suggested four major paradigms as a further clarification of research philosophy: functionalist, interpretive, radical humanist, and radical structuralist. In which, the term “paradigm” is defined as “a way of examining social phenomena from which particular understandings of these phenomena can be gained and explanations attempted” (Saunders *et al.*, 2009: p.118). In other words, a research paradigm is a way of explaining the basic set of beliefs that the researcher has and how it approaches the research. The purposes of clarifying these paradigms were highlighted in Burrell and Morgan (1982). Noticeably, researchers can gain supports by adopting an appropriate paradigm that clarifies their assumptions about their view of the nature of science and society and finds out their own route through their research.

**✓ The Paradigm under this Research**

Based on the background of research philosophy and different assumptions that are the researcher’s set of beliefs on the research questions, the functionalist paradigm is appropriately adopted to approach this research project. This is the most popular paradigm for business and management research topics (Saunders *et al.*, 2009).
According to Saunders et al. (2009, p.120), this paradigm associates with two dimensions: objectivist and regulation. Social entities are claimed to exist in reality external to social actors in respect of the objectivist perspective. Meanwhile, the regulatory perspective admits the existing state of organization affairs and attempts to provide suggestions how they may be improved from the current circumstance. These two perspectives seem appropriate to fulfill the research’s task, which concerns about the association between macroeconomic indicators and Vietnam’s stock market returns.

The research adopts objectivism as the ontology position, since it assumes stock market return is a reality that exists independently and objectively in the social world. In other words, it is objective can be investigated external to individual. Additionally, it is regulatory in that the research attempts to provide rational explanation of stock market return volatility and investigating factors that influence stock market return and its volatility, i.e. economic growth, consumer price index, money supply, interest rates, exchange rate, and foreign direct investment. It is referred to “problem-oriented” in approach, seeking practical solutions to practical problems (Burrell and Morgan, 1982, cited in Saunders et al., 2009: p.120).

In considerations of epistemology, the research selects the philosophy of positivist and critical realism. Firstly, secondary data of selected variables are collected in value-free way and it allows the chosen hypotheses to be tested. Secondly, under the position of critical realist, although the changes of stock market returns over years are observable, it is necessary to identify its determinants through theoretical and statistical processes of the social sciences. In terms of research approaches, researchers may follow either deduction or induction that decided based on the relationship between theory and research. If the deductive approach refers to deducing a hypothesis from the theory, testing the hypothesis, and revising the theory if necessary, the inductive approach refers to opposite direction: developing a theory from the findings by analyzing collected data.
Within the context of adopted paradigm, a deductive approach is selected to conduct this research. The process of deduction that was illustrated by Bryman (2012, p. 24) can be obtained as followings:

**Figure 4-2. The Process of Deduction**

1. Theory
2. Hypothesis
3. Data collection
4. Findings
5. Hypotheses confirmed or rejected
6. Revision of theory

*Source: Bryman (2012, p. 24)*

Under the certain circumstance of this research, a variety of hypotheses are developed to establish the relationship between Vietnam's stock market returns and macroeconomic variables (that will be clarified in the following sections). These hypotheses can be tested using the collection of secondary data of all the selected indicators. The empirical findings obtained from highly restructured methodology (that comprises of several statistical methods) will further confirm or reject where the hypotheses are confirmed or rejected. Also, to ensure the ability to generalize statistically in regularities, a sufficient data sample is constructed on monthly basis over 14 years (2000-2013) within the context of research.
4.3. SELECTION AND VALIDATION OF RESEARCH VARIABLES

It is primarily important to note that economics can be considered as a significant division among a wide variety of social science subjects, concerning how economic entities make decision in a world of scarcity. The study takes account of one major branch of economics - that is macroeconomics - in connection with the stock market in the empirical case of Vietnam, a newly emerging economy. Particularly, this section selects a series of macroeconomic factors in order to examine their impact on Vietnam’s stock market returns, based on the valuable background of the theoretical framework and literature review.

4.3.1. Selection of Research Variables

As appraised in the earlier chapter of theoretical framework and literature review, three main theoretical models (DDM, CAPM and APT) have delivered different dimensions to explain stock market prices. To briefly recall, DDM (Gordon, 1962) proposed that stock prices can be calculated via expected dividends and investor’s required rate of return; CAPM (Sharpe, 1964; Lintner, 1965) suggested one explanatory factor which is systematic risk to explain expected rate of return of an security; and APT (Ross, 1976) developed a multi-factor model considering various independent variables to price an underlying asset.

The problem has been raised in this case, since it seems that no unified selection, or any precise number, of macroeconomic indicators from the empirical research have so far been found for the relevant investigation of their influences on equity returns. In addition, whilst Vietnam is performing as a new dynamic emerging market under an inadequate regulatory system, both the macroeconomic environment and stock market tend to be under pressure from the unstable and highly volatile situation (as earlier specified in Section 2.3, Chapter 2). Also, another undoubted difficulty must be highlighted that involves the data gathering process in a country like Vietnam that has only had its current regime for nearly 30 years and its open economy policy only almost 20 ago. This can give rise to inadequacy, inaccuracy and a lack of transparency in statistical collection.
Acknowledging these issues, the selection of applicable macroeconomic variables under this study merits careful consideration.

Taking advantages of previous the results of previous studies in the same line of enquiry, together with tackling the current situation of Vietnam’s economy, the current paper selects six wide-ranging macroeconomic variables that are all expected to have a significant effect on the performance of Vietnam’s stock market over the period from the initial launch of the stock market in Vietnam in August 2000 until December 2013. Specifically, the six macroeconomic variables selected in real terms are gross domestic product (GDP), money supply (MS – using the broad money supply M2), consumer price index (CPI), interest rates (IR – including refinancing rate RR, deposit rate DR, and lending rate LR), foreign-exchange rate (USD/VND), and implemented foreign direct investment (FDI).

4.3.2. Validation of Research Variables

To validate the reliability of the macroeconomic variables selected, the following section concisely evaluates the recent findings of interactions between each candidate variable and stock market returns grounded by both theory and empirical research.

4.3.2.1. Economic Growth and Stock Returns

Economic growth is first and foremost the most basic macroeconomic factor that most participants in an economy are concerned with. The positive relationship between aggregate economic output and stock prices through corporate profitability has been well recognized in both theory and practice. To measure the real total output of goods and services in one economy, the real gross domestic product (GDP) is most commonly employed, after adjusting the nominal GDP by the price index (i.e. inflation rate).

In particular, when real economic activity goes up in a boom period, corporations have more opportunities to expand their profits, increasing expected cash flows, hence, raising investors’ confidence in the stock market, and also
raising stock prices. Conversely, in periods of recession, the downgrade of real economic output may negatively affect corporate profitability, resulting in decreasing stock prices.

Empirical research has shown strong support for this proposition between real economic output growth and equity prices (Fama, 1990; Wongbangpo and Sharma, 2002; Ibrahim and Aziz, 2003; Rahman et al., 2009; Hsing, 2011; Naik and Padhi, 2012; Trivedi and Behera, 2012). Thus, the literature almost seems to show conclusive evidence of a link between real economic growth output and stock market returns.

GDP data is normally published on quarterly and/or annual basis, hence in the context of Vietnam it may be difficult acquiring a sufficient number of observations to set up econometric models in terms of a time-series study. To avoid this problem, various projects have employed an industrial production index (IPI) as an alternative indicator to represent a proxy for the aggregate economic output factor based on its availability on monthly intervals.

4.3.2.2. Price Level and Stock Returns

The well-known hypothesis of Fisher (1930) indicates that inflation and equity returns are uncorrelated and neutral. Particularly, it explains that stock prices should be a hedge against inflation, or be unaffected by expected inflation in the long run. However, the empirical research has shown contrasting evidence for a linkage between inflation and stock market returns while showing several violations of Fisher’s initial assumptions.

According to Fama (1981), inflation could be hypothesized to negatively affect equity markets, resulting from a negative correlation between inflation and real economic activity in the context of money demand theory and the quantity theory of money. Even though this negativity between inflation and economic growth has been debated by several recent studies (Mallik and Chowdhury, 2001; Pollin and Zhu, 2006), the literature consistently suggests that of both expected and unexpected inflation negatively link with stock returns.
The negative dynamic between inflation and equity returns can be alternatively explained through the performance of corporate profits. Specifically, a surge in price level raises expenditure on corporate inputs, increases output prices, and then causes expected corporate profitability to decline. Additionally, higher inflation may lead to higher corporate taxes (Feldstein and Summers, 1979), as well as higher taxes paid by shareholders (Apergis and Eleftheriou, 2002). The decline in corporate profits tends to raise the required rate of returns of investors, and causing stock prices to decrease.

Furthermore, high inflation seems to be a signal of investment and production instability, which may adversely influence economic growth (Clark, 1993; Huizinga, 1993). As a response to concerns about this economic uncertainty, the government typically tightens its monetary policy. This effectively decreases the present value of expected future earnings, and causes a decline in stock returns.

A variety number of empirical papers support for this negative correlation, such as Fama and Schwert (1997), Balduzzi (1995), Marshall (1992), Spyrou (2001), Hsing (2011), Naik and Padhi (2012).

4.3.2.3. Money Supply Growth Rate and Stock Returns

The influence of money supply changes on equity prices has been broadly examined in the prior studies for several decades. One initial pioneer in determining the important role of monetary growth in stock market is Beryl W. Sprinkel. Sprinkel (1964) applied the simple principle of the quantity theory of money to propose a significant nexus between money supply and stock market returns. This was followed by numerous supportive results from Homa and Jaffee (1971), Hamburger and Kochin (1972), Coopers (1974), Rozeff (1974), Rogalski and Vinso (1977); those all mainly focus on the highly developed US stock market.

Listing three main determinants of stock prices, including liquidity effect, earnings effect and risk premium, Hamburger and Kochin (1972) asserted that the equity market was influenced by the growth of money in various dimensions,
conspicuously through long-term interest rates and corporate earnings. Coopers (1974) pointed out some shortcomings of Sprinkel’s (1964) work that seemed to conflict with the efficient market hypotheses. By proposing the combination model of the quantity of money theory and efficient market theory (SQ-EM model), Coopers (1974) strengthened the view that monetary growth led to changes in stock prices with a lag, using a data set from the US stock market from 1947-1970. Rogalski and Vinso (1977) were consistent with the result of US stock market efficiency. They concluded that growth of money was incorporated in current stock market returns and that the changes in returns might lead to changes in money.

Revisiting the monetary portfolio theory, Bilson et al. (2001) summarized that changes in money supply explain changes in money equilibrium, which in turn shifts the composition of assets in an investor’s portfolio, and led to variability of other economic variables and the variability of the economy in general. These were followed by changes in stock returns with a number of lags. Based on these early empirical results, a positive relationship is suggested between growth of money supply and equity returns. Some recent studies have provided support for this nexus, such as Naik and Padhi, (2012), Trivedi and Behera (2012), Hsing (2011), Rahman et al. (2009), etc.

Nonetheless, Fama (1981) argued that any surge in money supply might lead to inflation, raise risk premium and then decrease stock prices. Also expanding from the pure linkage between monetary growth and stock returns with the presence of inflation, Wongbangpo and Sharma (2002) asserted that stock prices could be influenced by money supply through portfolio substitution or inflationary expectations. However, they found various results for five ASEAN countries over the period 1985-1996, caused by different levels of inflation within specified economies. Particularly, money growth negatively influenced on stock indices in Indonesia and Philippines as a result of the high level of inflation during the observed time period, whilst positively influencing stock price indices in Malaysia, Singapore and Thailand.
4.3.2.4. Interest Rates and Stock Returns

There are two main explanations for the negative linkage between interest rates and stock prices in theory. Firstly, the fact is that most corporations operate their business via borrowing from banks or other financial institutions. Otherwise, they can raise capital from an IPO and secondary markets. When interest rates increase, the expected payments for the borrowings accordingly increase, negatively impacting on corporate profits, and in turn expectations of future dividend payments. Stock prices consequently fall.

Secondly, the behavior of investors towards the rise of interest rates may be impacted. There are always alternative investment options to the capital markets, such as savings/deposits in commercial banks or financial institutions, investing in real estate or the gold market. In other words, investors might change their portfolio structure due to changes in the interest rate (Erdem et al., 2005). The required rate of return increases to compensate investors’ expectation and encourages them to remain active in securities, causing the value of underlying assets to decrease.

A number of studies argue that interest rates seem to be one of the most significant explanatory factors to the variance of equity returns (Modigliani and Cohn, 1979; Ozlen and Ergun, 2012; Tangjitprom, 2012). The negative interaction between these two variables has been extensively confirmed (Alam and Uddin, 2009; Hsing, 2011; Kuwornu and Victor, 2011).

However, there is also evidence of a positive link between interest rates and equity prices caused by the presence of low-liquidity financial markets (Asprem, 1989), or risk premium change (Barsky, 1989). Erdem et al. (2005) found that interest rates and securities prices’ movements follow the same direction, supporting the previous findings of Wongbangpo and Sharma (2002) for Indonesia and Malaysia in the long run.
4.3.2.5. Foreign Exchange Rate and Stock Returns

The exchange rate has been recognized as one of the key determinants of corporate profitability throughout their input and output operations (Joseph, 2002; Kim, 2003). As corporate profits move up or down, stock prices will rise or fall (Soenen and Hennigar, 1988). According to Agrawal et al. (2010), the appreciation of a domestic currency reduced the competitiveness of exporters in the global market but increases the competitiveness of importers in the domestic market. Conversely, the depreciation of a domestic currency raises the competitiveness of exporters in the global market and downgrades the competitiveness of importers in the domestic market. Hence, it can be said that the influence of the exchange rate on the stock market appears to rely on the position of the country being studied whether it is export-dominant or import-dominant (Ma and Kao, 1990).

Many significant evidences of a correlation between exchange rate and stock returns have been found in Bahmani-Oskooee and Sohrabian (1992) for the UK; Abdalla and Murinde (1997) for Korea, Pakistan, and India; Kanas (2002) for the US, UK, and Japan; Acikalin; Aktas and Unal (2008) for Turkey, Narayan and Narayan (2010) for Vietnam, Alagidede, Panagiotidis, and Zhang (2011) for Australia, Canada, Japan, Switzerland, and the UK, etc. This is despite the fact that the existing literature has so far been inconclusive on the sign of any relationship between these two variables.

4.3.2.6. Foreign Direct Investment Growth Rate and Stock Returns

Only a few papers in the literature explored the direct relation amongst foreign direct investment (FDI) and stock market performance. More attention has been paid to the linkage between FDI (both inwards and outwards) and economic growth (Herzer, 2010; Tiwari and Mutasu, 2011; Wijeweera et al. 2010). Even though FDI is expected to promote economic output as it can be considered a major channel for technology diffusion (Barrell and Pain, 1997; Borensztein et al., 1998), some studies claim that adverse impacts of FDI lead to resource reallocation and deceleration in economic growth (Brecher, 1983; Boyd and Smith, 1999).
Hence, it is realistic to suggest a link between FDI and economic growth, but it must be viewed skeptically (Carkovic and Levine, 2002).

In empirical research, the positive influence of FDI through technological diffusion on economic growth is conventionally supported under certain circumstances. For example, the contribution of FDI to economic growth relies on the sufficient absorptive capacity of the advanced technologies available in the host country (Borensztein et al., 1998), the sufficient development of a financial system (Hermes and Lensink, 2010), or country-specific characteristics like liberalized trade regimes, human capital conditions, scale of export-oriented FDI, and stability of macro-economy (Zhang, 2007).

At the same time, a positive relationship between economic growth and stock market returns has been stressed in both theory and empirical research, as discussed earlier. Consequently, the connection between foreign direct investment and equity prices is rationally suggested. Most recently, Issahaku, Ustarz, and Domanban (2013) indicated a positive causality relationship between FDI and stock returns in Ghana for the period 2005-2010. This is similar to the result of Adam and Tweneboah (2008).

4.4. CONCEPTUAL FRAMEWORK AND HYPOTHESES OF THE RESEARCH

The reduced function of the research can be specified as follows:

\[ RVNI_t = F(RGDP_t, CPI_t, RMS_t, RIR_t, REX_t, RFDI_t) \]

where the acronyms \( RVNI_t, RGDP_t, CPI_t, RMS_t, RIR_t, REX_t, RFDI_t \) stand for real Vietnam stock price index, real economic growth rate, consumer price index, real broad money supply, real interest rates, real foreign exchange rate USD/VND, and foreign direct investment rate, respectively. Together with the discussion on the inclusion of each of the specified macroeconomic variables, a comprehensive conceptual framework is designed within the context of Vietnam (Table 4-1). Due to the limited amount of studies on relevant topics for Vietnam, this framework is expected to contribute to the current literature by fulfilling the purpose of the
research on investigating the relationship between macroeconomic variables and Vietnam's stock market returns over the period August 2000 to December 2013.

4.4.1. Conceptual Framework

In brief, the conceptual framework can be divided into three main phases to fulfill the aim of this research. They are in sequence depicted as follows (Figure 4-1).

Figure 4-4. Conceptual Framework of the Research

Stage 1: Cointegration Analysis for Long run Relationship under the Johansen Approach

- Economic Growth
- Consumer Price Index
- Money Supply
- Interest Rates
- Foreign Exchange Rate
- Foreign Direct Investment
**Stage 2: Granger Causality Analysis for the Direction of the Relationship**

Stock Market Returns

- Economic Growth
- Consumer Price Index
- Money Supply
- Interest Rates
- Foreign Exchange Rate
- Foreign Direct Investment

**Stage 3: Analysis of the Impact of Macroeconomic Variables on Vietnam's stock market Return Volatility under GARCH Framework**

Volatility of Stock Market Returns

- Economic Growth
- Consumer Price Index
- Money Supply
- Interest Rates
- Foreign Exchange Rate
- Foreign Direct Investment
4.4.2 Hypotheses of the Research

Following the conceptual framework for the case of Vietnam, a variety of relevant hypotheses are constructed in this study. The hypothesis development process is divided into two main stages.

Concerning the study of cointegration and causality linkage between specified variables; the research firstly tests three pairs of following hypotheses at the first stage of the hypothesis development process. Each pair includes the null hypothesis (H0) and the alternative hypothesis (H1) as follows.

- **H0a:** All the variables under the research are stationary.
- **H1a:** All the variables under the research are unit processes.
- **H0b:** There is no cointegrating relationship between RVNI and macroeconomic variables i.e. RGDP, CPI, RMS, RIR, REX and RFDI, neither in bivariate nor multivariate perspectives.
- **H1b:** There are cointegrating relationship(s) between RVNI and macroeconomic variables i.e. RGDP, CPI, RMS, RIR, REX and RFDI, in bivariate and/or multivariate perspectives.
- **H0c:** There is no bidirectional or unidirectional causality between RVNI and macroeconomic variables i.e. RGDP, CPI, RMS, RIR, REX and RFDI, neither in bivariate nor multivariate perspectives.
- **H1c:** There is bidirectional or unidirectional causality between RVNI and macroeconomic variables i.e. RGDP, CPI, RMS, RIR, REX and RFDI, in bivariate and/or multivariate perspectives.

The research secondly tests the three pairs of following hypotheses, in respect of the third phase in conceptual framework.
✓ **H0d:** Vietnam’s stock market returns under the research do not have volatility clustering.

✓ **H1d:** Vietnam’s stock market returns under the research have volatility clustering.

✓ **H0e:** There is no statistically significant impact of each macroeconomic variable on the volatility of Vietnam’s stock market returns.

✓ **H1e:** There is a statistically significant impact of each macroeconomic variable on the volatility of Vietnam’s stock market returns.

✓ **H0f:** There is no statistically significant impact of macroeconomic variables as a group on the volatility of Vietnam’s stock market returns.

✓ **H1f:** There is a statistically significant impact of macroeconomic variables as a group on the volatility of Vietnam’s stock market returns.

4.5. **RESEARCH DATA**

This research intends to explain the relationship between six macroeconomic variables, namely real economic growth \(\text{RGDP} \) – the real growth rate of Gross Domestic Product, consumer price index \(\text{CPI} \) – inflation rate, real money supply \(\text{RMS} \) – measured by broad money M2, real interest rates \(\text{RIR} \) – consisting of refinancing interest rate, deposit rate, and lending rate, real foreign exchange rate \(\text{REX} \) – represented by USD/VND and real foreign direct investment inward \(\text{RFDI} \), and real stock market returns \(\text{RVNI} \) based on the context of Vietnam’s economy.

Stock market returns utilized in this study are grounded on the key Vietnam’s stock market index, the Vietnam Ho Chi Minh Stock Index or VN-Index (officially denoted as VNI). The VN-Index is a capitalization-weighted index of all
the companies actively listed on the Ho Chi Minh City Stock Exchange (HOSE), the major stock exchange in Vietnam. The index was created on 28 July 2000 with a base index value of 100. Stock returns for the period $t$ can be computed as the percentage change of the stock market index over the period from $(t-1)$ to $t$, hence it can be formulated as follows:

$$\Delta VNI_t = \ln (VNI_t) - \ln (VNI_{t-1})$$

where $\ln$ denotes the natural logarithm; $VNI_t$ depicts the average of stock price index at the end of month $t$; and $\Delta VNI_t$ refers to the return on the Vietnam’s stock market on month $t$.

The real returns of the Vietnam’s stock market index can be calculated after adjusting by price level or inflation rate. Other macroeconomic series used in the research are generated in detail as provided in Table 4-1. Also note that all of the variables are obtained in real values after adjusting by the price deflator or inflation rate.

**Table 4-1. Definitions and Transformation of Macroeconomic Variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definitions of Variables</th>
<th>Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP (Economic Growth)</td>
<td>Measured by the monthly percentage change in the real Gross Domestic Product, that is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.</td>
<td>$\Delta LRGDP_t = \ln(RGDP_t) - \ln(RGDP_{t-1})$ (Real monthly economic growth)</td>
</tr>
</tbody>
</table>
| IR (Interest rates) | Measured by the monthly percentage change in interest rate.  
- Refinancing interest rate (FR): the interest rate that the State Bank of Vietnam (central bank in Vietnam) charges commercial banks and depository institutions on loans they | $\Delta LRIR_t = \ln(RIR_t) - \ln(RIR_{t-1})$ (Monthly growth rate of real interest rates) |
receive from the discount window.

- Deposit rate (DR): is the average deposit rate of all commercial banks applied for their deposits based on monthly intervals.
- Lending rate (LR): is the average lending rate of all commercial banks applied for their loans based on monthly intervals.

<table>
<thead>
<tr>
<th>CPI (Inflation Rate)</th>
<th>Measured by the monthly percentage change in consumer price index, that is the cost to the average consumer of acquiring a basket of goods and services.</th>
<th>$\Delta CPI_t = \ln(CPI_t) - \ln(CPI_{t-1})$ (Monthly growth rate of consumer price index)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS (Money Supply)</td>
<td>Measured by the monthly percentage change in broad money $M2$ (money and quasi money), comprising of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. This is the official calculation method for money supply generally used by Vietnam government statistical office.</td>
<td>$\Delta MS_t = \ln(RMSt) - \ln(RMSt-1)$ (Monthly growth rate of real broad money supply)</td>
</tr>
<tr>
<td>EX (Exchange Rate)</td>
<td>Measured by the monthly percentage change in the real exchange rate USD/VND.</td>
<td>$\Delta REX_t = \ln(REX_t) - \ln(REX_{t-1})$ (Monthly change in real exchange rate)</td>
</tr>
<tr>
<td>FDI (Foreign Direct Investment)</td>
<td>Measured by the monthly percentage change in the implemented foreign direct investment.</td>
<td>$\Delta RFDI_t = \ln(RFDI_t) - \ln(RFDI_{t-1})$ (Monthly change in real foreign direct investment)</td>
</tr>
</tbody>
</table>

Based on characteristics of macroeconomic time series, all of the variables in real values are transformed into natural logarithmic forms before being applied in the econometric models. The purpose of transforming variables into natural logarithmic format is to handle highly skewed distributions that are most likely appropriate to macroeconomic variables. Gelman and Hill (2007) also stated a preference for using natural logs because coefficients on the natural-log scale are directly interpretable as approximate proportional differences. Furthermore, to perform the percentage changes on displayed series based on monthly periods, their first differences are subsequently converted (Table 4-1).

While the chosen macroeconomic series are provided by the General Statistics Office of Vietnam (GSO), the Vietnam stock market index are collected from the official websites of the Ho Chi Minh Stock Exchange (HOSE) (http://www.banggia2.ssi.com.vn/). All series are gathered on a monthly basis spanning the period from the time the stock market officially launched in Vietnam (August 2000) until December 2013, except for the economic growth rate due to the fact that the range of GDP data is only available on a quarterly basis. Fortunately, the quarterly data of real GDP is subsequently successfully converted to monthly data using the statistical software Eviews Version 8.0. Hence, all of the variables are gathered in the same frequency to be applied to further statistical estimations.

There are 161 observations overall on each of the seven candidate variables and hence 160 observations on each after taking their first differences providing for the statistical analysis. These data are analysed using the statistical software Eviews 8.0 (the most updated version until 2014). This software is equipped as an easy-to-use statistical, econometric, and economic modeling package. More specific, it is one of the most powerful programmes for time series estimation and forecasting, especially in macroeconomics.

4.6. SPECIFICATION OF MULTI-FACTOR REGRESSION MODEL

As stated in the introduction, a multi-factor regression model following the arbitrage price theory (Ross, 1970) approach is first used to examine the linkage
between VN-Index and macroeconomic variables for the case of Vietnam. The APT is known as an extended form of the CAPM; that is, the APT assumes that stock returns can be modeled as a linear function of several factors rather than a single one as in the CAPM. The idea of the APT is illustrated by the following equations:

\[ E(R_i) = R_f + \beta_{i1} R_1 + \beta_{i2} R_2 + \cdots + \beta_{in} R_n \]  \hspace{1cm} (4.1)

In short, the equation is re-written as:

\[ E(R_i) = R_f + \sum_{j=1}^{n} \beta_{ij} R_j \]  \hspace{1cm} (4.2)

where:

- \( E(R_i) \) is expected rate of return on asset \( i \) at the beginning of the period
- \( R_f \) refers to risk free rate
- \( \beta_{ij} \) denotes the sensitivity of the asset on factor \( j \)
- \( R_j \) is the risk premium of factor \( j \)

\( R_i \) denotes the real return on the asset at the end of the period, and \( F_j \) is the realized risk factor at the end of the period; the equation of the return of the asset \( i \) is:

\[ R_i = E(R_f) + \beta_{i1} F_1 + \beta_{i2} F_2 + \cdots + \beta_{in} F_n + \varepsilon_i \]  \hspace{1cm} (4.3)

Or:

\[ R_i = E(R_f) + \sum_{j=1}^{n} \beta_{ij} F_j + \varepsilon_i \]  \hspace{1cm} (4.4)

Where \( \varepsilon_i \) is the random disturbance term.

Therefore, the return of the asset \( i \) can be reformulated as follows:

\[ R_i = R_f + \sum_{j=1}^{n} \beta_{ij} (R_j + F_j) + \varepsilon_i \]  \hspace{1cm} (4.5)

This equation completes the calculation of the return on asset \( i \) based on both the expected and unexpected risk exposures. The value of the unexpected risk
is reasonably assumed as zero, since it is impossible to obtain in empirical. Hence, the following function is standardized to estimate the return of an asset:

$$ R_i = R_f + \sum_{j=1}^{n} \beta_{ij} R_j + \varepsilon_i \quad (4.6) $$

Applying the above analysis to the current context of the research, the multiple regression specification is formulated as follows:

$$ RVNI_t = \alpha + \beta_1 RGDP_t + \beta_2 CPI_t + \beta_3 RMS_t + \beta_4 RIR_t + \beta_5 REX_t + \beta_6 RFDI_t + \varepsilon_t \quad (4.7) $$

Where:

- $RVNI_t$ depicts monthly real returns of Vietnam's stock market index at time $t$
- $RGDP_t, CPI_t, RMS_t, RIR_t, REX_t, RFDI_t$ respectively denote the monthly changes in real economic growth, consumer price index, real money supply, real interest rates, real exchange rate, and real implemented foreign direct investment (Note that there are three categories of interest rates, including refinancing interest rate (RR), deposit rate (DR), and lending rate (LR), which are run on separate test).
- $\beta_i (i = 1, 6)$ present the risk exposure, or the sensitivity of stock returns to each of macroeconomic variables.
- $\varepsilon_i$ is the disturbance term.

### 4.7. COINTEGRATION AND CAUSALITY TESTS

Since this research attempts to investigate the relation between macroeconomic factors and Vietnam’s stock market returns for both the long- and short-run dimensions, the statistical analysis further concentrates on the cointegration and causality testing methods.

Among the variety of methods for determining cointegration between the multivariate time series, the research utilizes the Johansen cointegration approach
(Johansen, 1991, 1995, 2000) based on the restricted vector autoregressive (VAR) representation as the main framework for long-run relations among specified macroeconomic indicators and Vietnam’s equity market prices. Under the circumstance that any equilibrium exists, the project will subsequently conduct the error correction model (ECM) and then Granger causality tests to find any short-run dynamics amongst variables.

Within the specified framework, the data analyzing procedure is proposed with three main steps: (i) unit root tests, (ii) cointegration tests, and (iii) causality tests. The dynamic analysis is constructed afterwards to take into account the response of a dependent variable (i.e. Vietnam’s stock market index) to a shock in any independent variable (i.e. macroeconomic indicators). These selected econometric methods are all described in details throughout the following subsections.

4.7.1. Unit Root Tests

Macroeconomic time series can be considered as non-static processes, as suggested by Nelson and Plosser (1982). It implies that these variables do not show any tendency to regress toward a constant value or a linear trend. Even though, it remains compulsory to conduct a test in order to confirm whether or not the selected macroeconomic variables are integrated or follow non-stationary processes. To explain why the matter of stationarity or non-stationarity of the data hassles most statistical analyses, Brooks (2008, pp. 318-319) and then Gujarati (2011, p. 207) consistently suggest two main reasons. First, non-stationary data cannot be generalized to other time periods. Thus, the study of its behavior is practical only for the period of consideration. Secondly, the regression of two (and more) non-stationary time series may cause the problem of spurious or nonsensical regression.

A time series is defined as a stationary process if its mean and variance remain unchanged time by time and the value of the covariance between two time periods relies only on the distance between the two time periods and not the actual time at which the covariance is computed (Gujarati, 2011: p. 206).
The phenomenon of spurious regression was originally discussed in Granger and Newbold (1974) and has been widely realized and explained in both theoretical and empirical research (Stock and Watson, 2006; Brooks, 2008; Gujarati, 2011). Suppose there are two non-stationary (random walk) variables, \( Y_t \) and \( X_t \) processes, with drift parameters \( (\theta, \gamma) \). It suggests that the means and variances of these two series \( Y_t \) and \( X_t \) must increase over time (hence violating the principles of stationary time series).

\[
Y_t = \theta + Y_{t-1} + \sigma_t \tag{4.8}
\]
\[
X_t = \gamma + X_{t-1} + \omega_t \tag{4.9}
\]

Where \( \sigma_t \) and \( \omega_t \) are uncorrelated white noise error terms. Each of them is NIID \((0,1)\), implying that they are both normally and independently distributed with zero mean and unit variance (i.e. standard normal distribution).

Consider the following simple regression model:

\[
Y_t = \alpha + \beta X_t + \varepsilon_t \tag{4.10}
\]

Reasonably, it is expected that the regression output is generating an insignificant coefficient \( \hat{\beta} \) since the two variables \( Y \) and \( X \) are completely unrelated. However, Granger and Newbold (1974) found that this test mostly produces a significant coefficient \( \hat{\beta} \) and a very high explanatory \( R^2 \) together with a very low DW statistic. It seems unreliable while there is no interrelationship between variables in the equation.

Based on this established background, the tests for identifying non-stationary series are essentially required at the early stage of any statistical analysis. The general practice suggests three methods that can be employed to examine the presence of unit roots in time series, namely graphical analysis, correlogram, and unit root analysis (Gujarati, 2011: p. 208). However, the two former informal analyses possibly generate imprecise conclusions due to a minor difference in performance of a near unit root series compared with a real unit root series.
Thus, several formal tests using unit root analysis has been introduced in practice. Concerning a large number of unit root tests, Maddala and Kim (1998, p. 45) claims that no test for unit root hypothesis has been found as the uniformly most powerful one. Therefore, the research then employs three different unit root techniques, which are most commonly used: Augmented Dickey Fuller (ADF) (Dickey, 1979; 1981), Phillips-Perron (PP) (Phillips and Perron, 1988), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (Kwiatkowski et al., 1992).

While the hypothesis for the ADF and PP tests are the same, in which the null hypothesis claims the presence of a unit root, the KPSS works the other way around, which its null hypothesis claims for stationarity, rather than a unit root in the series. If the ADF and PP both reject the null hypothesis while the KPSS fails to reject the null hypothesis, it could be a sign of the existence of non-stationarity or a unit root in levels.

Statistically, the ADF tests the following equation:

\[ \Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + \varepsilon_t \]  \hspace{1cm} \text{(without time trend)} \tag{4.11}

\[ \Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + \varepsilon_t \]  \hspace{1cm} \text{(with time trend)} \tag{4.12}

The null hypothesis is \( H_0: \gamma = 0 \), against the alternative hypothesis where is \( H_1: \gamma \neq 0 \). The major critical problem of the ADF test refers to the difficulty selecting the appropriate lag length \( p \). If \( p \) is too small, the test can get bias result because of the remaining serial correlation in the errors. Otherwise, if \( p \) is too large, the power of the test will be impacted. Together with some suggestions in the literature to mitigate this issue (i.e. see Ng and Perron (1995)), the statistical software Eviews fortunately allows lag length to be selected automatically regarding Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC), with a maximum lag length set equal to 13.

To differentiate from ADF test when additional lags of the first differenced variable are used, the PP test uses Newey-West (1987) heteroskedasticity and an autocorrelation-consistent covariance matrix estimator to account for serial
correlation. The PP test takes advantages of the ADF test by performing heteroskedasticity in the error term, and does not require a lag length specification in the regression. The PP equation can be formulated as:

\[
Y_t = \alpha_0 + \gamma Y_{t-1} + \varepsilon_t \quad \text{(without time trend)} \quad (4.13)
\]

\[
Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \varepsilon_t \quad \text{(with time trend)} \quad (4.14)
\]

Even though the PP test seems powerful than the ADF test regarding lag length specification, it remains subject to severe issues of “bandwidth” parameter selection as part of the Newey-West estimator. However, this can be resolved with the Eviews software, as it allows the bandwidth to be selected automatically using the kernel function Bartlett.

To strengthen the conclusion of unit roots in time series, the research further utilizes the KPSS test following the regression:

\[
Y_t = \alpha_0 + \theta \sum_{i=1}^{l} \rho_i + \varepsilon_t \quad \text{(without time trend)} \quad (4.15)
\]

\[
Y_t = \alpha_0 + \alpha_1 t + \theta \sum_{i=1}^{l} \rho_i + \varepsilon_t \quad \text{(with time trend)} \quad (4.16)
\]

It assumes that \(\varepsilon_t\) is stationary and i.i.d. \(\rho_i\) has an expected value of zero and variance equals 1. The null hypothesis is that \(H_0: \theta = 0\) (the process is stationary, or integrated) and the alternative is that \(H_1: \theta \neq 0\) (the process is nonstationary, or trend-stationary).

In case a series is found as non-stationary, it must be differenced to become stationary in order to solve the spurious equation issue. The times of differencing the series to become stationary is referred to as the order of integration, or the number of unit roots. An integration of order \(d\) can be denoted as \(I(d)\) or \(I-\{d\}\).

### 4.7.2. Cointegration Tests

If some of the variables in the specified function are integrated processes, it may imply the existence of cointegration amongst these time series. The terminology of cointegration was originally introduced by Granger (1981) and
broadly extended by Engle and Granger (1987), Engle and Yoo (1987), Johansen (1988, 1991, 1995, 2000), Stock and Watson (1988, 1993), among others. The existence of cointegration presents a long-run equilibrium between variables, even though the variables may drift apart in short-run (Engle and Granger, 1987). In other words, a linear combination among cointegrated non-stationary variables is stationary. There must be at least one variable in the model responding by way of correcting the deviation from the long-run equilibrium or the equilibrium error (Enders, 2004).

4.7.2.1. Appraisal of Cointegration Approaches

Regarding the economic modeling for integrated time series data, Granger and Weiss (1983) were pioneers in impressing the essential role of cointegration analysis. The practical power of this concept has been stretched over time while numerous significant statistical frameworks are built. Inter alia, three sound econometric techniques for testing the existence of cointegration can be considered within the context of this research: a single equation method or two-step error correction model (Engle and Granger, 1987); the maximum likelihood cointegration test (Johansen, 1991, 1995); and the bounds test within the autoregressive distributed lag (ARDL) approach (Pesaran and Shin, 1999; Pesaran et al., 2001)).

It is noted that these above tests focus only on a lower level of integration of the variables (0≤d≤1). It is fairly rational to apply to the current research since the empirical findings have revealed that financial time series are rarely integrated at a higher level (i.e. d ≥ 2). However, practical studies have uncovered cointegration between I(2) variables, such as the studies by Johansen (1995), Kitamura (1995), Phillips and Change (1994), etc. Accordingly, two main methods have been proposed, including single-equation methods and system methods. Further discussion can be seen in Chapter 11, Maddala and Kim (1998, pp. 342-361).

More attention has been paid to I(0) and I(1) variables. The research extensively sums up main strengths and weaknesses of three popular approaches towards cointegration as follows.
<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Equation Method: Residual-Based Tests (Engle and Granger, 1987)</td>
<td>• Easy to understand and to implement.</td>
<td>• Sensitive to the order of the variables</td>
</tr>
<tr>
<td></td>
<td>• Useful for bivariate analysis.</td>
<td>• Inability to detect more than one cointegrating relationship.</td>
</tr>
<tr>
<td></td>
<td>• Sensitive to the order of the variables</td>
<td>• Some errors generated from the first step can be carried over into the second step based on this two-step estimator.</td>
</tr>
<tr>
<td></td>
<td>• Some errors generated from the first step can be carried over into the second step based on this two-step estimator.</td>
<td>• All the variables are required to be integrated of the same order.</td>
</tr>
<tr>
<td></td>
<td>• All the variables are required to be integrated of the same order.</td>
<td></td>
</tr>
<tr>
<td>Multiple Equation Method based on Canonical Correlations: Johansen Tests (Johansen, 1991, 1995)</td>
<td>• Avoid the problem of normalization that plagues other estimators by using one-step estimation.</td>
<td>• Extremely sensitive to the assumption regarding to the underlying distributions of the error terms.</td>
</tr>
<tr>
<td></td>
<td>• Able to detect more than one cointegrating relationship by using the multiple-equation approach.</td>
<td>• Tendency to find spurious cointegration.</td>
</tr>
<tr>
<td></td>
<td>• Applicable for multiple variables.</td>
<td>• High variance and high probability of producing outliers.</td>
</tr>
<tr>
<td></td>
<td>• Allow testing of restrictions on the cointegrating vector.</td>
<td>• Require that all the variables be I(1).</td>
</tr>
<tr>
<td>Bounds Test within ARDL Modeling Method</td>
<td>• Simple to implement and interpret.</td>
<td>• Not applicable if there is a presence of I(2) in the system.</td>
</tr>
<tr>
<td></td>
<td>• Irrespective to the order of the integration of the</td>
<td>• Highly sensitive to the order</td>
</tr>
<tr>
<td><strong>variables.</strong></td>
<td><strong>of lags.</strong></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>• Allow for differential lag lengths for the variables, and able to accommodate more variables than in other models (i.e. VAR).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Allow for inference on long-run estimates.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sources:** Compiled by the Researcher from Asteriou and Hall (2011, pp. 366-367); Maddala and Kim (1998, pp. 173, 220-221); Pesaran and Shin (1999); Pesaran et al. (2001).

### 4.7.2.2. The Johansen Cointegration Approach

Since all the variables of the research projects are later found as I(1) (details provided in Chapter 5), the method developed by Johansen (1991, 1995) has been chosen as the main approach for the presence of cointegration in the system. Following a pre-conditional test for integration of all of the candidate variables, the Johansen technique contains three further steps: (i) selecting the optimal lag length for the VAR model; (ii) conducting cointegration tests for the presence of long-run relationship amongst the variables; (iii) using VECM to check short-run relationships in case a long-run equilibrium exists.

✓ **Selection of the Optimal Lag Length**

It is of primary importance to note that the Johansen's statistical results are considerably sensitive to the lag order and the type of deterministic structures. The wrong choice of lag length may lead to imprecise statistical results. In order to achieve better output for the cointegration tests, various criteria are developed to select the ideal lag number for the VAR models. The optimal lag orders obtained from the VAR estimation should be hired to determine the rank of cointegration as well as in estimating the vector error correction models (VECMs) afterwards.
There are five commonly used statistical criteria in practice, including the sequential log likelihood ratio (LR) (Lorden, 1972), the final prediction error (FPE), Akaike information criterion (AIC) (Akaike, 1973; Akaike, 1974), Schwarz information criterion (SC) (Schwarz, 1978) and the Hannan-Quinn information criterion (HQ) (Hannan and Quinn, 1979) tests. Among others, the AIC and SC are the most used statistical criteria methods for checking the lag order of dependent variables and regressors. In the case of a small sample size, Pesaran and Shin (1998) stated that the SC performs slightly better than the AIC due to the fact that the SC is a consistent model selection criterion while AIC is not.

**Johansen Cointegration Tests**


$$Y_t = \varphi_0 + \varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + \cdots + \varphi_p Y_{t-p} + \varepsilon_t$$

(4.17)

Rewritten the equation as:

$$Y_t = \varphi_0 + \sum_{i=1}^{p} \varphi_i Y_{t-i} + \varepsilon_t$$

(4.18)

Where:

- $Y_t$ is a vector containing $n$ non-stationary $I(1)$ variables
- $t$ symbolizes the time period
- $\varphi_0$ represents an $(n\times1)$ vector of constants
- $\varphi_p$ represents an $(n\times n)$ matrix of coefficient
- $p$ denotes the maximum lag length included in the model
- $\varepsilon_t$ symbolizes an $(n\times1)$ vector of error terms.

It is an assumption that all of the variables in the VAR models under Johansen approach are endogenous. The cointegration test relies on the
association between the rank of a coefficient matrix and its eigenvalues (or characteristic roots).

If $Y_t$ is cointegrated, it is possible to generate this time series into form of the vector error correction model (VECM) and the equation (4.18) can be reformulated in the first difference as:

$$
\Delta Y_t = \lambda_0 + \sum_{i=1}^{p-1} \lambda_i \Delta Y_{t-i} + \Pi \Delta Y_{t-p} + \varepsilon_t
$$

(4.19)

Where:

- $\Delta$ is the first difference operator
- $\lambda_i = (-\sum_{j=i+1}^{p} \Phi_j)$ estimates the short-run adjustments to changes in $Y_t$
- $\Pi = (\sum_{i=1}^{p} \Phi_i - I)$ illustrates the long-run equilibrium relationship amongst the variables under investigation included in $Y_t$, and $I$ is an $(n \times n)$ identity matrix.

Under the VAR framework, $\Pi$ depicts a matrix of long-run coefficients. The Johansen approach can be conveyed as a determination of the rank of $\Pi$ through its eigenvalues. The number of eigenvalues $r$ defines the rank of the coefficient matrix $\Pi$. There are three different cases under consideration:

(1) If the reduced rank of the matrix $\Pi$ is zero ($r=0$), it reveals that the underlying variables are not cointegrated or no linear combination exists among the variables in the vector $Y_t$.

(2) If the matrix has a full rank ($r=n$), it suggests that there is no stochastic trend in the variables and $Y_t$ is I(0) or stationary, which against the primary assumption about the same order of integration amongst all the variables included in the vector $Y_t$.

(3) If the reduced rank of the matrix $\Pi$ is greater than zero and less than $n$ ($0<r<n$), the matrix possibly contains $r$ linear independent combinations. It infers the presence of $r$ cointegrating relationships included in the model.
In the case that the matrix $\Pi$ has less than $n$ characteristic roots, it can be defined as a multiple of two $(n \times r)$ vectors $\alpha$ and $\beta'$ such that:

$$\Pi = \alpha \beta'$$  \hspace{1cm} (4.20)

Where $\alpha$ and $\beta$ are $(n \times r)$ loading matrices of eigenvectors with rank $r$, representing the speed of adjustment from disequilibrium. Each element of the vector $\alpha$ is defined as the adjustment parameter in the VECM, whilst each column of the vector $\beta$ refers to the cointegrating vector. The elements of $\beta'$ are a matrix of long run equilibrium, wherein $(\beta'Y_t)$ represents up to $(n-1)$ economic equilibrium or cointegrating relationships in the model.

The rank of the matrix $\Pi$, also the quantity of cointegrating vectors, can be computed by two likelihood tests through Johansen’s approach based on propositions about eigenvalues.

- **The maximum eigenvalue statistic**: the null hypothesis of $r$ cointegrating vectors is tested against the alternative hypothesis of $(r+1)$ cointegrating vectors.

Suppose there are $n$ characteristic roots obtained from the system, which are denoted as $\lambda_i$ (i=r+1,..., n) and $\lambda_1 > \lambda_2 > \lambda_3 > \cdots > \lambda_n$. The test is therefore using the following statistic:

$$\lambda_{max}(r, r + 1) = -T \ln \left(1 - \frac{1}{\lambda_{r+1}}\right)$$  \hspace{1cm} (4.21)

Where $r$ is the number of cointegrating vectors, $T$ refers to the sample size (or the number of usable observations), and $\lambda_i$ denotes the eigenvalues taken from the matrix $\Pi$. The null hypothesis of exactly $r$ cointegrating vectors will be rejected if the statistic is greater than the critical value (which are provided by Johansen and Juselius (1990)).

- **The trace statistic**: the null hypothesis of $r$ cointegrating vectors $(\beta_1, \beta_2, \ldots, \beta_r)$ is tested against the alternative hypothesis of $n$ cointegrating vectors.
\[ \lambda_{\text{trace}}(r) = -T \sum_{i=r+1}^{m} \ln (1 - \hat{\lambda}_{i+1}) \] (4.22)

Similarly, the null hypothesis of at most \( r \) cointegrating vectors will be rejected if the statistic exceeds the critical value.

These two statistical tests do not necessarily always indicate the same results. Under the circumstance that there is not only one cointegrating vector in the system, the maximum eigenvalue result is mostly preferred (Johansen and Juselius, 1990; Enders, 2004).

Additionally, the inclusion of an intercept or a deterministic trend in the system decides the critical values for both tests. Johansen (1995) suggested five different assumptions that are summarized as follows:

- The series included in the equations have no deterministic trends and the cointegrating equations do not have intercepts (no intercepts, no trends);
- The series included in the equations have no deterministic trends and the cointegrating equations have intercepts (restricted intercepts, no trends);
- The series included in the equations have linear trends but the cointegrating equations (unrestricted intercepts, no trends);
- The series included in the equations have only intercepts and the cointegrating equations have linear trends (unrestricted intercepts, restricted trends);
- The series included in the equations have quadratic trends and the cointegrating equations have linear trends (unrestricted intercepts, unrestricted trends).

Another underline is that, different from the Engle-Granger test, where only one cointegration relationship can be obtained, there may occur more than one
single cointegration relationship obtained from the Johansen procedure (with a maximum of (n-1) cointegrating vectors).

✓ Vector Error Correction Model

If non-stationary variables are found to cointegrated, they are said to have a long-term relationship. Put differently, there exists an equilibrium link between such variables. Engle-Granger (1987) introduced an error correction mechanism (ECM) to see how this equilibrium reached while there may be disequilibrium in the short-run. That is, ECM allows for correcting the disequilibrium in the cointegration relationship to observe the causality among cointegrated variables for both the long and short run (Hamdi et al., 2013).

The multivariate counterpart of ECM is referred to as the vector error correction model (VECM), which is known as a restricted form of VAR model. VECM allows for checking the presence of short-run dynamics in the system.

The estimation of the VAR system under the VECM approach for two non-stationary cointegrated variables can be specified from the following equations:

\[
\Delta X_t = \alpha_1 + \sum_{i=1}^{p} \beta_{1i} \Delta X_{t-i} + \sum_{i=1}^{p} \gamma_{1i} \Delta Y_{t-i} + \delta_1 \epsilon_{1t-i} + \epsilon_{1t} \quad (4.23)
\]

\[
\Delta Y_t = \alpha_2 + \sum_{i=1}^{p} \beta_{2i} \Delta Y_{t-i} + \sum_{i=1}^{p} \gamma_{2i} \Delta X_{t-i} + \delta_2 \epsilon_{2t-i} + \epsilon_{2t} \quad (4.24)
\]

Where:

- \( \delta_1 \) and \( \delta_2 \) are the parameters of the error correction terms (ECTs), representing the long run equilibrium amongst the underlying time series. The absolute value of \( \delta_1 \) and \( \delta_2 \) reveal the speed of getting back to equilibrium.
- \( \epsilon_{1t-j} \) and \( \epsilon_{2t-j} \) are the ECTs that obtained from long run model at lagged number \( j \), also called the lagged equilibrium error terms. The ECTs are added to the system to represent the short run relations among variables.
The estimations of \( y_{1t} \) and \( y_{2t} \) capture the short-run influences from changes in X to Y and from changes in Y on X, respectively.

Based on the idea of the bivariate approach discussed above, the study extends to a multivariate procedure using the VECM approach to test for short-run dynamics between six macroeconomic indicators and returns on VN-Index, expressed by the modified equation:

\[
\Delta Y_t = \lambda_0 + \sum_{j=1}^{p-1} \lambda_j \Delta Y_{t-j} + \Pi \Delta Y_{t-p} + \epsilon_t \quad (4.25)
\]

Where:

- \( \sum_{j=1}^{k-1} \lambda_j \Delta Y_{t-j} \) and \( \Pi \Delta Y_{t-p} \) are the vector autoregressive (VAR) components in first differences and error correction terms in levels.
- \( Y_t \) is a \((p \times 1)\) vector of variables and is integrated of order one.
- \( \lambda_0 \) is a \((p \times 1)\) vector of constants.
- \( p \) is a lag structure.
- \( \epsilon_t \) is a \((p \times 1)\) vector of white noise error terms.
- \( \lambda_j \) is a \((p \times p)\) matrix that indicates short-term adjustments among variables across p equations at the jth lag.
- \( \Pi = \alpha \times \beta' \) where \( \alpha \) is a \((p \times r)\) matrix that indicates the speed of adjustment parameters representing the speed of error correction mechanism, \( \beta' \) is a \((p \times r)\) matrix of cointegrating vectors.

### 4.7.3. Granger Causality Test

Even though the cointegration tests account for the presence of long- or short-run dynamics between variables, they are not able to show the direction of these relationships. A number of Granger causality tests (originally introduced by Granger (1969)) are employed in the project to find out whether there are any unidirectional or bidirectional causal relations among the specified variables. The following section briefly discusses the ideas of the Granger causality test, which can be applied for the standard pairwise Granger causality test, the Granger
causality test within the VECM framework, and the Granger causality test using TYDL.

4.7.3.1. Standard Granger Causality Test

A causality relationship between two variables occurs when one variable causes a change in another variable, or the past values of one variable can help predict the future values of another. The standard causality test is conducted by Granger (1969) to check the existence and direction of causality between non-cointegrated variables. The method is later developed similarly to the test for causality between cointegrated variables.

The main idea of Granger is originally performed by bivariate VAR functions as follows.

\[ X_t = \alpha_1 + \sum_{i=1}^{p} \beta_{1i} X_{t-i} + \sum_{i=1}^{p} \gamma_{1i} Y_{t-i} + \varepsilon_{1t} \]  
\[ Y_t = \alpha_2 + \sum_{i=1}^{p} \beta_{2i} X_{t-i} + \sum_{i=1}^{p} \gamma_{2i} Y_{t-i} + \varepsilon_{2t} \]

The method is proposed to test the null hypotheses:

\[ H_0: \sum_{i=1}^{m} \gamma_{1i} = 0 \]  
\[ H_0: \sum_{i=1}^{m} \gamma_{2i} = 0 \]

The statistical estimation of the coefficients \( \gamma_{1i} \) and \( \gamma_{2i} \) provides evidence of the existence and direction of causality relationships between variables in the system. There are four suggestions as follows.

i. If the estimated coefficient \( \gamma_{1i} \) is statistically significant, but \( \gamma_{2i} \) is not, then variable Y Granger-causes variable X. The relation between Y and X is a unidirectional causality. In other words, Y drives X towards long run equilibrium.

ii. If coefficient \( \gamma_{1i} \) is not statistically significant, but \( \gamma_{2i} \) is, then variable X Granger-causes variable Y. It suggests a unidirectional causality from X to Y.
iii. If both estimated coefficients $\gamma_{1i}$ and $\gamma_{2i}$ are significant, then X and Y are said to have bidirectional causality relationship.

iv. If both $\gamma_{1i}$ and $\gamma_{2i}$ are statistically not significant, then it is said that no causality occurs between variable X and variable Y. In other words, X and Y are independent.

The typical statistical mean for Granger causality is the Wald test. The null hypotheses are set up as all the coefficients of $\gamma_{1i}$ and $\gamma_{2i}$ equal zero. A Wald test estimates F-statistics by the computation as shown below:

$$F = \frac{(RSS_R - RSS_{UR})/p}{RSS_{UR}/(n-m)}$$

(4.30)

Where $p$, $m$, $n$ correspondingly depict the numbers of restrictions, explanatory variables estimated in the unrestricted model (including the intercept), observations. $RSS_R$ and $RSS_{UR}$ are residual sum of squares ($R^2$) from restricted and unrestricted models, respectively.

The null hypothesis is not accepted once the calculated $F$-value exceeds the critical $F$-value at the selected significance level. It therefore infers to the presence of causality among nominated variables.

4.7.3.2. Granger Causality Test using TDYL Procedure

Among several techniques that are used to test Granger causality (Granger (1969), Sims (1972), Gweskes et al. (1983)), the augmented lag method of TDYL has been proven with a consistent performance for numerous data-generating processes (Clarke and Mirza, 2006). If a variable is non-stationary time series, the stability conditions under the VAR framework are not satisfied, leading to invalid Wald statistics for the Granger causality test. The standard Wald statistics for testing the null hypothesis of Granger causality test have asymptotically valid distribution only if certain cointegration rank conditions are satisfied (Toda and Phillips, 1993). This TDYL procedure overcomes these drawbacks while it can be done without pre-testing cointegration for the system (Zapata and Rambaldi, 1997).
Particularly, the pre-tests for the integration or cointegration properties of the variables are not compulsory regarding to the TYDL technique. The TYDL tests the significance of the parameters of the VAR (p) model with p being the lag length of the VAR system, utilizing the modified Wald statistics. However, instead of modeling the general VAR (p) model, this method fits the augmented VAR (p+d_{max}) where d_{max} denotes the maximum order of integration of the time series in the model. It is noted that the test is valid as long as the order of integration (d) is satisfied to be less than the optimal lag number determined by the VAR model. The null hypothesis of non-causality is then examined by a conventional Wald statistics.

4.7.4. Dynamic Analysis

Under the VAR framework, essential tools are also provided to examine the structural impact of changes in one variable onto another variable in terms of its present and future values. In order to trace the dynamics amongst all the variables in the model with the presence of shocks or innovations, two prominent types of analysis are performed under this research - impulse response function (IRF) and variance decomposition (VD) (Luetkepohl, 2011).

The IRF is firstly employed to investigate the response of Vietnam security returns to shocks or non-zero residuals in macroeconomic indicators beyond the selected time period. Thenceforth, VD is utilized to examine the attribution of each of the different structural shocks to the movements in the equity returns, due to their own variation and due to the other variables' variation.

However, the outcomes of the traditional IRFs (also known as the “orthogonalized” impulse responses) in typical dynamic analysis of the VAR models may vary to the ordering of the variables (Luetkepohl, 1991). It implies that sufficient restrictions cannot be found to obtain a structural model (Lanne and Nyberg, 2014). To overcome this problem, Koop et al. (1996), and later Pesaran and Shin (1998), introduced a new concept of generalized impulse response function (GIRF) which considers the impulse function as a random variable in the
given model. This unified approach to measure shock persistence and asymmetric effects is appropriate for both linear and non-linear multivariate models.

Similarly, based on the concept of GIRF set up by Koop et al. (1996), the generalized forecast error variance decomposition (GFEVD) has been proposed by Perasan and Shin (1998), and then modified by Lanne and Nyberge (2014), in order to encompass the orthogonalized case as well as to facilitate the convenience of interpretation.

This research will avoid the subjection of the orthogonalized assumption by subsequently plotting GIRF and GFEVD to explore the response of equity returns to any innovation in macroeconomic indicators in the system and to estimate the ratio of the variance of the error made in forecasting equity returns caused by a specific macroeconomic shock at a given horizon.

4.8. GENERALIZED AUTOREGRESSIVE CONDITIONAL HETEROSKEDASTICITY MODELS

Regarding to Enders (2004), one stylized fact of economic time series data is majorly “conditionally heteroskedasticity”, implying that the volatility of such series is inconstant over a specified period, in spite of the assumption of unchanged unconditional or long run variance. Additionally, most high-frequency financial and economic data are also characterized as “volatility clustering”, which refers to the phenomenon that a period of high/low volatility tends to be followed by periods of high/low volatility and vice versa (Mandelbrot, 1963).

Understanding the behavior of market volatility in order to make better investment decisions is extremely significant to both academicians and practitioners (i.e. risk managers, portfolio managers, investors). Therefore, several studies have been concerned with modeling and forecasting the volatility of financial time series data (Engle, 1982; French et al., 1987; Schwert, 1989). To account for the behavior of the volatility of financial time series, the traditional regression models (OLS) are not adequate to analyze such data (Rachev et al., 2007).
Three so-called methods to measure the conditional variance of stock returns are historic volatility, exponential weighted moving average (EWMA) and autoregressive conditional heteroskedasticity (ARCH). However, historic volatility and correlation forecasting methods (also known as equally weighted moving average) and EWMA reveal several unrealistic assumptions that may lead to the problem of mispricing volatility. As stated by Alexander (1998), the first methods equal all weighted moving averages or the impact of an event does not matter when it occurs, long time ago or recently; wherein, even given more weight on more resent observations, the second method assumes constant volatility term structures while the fact usually characterizes volatility with a cluster.

The most popular one, due to its efficiency for modeling conditional time-varying variance in recent empirical, is the ARCH approach, which was originally designed by Engle (1982). This approach estimates changes of information flows, both recent and old, on volatility. Although the standard ARCH models fail to take into account some other properties of financial time series data (i.e. leptokurtosis, asymmetric volatility), a number of extended ARCH models have been introduced to produce better predictions of volatility (i.e. GARCH, EGARCH, TGARCH).

One limitation of the original work by Engle (1982) is that the system requires a large number of lags to precisely fit the model. Bollerslev (1986) is therefore attributed to the current technique, the so-called generalized autoregressive conditional heteroskedasticity (GARCH).

4.8.1. Background on GARCH models

The idea of the standard GARCH (p,q) is based on a joint estimation of the conditional mean equation and the conditional variance equation. Specifically, Bollerslev (1986) suggests that conditional variance of returns is determined by both the squared residuals of the mean equation and its past own values. The maximum log likelihood method is utilized to generate a GARCH model.

The standard GARCH (p, q) is represented by the two following equations.
• **The conditional mean equation:** can be illustrated by a typical autoregressive moving average (ARMA) process, representing impact of the news on the volatility from the last period.

\[ R_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i R_{t-i} + \sum_{j=1}^{q} \gamma_j \epsilon_{t-j} + \epsilon_t \quad (4.31) \]

where \( R_t \) denotes returns of the variables of interest at time \( t \), \( R_{t-i} \) denotes a set for the mean of \( R_t \) conditional on the past information, \( \epsilon_{t-j} \) denotes moving average components, \( \epsilon_t \) is the heteroskedastic error term for the present period, parameter \( \alpha_0 \) is the constant, and \( p \) and \( q \) are the orders of the processes.

• **The conditional variance equation:** represents a persistent coefficient.

\[ h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \epsilon_{t-i}^2 + \sum_{j=1}^{p} \delta_j h_{t-j} \quad (4.32) \]

where \( p, q \) are correspondingly the numbers of ARCH parameters \( (\epsilon_{t-i}^2) \) and GARCH parameters \( (h_{t-j}) \).

In which, the error process is that:

\[ \epsilon_t = \nu_t \sqrt{h_t} \quad (4.33) \]

Where \( \sigma_v^2 = 1 \); \( \{\nu_t\} \) is a white-noise process, the conditional and unconditional means of \( \epsilon_t \) are equal to zero (for the more details in mathematics, see Enders (2004)).

The size of \( \alpha_i \) and \( \delta_j \) defines the short-run dynamics of the volatility of the underlying variable while the sum of these two parameters determines the persistence of the volatility to a specific shock (Alexander, 2007). In another words, if the sum of \( \alpha_i \) and \( \delta_j \) is very close to one, the volatility is very persistent to the shock.
4.8.2. Estimation Strategy

Based on the above discussion, given that volatility can be measured through conditional variance by GARCH models, identifying the determinants of stock market volatility can be further examined to facilitate the forecasting ability of stock market movements. It is also one main objective of this research that was proposed in the first chapter. To obtain this objective, which particularly is to investigate the association between various macroeconomic indicators and Vietnam’s stock market volatility, the following statistical analysis will be structured with three major stages: (i) modeling volatility clustering for Vietnam’s stock market returns; (ii) constructing GARCH models to identify the impact of each macroeconomic variables on the volatility of Vietnam’s security prices; (iii) employing GARCH models to identify the macroeconomic influences as a group on Vietnam’s stock market volatility.

Since the literature shows that the simple model GARCH (1,1) is adequate to describe data and produce significant results (Connolly, 1989; Fan and Yao, 2003; Floros, 2007; etc.), this research firstly uses standard GARCH (1,1) models to estimate the volatility of Vietnam’s stock market returns. It is also necessary to note that a number of disadvantages of applied GARCH models still exist. Specifically, the simple GARCH model is not adequate to account for an asymmetry problem, which can generate inaccurate forecasts of volatility (Brooks and Persand, 2003). Therefore, extensions of the GARCH models that incorporate with asymmetric volatility are further applied to attain more precise estimations for this study, which are the exponential GARCH (1,1) model (or EGARCH, introduced by Nelson, 1991) and threshold ARCH model (or TARCH, presented by Zakoian (1991) and Glosten et al. (1993)). The EGARCH model modifies the standard GARCH by estimating the logarithm of the conditional variance process so that the asymmetry in volatility clustering can be captured. Differently, the TARCH model divides the innovations that influence on the conditional variance into good and bad intervals. The asymmetry or leverage effect occurs when the underlying impact from bad news is beyond the impact from good news.
For the next stage, the study investigates the influence of macroeconomic forces (either as individual or as a group) on stock market volatility exploiting different GARCH models in both univariate and multivariate perspectives. In specific, the conditional mean equation is kept unchanged, while the variance equation is adjusted to include from individual macroeconomic factors (univariate analysis) to all the six macroeconomic factors (multivariate analysis).

4.9. CONCLUSIONS

To summarize, this chapter selects and defines all of the variables under investigation. It further designs a comprehensive conceptual framework as well as a methodological strategy to fulfill the objectives of the research that are proposed in Chapter 1. In particular, the interrelations between Vietnam’s stock market returns and six selected macroeconomic factors are examined under two sound frameworks in applied financial econometrics that comprised of vector autoregressive (VAR) models and generalized autoregressive conditional heteroskedasticity (GARCH) models.

More specifically, employing the data sample gathered from the Vietnam's economy during the period August 2000 to December 2013, the cointegration analysis under VAR framework is initially operated to detect the long-term equilibrium and short-run dynamics between macroeconomic measures (economic growth – GDP, inflation rate – CPI, money supply – MS, interest rates – Irs, USD/VND foreign exchange rate – EX, and foreign direct investment – FDI) and stock market returns for Vietnam. Afterwards, long- and short-run causal links among variables are determined by either traditional Granger causality tests or TYDL causality tests.

In order to take volatility into account, which is practically recognized as a significant characteristic of financial and economic time series data, the research is followed by the approach of the GARCH framework to investigate the determinants of macroeconomic indicators on the volatility of stock market returns in Vietnam. Several forms of GARCH models, including GARCH (1,1), EGARCH (1,1) and
TGARCH (1,1), are subsequently operated in order to achieve adequate statistical results.

The next chapter will describe statistical results, and then analyze all of the empirical findings that were achieved from econometric techniques studied.
CHAPTER 5:

EMPIRICAL RESULTS OF COINTEGRATION AND CAUSALITY

5.1. INTRODUCTION

5.2. STATISTICS DESCRIPTION

5.2.1. Graphic Representations of Data
5.2.2. Descriptive Statistics
5.2.3. Correlation Matrix

5.3. RESULTS OF UNIT ROOT TESTS

5.4. BIVARIATE ANALYSIS

5.4.1. Lag Length Selection for the Bivariate VAR Models
5.4.2. Results of the Bivariate Johansen Cointegration Tests
5.4.3. Results of the Bivariate Granger Causality Tests

5.5. MULTIVARIATE ANALYSIS

5.5.1. Lag Length Selection for the Multivariate VAR Model
5.5.2. Results of the Multivariate Johansen Cointegration Tests
5.5.3. Results of the Multivariate Granger Causality Tests

5.6. DYNAMIC ANALYSIS

5.6.1. Generalized Impulse Response Functions
5.6.2. Variance Decomposition

5.7. CONCLUSIONS
5.1. INTRODUCTION

Based on the specified model in the spirit of the APT framework, this chapter demonstrates empirical evidences for cointegration as well as causality relationships among variables of interest by applying the Johansen method (Johansen, 1991, 1995) together with the VECM framework on the data gathered from Vietnam during the period 2000-2013. The research employs Eviews version 8.0 as its primary statistical software, which fully supports the data analysis methodology set out in the previous chapter.

This chapter starts with a brief overview of the statistics, then follows two main dimensions: bivariate analysis and multivariate analysis. In particular, the research firstly undertakes the test for the presence of cointegration between returns on VN-Index and each of the selected macroeconomic indicators. A test for the long-run equilibrium between VN-Index and the candidate macroeconomic set is conducted afterwards. Based on the existence of any long-run associations in either bivariate or multivariate perspectives, the direction of each link or the causality in either the long or short run will be correspondingly checked.

The research project runs the Johansen cointegrating method (developed by Johansen 1991, 1995) within the VAR framework as the main method to approach the long-run relationships among the variables, since several advanced features of this method are acknowledged over conventional cointegration testing. A pre-conditional test is required under the Johansen procedure, considering whether all of the variables are I(1) or their integrated level is at the first order. Henceforth, the unit root tests are employed to check the integration orders of all variables, including following methods: the augmented Dickey-Fuller (ADF), the Phillips-Perron (PP), and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS).

The findings of the Johansen cointegrating approach under both bivariate and multivariate cases are presented in respect of the typical Johansen procedure, which are comprised of three main stages: lag length selection, cointegration test, and estimation of VECM (if there exists a cointegration). Furthermore, all of the
regressions conducted require diagnostic and stability tests. Specifically, these tests verify whether the residuals of the specified models are free from non-normally distributed, serial correlation, heteroskedasticity, and functional form misspecification. Irrespective to the existence of cointegration between the variables, causality tests are operated to uncover the direction of the relationship. The standard Granger causality tests and the modified TYDL Granger causality tests are therefore employed. Under the occurrence of cointegration in the multivariate analysis, the Granger causality analysis based on error correction mechanism (ECM) is later conducted.

The impulse response function together with the variance decomposition analyses are included in the final section to provide more information in consideration of macroeconomic innovations to the movement of Vietnam's stock market. All the empirical findings are subsequently illustrated in details in the following sub-sections.

5.2. **STATISTICS DESCRIPTION**

The data are gathered based on monthly frequency from August 2000 to December 2013, making a total 161 observations under investigation. The macroeconomic set comprise the real economic growth rate (RGDP), the consumer price index (CPI), the real interest rates (refinancing rate RFR, lending rate RLR, and deposit rate RDR), the real exchange rate USD against VND (REX), the real broad money supply (RMS), and the real inward foreign direct investment (RFDI). As noticed in the previous chapter, all of the series are studied in real terms and in natural logarithm forms.

5.2.1. **Graphic Representations of Data**

Graphs 5-1 to 5-7 capture the growth curves of each of the variables in forms of their natural logs and their first differences over the period August 2000 – December 2013.
Figure 5-1. Growth Rate of Real Vietnam’s Stock Market Index (RVNI)

Figure 5-2. Real Output Growth Rate (RGDP)

Figure 5-3. Growth Rate of Consumer Price Index (CPI)

Figure 5-4. Growth Rate of Real Money Supply (RMS)
Figure 5-5. Growth Rate of Real Interest Rates (RFR, RLR, RDR)

Figure 5-6. Growth Rate of Real Exchange Rates USD/VND (REX)

Figure 5-7. Growth Rate of Real Foreign Direct Investment (RFDI)

Source: Graphic Representations by Eviews 8.0
The figures illustrate that all of the variables of interest in the research project are not constant at all levels. However, most of them after transformation into the first differences of natural log-values seem to have stable means and variances. They suggest the possibility of integration order of one for all the variables. The following sections provide more specifics regarding the statistical features of all of the selected variables in the study.

5.2.2. Descriptive Statistics

Tables 5-1 and 5-2 follow in sequence and provide the basic statistic features of the data in their levels and first differences. These descriptions reflect the historical behavior of the data being studied, including the mean, minimum and maximum values, standard deviation, kurtosis, skewness, and the Jarque-Bera statistics. Based on the dispersion levels of series obtained from the standard deviation statistics (Table 5-1), the consumer price index (CPI), the real interest rates (RFR, RLR, and RDR), and the real exchange rate (REX) are less volatile in comparison with the remaining macroeconomic variables.

Table 5-1. Descriptive Statistics of the Data in Levels

| Source: Descriptive Statistics by Eviews 8.0 |

The highest volatility is recorded in the real foreign direct investment. It can be explained by the improvement of the openness policy in Vietnam during the
2000s and the country’s entry into the WTO in 2007. These significant changes drastically boosted FDI flows into the country. The inflows seemed to be reluctant from 2008 due to the global recession 2007/2008. However, they resumed their upward trend from the end of 2009, as Vietnam’s social-political environment has remained stable, also enhancing its attractiveness as a foreign investment destination.

On the other hand, the low fluctuation of interest rates possibly originated from various monetary policies implemented by the government. For example, the State Bank of Vietnam (SBV) introduced the base rate, which has been used as a deposit rate ceiling in the past and recently known as a reference rate for commercial banks to set lending rates. From September 2011, the SBV announced a deposit rate ceiling in order to avoid competition in deposit rates, and also enforced caps on the lending rate for some special sectors in the economy. During the same period, easing the inflation rate has been a central aim of the Vietnamese government. Even after it reached a peak high (around 28%) in 2008, this situation was relieved quickly by the effort of the government. Overall, the inflation rate was kept within a range of 6-10% annually over the period sample.

The low volatility of the exchange rate USD/VND is due to the exchange rate policy in Vietnam, which has been followed a floating exchange rate regime with managed arrangement. While USD has been considered as a key nominal anchor in Vietnam, the State Bank of Vietnam has made effort to keep USD/VND stable to help this country deal with high inflation, rapid economic growth, and large government budget deficits. The Dong trading band was kept at 1% until 2014, doubled to 2% from 2015, and to 3% from 2016.

Furthermore, the skewness, kurtosis, and Jarque-Bera statistics are also included in Table 5-1, which are designed to take account of testing the normal distribution of the series. While the skewness statistics of a series indicate the symmetry of its distribution around the mean, the kurtosis describes the curvature of the distribution of the series, whether it is flat or reaches a peak. Additionally,
the Jarque-Bera tests for a normal distribution of the individual series (Eviews 8, User's Guide I).

The results reveal that all of the macroeconomic variables have long right tails with positive skewness values. While the distribution of real consumer price indexes and real interest rates are leptokurtic relative to the normal as their kurtosis values surpass 3, the remaining variables with kurtosis values smaller than 3 have platykurtic distributions. Since the skewness values are all non-zero and kurtosis values are all different from three, the p-values of the Jarque-Bera statistics imply the rejection of the null hypothesis for most of the variables. Particularly, the distributions of real GDP, consumer price index, real interest rates, real money supply, and real exchange rate exhibit non-normality. In contrast, the Jarque-Bera findings suggest a normal distribution of real VNI and real FDI, supporting the point that the skewness and kurtosis values of these two variables are also not significantly different from zero and three respectively.

Table 5-2 exhibits similar statistical features of the data, but in their first differences. Except for real economic growth, the other variables in their first differences are leptokurtic distributed, given that their kurtosis values are significantly larger than 3. Together with non-zero skewness values, the probabilities of the Jarque-Bera tests indicate that most variables are not normally distributed, only disregarding RVNI. Additionally, the monthly average growth rate of the series can be obtained by values of their means shown in Table 5-2. It is suggested that all variables have comparable growth rates, with the majority growing at less than 2% on a monthly basis. Exceptionally, real foreign direct investment increased by 2.5% on average per month, which is the highest rate compared to the rest of variables. The following is the money supply with nearly a 1.9% growth rate on monthly average during the sample period.
5.2.3. Correlation Matrix

The correlation matrix is a basic, simple test to examine the strength of the linear association between a pair of variables. Table 5-3 shows the correlation coefficients of all of the variables in their log levels. The result reveals that the correlations between the independent variables are mostly statistically significant (except for the correlation between CPI and REX only). It is a sign of multicollinearity in the system, which causes difficulty estimating model parameters (Brooks, 2008: p.171). To detect the possible problem of multicollinearity, the series are replaced into percentage changes by transforming level data into natural log form to their first differences (Table 5-4).
Table 5-3. Correlation Matrix and Probability Values in Log Levels

<table>
<thead>
<tr>
<th></th>
<th>LRVNI</th>
<th>LRGDP</th>
<th>LCPI</th>
<th>LRMS</th>
<th>LRFR</th>
<th>LRLR</th>
<th>LRDR</th>
<th>LREX</th>
<th>LRFDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRVNI</td>
<td>1.000</td>
<td>-----</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRGDP</td>
<td>0.529</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCPI</td>
<td>0.258</td>
<td>0.443</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRMS</td>
<td>0.607</td>
<td>0.981</td>
<td>0.499</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRFR</td>
<td>0.347</td>
<td>0.729</td>
<td>0.770</td>
<td>0.741</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRLR</td>
<td>0.331</td>
<td>0.547</td>
<td>0.811</td>
<td>0.577</td>
<td>0.893</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRDR</td>
<td>0.380</td>
<td>0.641</td>
<td>0.813</td>
<td>0.688</td>
<td>0.868</td>
<td>0.889</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LREX</td>
<td>0.292</td>
<td>0.792</td>
<td>-0.061</td>
<td>0.740</td>
<td>0.392</td>
<td>0.183</td>
<td>0.275</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>LRFDI</td>
<td>0.725</td>
<td>0.607</td>
<td>0.470</td>
<td>0.679</td>
<td>0.425</td>
<td>0.396</td>
<td>0.499</td>
<td>0.327</td>
<td>1.000</td>
</tr>
</tbody>
</table>

* denotes the statistical significance at 5 percent level.

The correlation coefficients in Table 5-4 appear to be mostly insignificant, excluding that the correlations among three types of interest rates remain perfectly significant. It infers to the existence of parallel movements in three selected types of interest rates over the sample period. In order to avoid misleading statistical results, the refinancing interest rate is henceforward selected as the main proxy for interest rates in further regression models of the research. It means that lending rates and deposit rates are rationally omitted from any further regressions. It seems appropriate since the refinancing rate is considered as one of the most effective tools used by the Vietnamese government to regulate the monetary environment. Also, this indicator is able to directly impact commercial banks’ offering rates, both in their deposits and loans.
Table 5-4. Correlation Matrix and Probability Values in First Differences

<table>
<thead>
<tr>
<th></th>
<th>DLRVNI</th>
<th>DLRGDP</th>
<th>DLCPI</th>
<th>DLRMS</th>
<th>DLRFR</th>
<th>DLRLR</th>
<th>DLRDR</th>
<th>DLREX</th>
<th>DLRFDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLRVNI</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLRGDP</td>
<td>0.005</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.948</td>
<td></td>
<td>-0.277</td>
<td>-0.102</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLCPI</td>
<td></td>
<td>0.000*</td>
<td></td>
<td>0.198</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLRMS</td>
<td>0.261</td>
<td>0.162</td>
<td>-0.630</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.001*</td>
<td>0.041*</td>
<td>0.000*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLRFR</td>
<td>0.274</td>
<td>0.809</td>
<td>0.398</td>
<td>0.307</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.087</td>
<td>-0.019</td>
<td>0.000*</td>
<td>0.000*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLRLR</td>
<td>-0.077</td>
<td>-0.085</td>
<td>0.416</td>
<td>-0.248</td>
<td>0.481</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.332</td>
<td>0.287</td>
<td>0.000*</td>
<td>0.002*</td>
<td>0.000*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLRDR</td>
<td>-0.059</td>
<td>-0.070</td>
<td>0.362</td>
<td>-0.231</td>
<td>0.477</td>
<td>0.674</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.455</td>
<td>0.378</td>
<td>0.000*</td>
<td>0.003*</td>
<td>0.000*</td>
<td>0.000*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLREX</td>
<td>0.085</td>
<td>0.017</td>
<td>-0.239</td>
<td>0.164</td>
<td>-0.077</td>
<td>-0.093</td>
<td>-0.062</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.287</td>
<td>0.830</td>
<td>0.002*</td>
<td>0.039*</td>
<td>0.334</td>
<td>0.242</td>
<td>0.432</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLRFDI</td>
<td>0.054</td>
<td>0.002</td>
<td>-0.026</td>
<td>0.021</td>
<td>0.043</td>
<td>-0.007</td>
<td>-0.063</td>
<td>0.045</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>0.499</td>
<td>0.976</td>
<td>0.743</td>
<td>0.794</td>
<td>0.593</td>
<td>0.931</td>
<td>0.429</td>
<td>0.569</td>
<td></td>
</tr>
</tbody>
</table>

Source: Correlation Matrix in First Differences by Eviews 8.0

* denotes the statistical significance at 5 percent level.

5.3. RESULTS OF UNIT ROOT TESTS

The study subsequently runs the ADF tests, PP tests, and KPSS tests on all of the variables individually in order to check stationarity for every time series under the research, considering the inclusion of trend, trend and intercept, and without trend and intercept.

The occurrence of a unit root in each time series is determined by comparing computed t-statistics and critical values provided in Table 5-8. Regarding the ADF and PP tests, the null hypothesis of a unit root cannot be accepted unless the computed t-statistic exceeds the critical values at 5 percent level of significance (which is the most preferable statistical significance level used in many econometric papers). In contrast, the null hypothesis of the KPSS test is rejected if the computed t-statistic surpluses the critical value at the significance
level of 5 percent. Also, it is noted that the study may utilize other critical values (i.e. at conventional levels of 1 percent and 10 percent) in interpretation of empirical results under some certain circumstances throughout the study.

The unit root testing results based on the ADF and PP methods are summarized in Table 5-5 and Table 5-6 respectively.

**Table 5-5. ADF Results on Log Levels and First Differences**

<table>
<thead>
<tr>
<th>ADF Results</th>
<th>Level</th>
<th>First Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>Trend and</td>
<td>Trend and</td>
</tr>
<tr>
<td></td>
<td>Trend</td>
<td>Intercept</td>
</tr>
<tr>
<td>LRVNI</td>
<td>-2.696</td>
<td>-2.932</td>
</tr>
<tr>
<td>LRGDP</td>
<td>0.367</td>
<td>-2.486</td>
</tr>
<tr>
<td>LCPI</td>
<td>-2.638</td>
<td>-3.146</td>
</tr>
<tr>
<td>LRMS</td>
<td>-0.324</td>
<td>-2.443</td>
</tr>
<tr>
<td>LRFR</td>
<td>-1.930</td>
<td>-2.821</td>
</tr>
<tr>
<td>LREX</td>
<td>-0.002</td>
<td>-1.270</td>
</tr>
<tr>
<td>LRFDI</td>
<td>-2.602</td>
<td>-3.204</td>
</tr>
</tbody>
</table>

*Source: Output of Augmented Dickey-Fuller Unit Root Tests from Eviews 8.0*

**Table 5-6. PP Results on Log Levels and First Differences**

<table>
<thead>
<tr>
<th>PP Results</th>
<th>Level</th>
<th>First Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>Trend and</td>
<td>Trend and</td>
</tr>
<tr>
<td></td>
<td>Trend</td>
<td>Intercept</td>
</tr>
<tr>
<td>LRVNI</td>
<td>-2.397</td>
<td>-2.480</td>
</tr>
<tr>
<td>LRGDP</td>
<td>1.801</td>
<td>-2.149</td>
</tr>
<tr>
<td>LCPI</td>
<td>-2.627</td>
<td>-2.617</td>
</tr>
<tr>
<td>LRMS</td>
<td>-0.261</td>
<td>-2.407</td>
</tr>
<tr>
<td>LRFR</td>
<td>-2.041</td>
<td>-2.540</td>
</tr>
<tr>
<td>LREX</td>
<td>-1.142</td>
<td>-2.634</td>
</tr>
<tr>
<td>LRFDI</td>
<td>-2.945*</td>
<td>-4.127*</td>
</tr>
</tbody>
</table>

*Source: Output of Phillips-Perron Unit Root Tests from Eviews 8.0*

* denotes the statistical significance at 5 percent level.
The results of the ADF and PP tests are mostly consistent, except for the cases of real economic output (LRGDP) in its first difference, real consumer price index (LCPI) in its first difference and real foreign direct investment (LRFDI) in level.

Considering to the differences between the outcomes from these two forms of unit root tests, the t-statistics of LRGDP in the first difference under the ADF results surpass their critical values at 5% significance levels regardless of trend and intercept; the t-statistics of LCPI under the ADF tests are lower than their critical value in the case of trend and intercept; the t-statistics of LRFDI in level under the PP tests are less than their critical value at 5 percent level of significance under the case of trend, and trend and intercept.

However, evaluating the significances of trend and intercept in corresponding regressions (which are reported in unit root results run by Eviews 8.0), the series of real GDP in difference and real FDI in level appear to be reasonable with the existence of trend. Wherein, it is noticed that the calculated t-statistic of real GDP in the first difference by the ADF test is quite close to its critical value at 5% level of significance (-2.803 and -2.879, respectively), while the calculated t-statistic of real FDI in level under the PP results nearly reaches its critical value at a 5% level of significance (-2.945 and -2.879, respectively). Together with further support from the KPSS results (Table 5-7), it is henceforward rational to treat LRGDP and LRFDI as I (1) time series. It suggests that both of them are not stationary time series at levels but turn into stationary after first differencing.

Irrespective of these minor dissimilarities, under the ADF and PP tests, the rejection of null hypothesis of a unit root are consistently failed for a majority of macroeconomic variables in their natural logarithm transformations (including LRVNI, LCPI, LRMS, LRFR, and LREX) at levels, but statistically reject the null hypothesis for those variables in their first differences. It implies that LRVNI, LCPI, LRMS, LRFR, and LREX are first difference stationary time series, not stationary at levels. In other words, these variables are individually integrated at I(1).
The KPSS tests below show the matches in results compared to two previous tests, excluding the outcomes of LCPI, LRMS, and LRFR in levels with trend and intercept (Table 5-7). Accordingly, LCPI, LRMS, and LRFR are seen as stationary at levels in case of including both trend and intercept. Without these exception, all variables of interest are found as I(1), while they contain unit roots at levels then become stationary after first differenced either when they contain trend or both trend and intercept.

**Table 5-7. KPSS Results on Log Levels and First Differences**

<table>
<thead>
<tr>
<th>KPSS Results</th>
<th>Level</th>
<th>First Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Trend and Intercept</td>
</tr>
<tr>
<td>Variables</td>
<td>Trend</td>
<td>0.726 0.153</td>
</tr>
<tr>
<td>LRVNI</td>
<td>Trend and Intercept</td>
<td>0.086* 0.051*</td>
</tr>
<tr>
<td>LRGDP</td>
<td>1.554 0.402</td>
<td>0.389* 0.110*</td>
</tr>
<tr>
<td>LCPI</td>
<td>0.644 0.138*</td>
<td>0.080* 0.026*</td>
</tr>
<tr>
<td>LRMS</td>
<td>1.572 0.144*</td>
<td>0.053* 0.052*</td>
</tr>
<tr>
<td>LRFR</td>
<td>1.090 0.078*</td>
<td>0.071* 0.050*</td>
</tr>
<tr>
<td>LREX</td>
<td>1.016 0.294</td>
<td>0.117* 0.050*</td>
</tr>
<tr>
<td>LRFDI</td>
<td>0.966 0.172</td>
<td>0.088* 0.066*</td>
</tr>
</tbody>
</table>

* Source: Output of Kwiatkowski-Phillips-Schmidt-Shin Unit Root Tests from Eviews 8.0

* denotes the statistical significance at 5 percent level.

**Table 5-8. Critical Values for Unit Root Tests at 5% Significance Level**

<table>
<thead>
<tr>
<th></th>
<th>ADF(1)</th>
<th>PP(2)</th>
<th>KPSS(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-2.879</td>
<td>-2.879</td>
<td>0.463</td>
</tr>
<tr>
<td>Trend and Intercept</td>
<td>-3.438</td>
<td>-3.438</td>
<td>0.146</td>
</tr>
<tr>
<td>None</td>
<td>-1.943</td>
<td>-1.943</td>
<td>-</td>
</tr>
</tbody>
</table>

* Source: Critical Values for Unit Root Tests from Eviews 8.0

(1) and (2) MacKinnon (1996) critical values for rejection of the null hypothesis of a unit root

(3) KPSS (1992) asymptotic critical values for rejection of the null hypothesis of stationarity
Notwithstanding the occurrence of few conflicts among the findings from three different unit root tests, all variables of interest (LRVNI, LRGDP, LCPI, LRMS, LRFR, LREX, LRFDI) are reasonably treated as non-stationary time series, which are individually I(1) (relied on the common in results among three methods). They all become I(0) or stationary after taking their first differences.

The same order of integration (i.e. I(1)) among selected variables is sufficient to apply the cointegration tests exploiting the Johansen technique, as described in the previous chapter (Section 4.7, Chapter 4). Thus, the cointegrating and causality linkages between returns on VN-Index and six nominated macroeconomic variables are proceeding in bivariate and multivariate analyses and the results will be provided in the following sections.

5.4. BIVARIATE ANALYSIS

The bivariate cointegration concerning the stock market and each macroeconomic variable is forwardly constructed following the Johansen cointegration testing procedure. As described in Chapter 4, after checking the integration order of the variables, the process continues with three other steps: selecting the optimal number of lag order for the VAR models; determining the order of cointegration using the trace and max eigenvalue statistics tests; and estimating the short-run relationship via the VECM framework.

5.4.1. Selection of Optimal Lag Length for Bivariate VAR Models

The appropriate lag orders for VAR models are widely chosen by selected information criteria (i.e. Akaike information criterion (AIC) and Schwarz information criterion (SC)). Table 5-9 below summarizes the results of the lag lengths selected by AIC and SC and also presents the optimal lag orders for different bivariate VAR models by increasing the suggested lags until free of autocorrelation in the residuals.
Table 5-9. Lag Length Specifications for Bivariate VAR Models

<table>
<thead>
<tr>
<th>Equation</th>
<th>Lag Length Selected by AIC</th>
<th>Lag Length Selected by SC</th>
<th>Optimal Lag Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>F(LRVNI</td>
<td>LRGDP)</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>F(LRVNI</td>
<td>LCPI)</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>F(LRVNI</td>
<td>LRMS)</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>F(LRVNI</td>
<td>LRFR)</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>F(LRVNI</td>
<td>LREX)</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>F(LRVNI</td>
<td>LRFDI)</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Selection of Lag Orders by Eviews 8.0

The optimal lag lengths that are selected from Table 5-9 are used in the following cointegration and causality analyses.

5.4.2. Results of Bivariate Johansen Cointegration Tests

The null hypothesis under consideration is that there is no existence of cointegration and \( r \) denotes the number of cointegrating relationships, the results of the Johansen cointegration tests are exhibited in Table 5-10. As mentioned in Section 4.5.2.2, the critical values of the cointegration test vary based on the presence of an intercept or a deterministic trend included in the system (Johansen, 1991, 1995). To select an appropriate deterministic trend assumption among the five different suggestions introduced by Johansen (1995), the research employs information criteria (Log Likelihood-LL, Akaike Information Criteria-AIC and Schwarz Criteria-SC) by rank and model, with a preference for the SC method.
Table 5-10. Bivariate Cointegration Results under the Johansen Approach

<table>
<thead>
<tr>
<th></th>
<th>No. of CE(s)</th>
<th></th>
<th>No. of CE(s)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r=0</td>
<td>r≤1</td>
<td>r=0</td>
<td>r≤1</td>
</tr>
<tr>
<td>LRVNI and LRGDP</td>
<td>Eigenvalue</td>
<td>0.1005</td>
<td>0.0017</td>
<td>Eigenvalue</td>
</tr>
<tr>
<td></td>
<td>Trace Statistic</td>
<td>14.6415</td>
<td>0.2377</td>
<td>Max-Eigen Statistic</td>
</tr>
<tr>
<td></td>
<td>Prob.**</td>
<td>0.0669</td>
<td>0.6259</td>
<td>Prob.**</td>
</tr>
<tr>
<td>LRVNI and LCPI</td>
<td>Eigenvalue</td>
<td>0.1074</td>
<td>0.0339</td>
<td>Eigenvalue</td>
</tr>
<tr>
<td></td>
<td>Trace Statistic</td>
<td>21.1808</td>
<td>4.9263</td>
<td>Max-Eigen Statistic</td>
</tr>
<tr>
<td></td>
<td>Prob.**</td>
<td>0.0373*</td>
<td>0.2916</td>
<td>Prob.**</td>
</tr>
<tr>
<td>LRVNI and LRMS</td>
<td>Eigenvalue</td>
<td>0.0666</td>
<td>0.0001</td>
<td>Eigenvalue</td>
</tr>
<tr>
<td></td>
<td>Trace Statistic</td>
<td>10.0833</td>
<td>0.0151</td>
<td>Max-Eigen Statistic</td>
</tr>
<tr>
<td></td>
<td>Prob.**</td>
<td>0.2744</td>
<td>0.9021</td>
<td>Prob.**</td>
</tr>
<tr>
<td>LRVNI and LRFR</td>
<td>Eigenvalue</td>
<td>0.0837</td>
<td>0.0149</td>
<td>Eigenvalue</td>
</tr>
<tr>
<td></td>
<td>Trace Statistic</td>
<td>15.0536</td>
<td>2.2001</td>
<td>Max-Eigen Statistic</td>
</tr>
<tr>
<td></td>
<td>Prob.**</td>
<td>0.2233</td>
<td>0.7376</td>
<td>Prob.**</td>
</tr>
<tr>
<td>LRVNI and LREX</td>
<td>Eigenvalue</td>
<td>0.0333</td>
<td>0.0214</td>
<td>Eigenvalue</td>
</tr>
<tr>
<td></td>
<td>Trace Statistic</td>
<td>8.1523</td>
<td>3.1758</td>
<td>Max-Eigen Statistic</td>
</tr>
<tr>
<td></td>
<td>Prob.**</td>
<td>0.8117</td>
<td>0.5484</td>
<td>Prob.**</td>
</tr>
<tr>
<td>LRVNI and LRFDI</td>
<td>Eigenvalue</td>
<td>0.1187</td>
<td>0.0299</td>
<td>Eigenvalue</td>
</tr>
<tr>
<td></td>
<td>Trace Statistic</td>
<td>22.8718</td>
<td>4.4259</td>
<td>Max-Eigen Statistic</td>
</tr>
<tr>
<td></td>
<td>Prob.**</td>
<td>0.0214*</td>
<td>0.3524</td>
<td>Prob.**</td>
</tr>
</tbody>
</table>

* indicates rejection of the hypothesis at 5% significance level.

** p-values provided by MacKinnon-Haug-Michelis (1999).

Source: Output of Johansen Cointegration Tests by Eviews 8.0

According to the trace and maximum eigenvalue outcomes at 5% significance level, it is suggested that stock market shares the long-run path with three macroeconomic variables: economic growth, consumer price index, and foreign direct investment in real values. However, the null hypotheses of no cointegration between VN-Index and the rest of macroeconomic indicators (refinancing rate, money supply, and exchange rate) cannot be rejected, even at a 10% significance level.
Hence, excluding these three factors, the Johansen results indicate at least one cointegrating vector between real returns on Vietnam’s security prices and each of the remaining macroeconomic indicators. The normalized cointegrating equations that represent long-run equilibriums amongst variables are summarized in Table 5-11 as follows.

The illustration of estimated cointegrating equations from the vector error correction models (VECMs) (Table 5-11) suggests that real economic growth, consumer price index, and real foreign direct investment positively relate to a real Vietnam’s stock market index. While LRGDP insignificantly links with the Vietnam’s stock market in long term (with t-statistic = -0.40), the remaining variables (LCPI and LRFDI) statistically significantly contribute to the long-run path with the real stock market index in Vietnam (their t-statistics are -5.98 and -11.22, respectively). Furthermore, each 1% movement forward of real economic growth, consumer price index, and real foreign direct investment can respectively contribute to 0.08%, 13.44%, and 0.46% rise in real stock market index.

### Table 5-11. Results of Vector Error Correction Estimates

<table>
<thead>
<tr>
<th>Functions</th>
<th>Normalized Cointegrating Equations</th>
<th>ECT [t-statistic]</th>
</tr>
</thead>
<tbody>
<tr>
<td>F(LRVNI</td>
<td>LRGDP)</td>
<td>( LRVNI = 0.0796 \times \text{LRGDP} + 4.8338 )</td>
</tr>
<tr>
<td>F(LRVNI</td>
<td>LCPI)</td>
<td>( LRVNI = 13.4380 \times \text{LCPI} - 57.2513 )</td>
</tr>
<tr>
<td>F(LRVNI</td>
<td>LRFDI)</td>
<td>( LRVNI = 0.4561 \times \text{LFDI} - 0.2110 )</td>
</tr>
</tbody>
</table>

*Source: VECM Results by Eviews 8.0*

Also exhibited in Table 5-11, the error correction terms (ECTs) for all of the cointegrating relationships are negative but only appear significant at 5% significance level in the equation between VN-Index and economic growth. The coefficient of -0.0561 reflects a speed of 5.61% monthly from any disequilibrium in short-run towards the long-run equilibrium.
5.4.3. Results of Bivariate Granger Causality Tests

Engle-Granger (1987) stated that there would exist a causal relationship between two cointegrated non-stationary series, in at least one direction. While the cointegrating vectors have been established among the system, causality tests are further applied to analyze the dynamic bivariate interactions. The research project uses two main methods to investigate the presence of any bivariate causal links amongst the candidate variables: the standard pairwise Granger causality test and the TYDL Granger causality test.

5.4.3.1. Pairwise Granger Causality Results

The research firstly uses the standard pairwise Granger causality tests operated by Eviews 8.0 to inspect the bivariate causal links between macroeconomic indicators and stock prices. The lag length used for pairwise Granger causality tests are selected from Table 5-9. The results of the causality relationship are represented in Table 5-12.

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>F-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRGDP does not Granger Cause LRVNI</td>
<td>1.0768</td>
<td>0.3860</td>
</tr>
<tr>
<td>LRVNI does not Granger Cause LRGDP</td>
<td><strong>1.5735</strong></td>
<td>0.0663</td>
</tr>
<tr>
<td>LCPI does not Granger Cause LRVNI</td>
<td>1.1769</td>
<td>0.953</td>
</tr>
<tr>
<td>LRVNI does not Granger Cause LCPI</td>
<td><strong>1.7728</strong></td>
<td>0.0407</td>
</tr>
<tr>
<td>LRMS does not Granger Cause LRVNI</td>
<td><strong>1.6783</strong></td>
<td>0.0691</td>
</tr>
<tr>
<td>LRVNI does not Granger Cause LRMS</td>
<td>1.1586</td>
<td>0.3162</td>
</tr>
<tr>
<td>LRFR does not Granger Cause LRVNI</td>
<td><strong>3.4177</strong></td>
<td>0.0002</td>
</tr>
<tr>
<td>LRVNI does not Granger Cause LRFR</td>
<td>1.4355</td>
<td>0.1527</td>
</tr>
<tr>
<td>LREX does not Granger Cause LRVNI</td>
<td>0.5040</td>
<td>0.9185</td>
</tr>
<tr>
<td>LRVNI does not Granger Cause LREX</td>
<td>0.4499</td>
<td>0.9473</td>
</tr>
<tr>
<td>LRFDI does not Granger Cause LRVNI</td>
<td>1.4137</td>
<td>0.1573</td>
</tr>
<tr>
<td>LRVNI does not Granger Cause LRFDI</td>
<td><strong>2.6530</strong></td>
<td>0.0021</td>
</tr>
</tbody>
</table>

* and ** denote the rejection of the null hypothesis at 5% and 10% respectively.

Source: Output of Pairwise Granger Causality Test by Eviews 8.0
As given in Table 5-12, none of bi-directional causality is found among Vietnam’s stock market prices and any individual macroeconomic variables. However, the null hypothesis of Granger non-causality is accepted for the one-way direction from real money supply (at 10% significance level), and from real refinancing rate to stock market index (at 5% significance level). It recommends that the previous movements of money supply and real financing rate, alongside the historical values of stock market index, can be possibly used to predict the equity returns.

Furthermore, unidirectional causal links originating from stock prices are found to real economic growth (at 10% level of significance) and real foreign direct investment (at 5% level of significance). The results suggest that stock market indexes play an essential part in explaining the changes in economic growth as well as foreign direct investment under the case of Vietnam.

The outcome of the standard Granger causality tests from Table 5-12 reveals no conflicts to the findings of cointegration results. Engle-Granger (1987) stated that if a pair of two non-stationary series I(1) are cointegrated, there would be a causal relationship between these two series, at least in one direction. The Johansen findings indicate three cointegrating relationships (between LRVNI and RLGDP, LRVNI and LCPI, and LRVNI and LRFDI). At least one directional causal is correspondingly found for each cointegrating relation. The findings of causality by standard method, therefore, seem reliable and satisfied.

5.4.3.2. Bivariate Granger Causality Results using TYDL Method

For the next step within bivariate Granger causality analysis, the research utilizes the TYDL procedure under the VAR framework to uncover the bivariate causal relations between Vietnam’s equity market index and nominated macroeconomic factors.

As mentioned earlier in Chapter 4 (Section 4.7.3.2), the TYDL approach is applied which consists of four main steps: (1) setting up a VAR model in the levels of the data; (2) determining the appropriate maximum lag order (ρ) for variables
to ensure that VAR is well-specified; (3) checking up cointegration relationships among variables; and (4) testing for Granger causality using a modified Wald test (MWald) for the null hypothesis that the coefficients of the first \( p \) lagged values of one variable are zero in the regression of another variable.

In previous sections (5.4.1 and 5.4.2), the study set up VAR models for pairs of stock prices and each macroeconomic variable using optimal lag length that takes no autocorrelation problem into account. The attendance of a bivariate cointegrating relationship between equity prices and macroeconomic indicators has also been examined by Johansen cointegration tests (illustrated in Table 5-10). Accordingly, there are four significant long-run relationships that are found among the variables of interest. Since the TYDL method is conducted inside the context of VAR, the findings of Johansen are preferable to use for reliable results. Regardless of the findings of the cointegrations between variables, the TYDL procedure can be processed because the results of cointegration have no impact on the TYDL Granger causality outcome. However, they can be used as a crosscheck afterwards.

The results of bivariate Granger causal links based on the TYDL technique between Vietnam’s stock market index and six macroeconomic factors are demonstrated in Table 5-13.

**Table 5-13. Bivariate Granger Causality Results using TYDL Approach**

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>MWALD-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRGDP ( \rightarrow ) LRVNI</td>
<td>25.0293</td>
<td>0.4042</td>
</tr>
<tr>
<td>LRVNI ( \rightarrow ) LRGDP</td>
<td>25.5900</td>
<td>0.3743</td>
</tr>
<tr>
<td>LCPI ( \rightarrow ) LRVNI</td>
<td>20.7000</td>
<td>0.2400</td>
</tr>
<tr>
<td>LRVNI ( \rightarrow ) LCPI</td>
<td><strong>26.1004</strong></td>
<td>0.0727</td>
</tr>
<tr>
<td>LRMS ( \rightarrow ) LRVNI</td>
<td>19.7728</td>
<td>0.1375</td>
</tr>
<tr>
<td>LRVNI ( \rightarrow ) LRMS</td>
<td>16.4804</td>
<td>0.2849</td>
</tr>
<tr>
<td>LRFR ( \rightarrow ) LRVNI</td>
<td><strong>46.5736</strong></td>
<td>0.0000</td>
</tr>
<tr>
<td>LRVNI ( \rightarrow ) LRFR</td>
<td>15.1521</td>
<td>0.2980</td>
</tr>
<tr>
<td>LREX ( \rightarrow ) LRVNI</td>
<td>7.2294</td>
<td>0.8899</td>
</tr>
</tbody>
</table>
LRVNI → LREX  4.9211  0.9769
LRFDI → LRVNI  15.4416  0.3486
LRVNI → LRFDI  38.2075*  0.0005

* and ** denote the rejection of the null hypothesis at 5% and 10%, respectively.

Source: Output of Modified WALD Tests by Eviews 8.0

The results of the TYDL method reveal three unidirectional causality relationships: from LRVNI to LCPI, from LRFR to LRVNI, and from LRVNI to LRFDI. They seem to be consistent with the findings of standard Granger causality tests. However, differentiating the previous outcomes (illustrated in Table 5-12), no causal links have been found between stock market returns and economic growth by TYDL approach. These outputs go against Engle-Granger (1987)’s findings wherein two cointegrated variables must have a causal link in at least one direction.

5.5. MULTIVARIATE ANALYSIS

While three cointegrating vectors between variables have been found under the Johansen approach, it remains a concern whether stock returns and macroeconomic factors share multivariate long-run equilibrium. Hence, the study employs the Johansen procedure as the key method to examine the existence of multivariate cointegration, which engages similar stages as designated for the previous bivariate analysis. Afterwards, multiple Granger causality tests are constructed to find out the presence of any unidirectional and bidirectional causal dynamics between Vietnam’s stock market index and selected macroeconomic indicators.

5.5.1. Lag Length Selection for the Multivariate VAR Model

Similarity to the bivariate analysis, the study firstly estimates the unrestricted VAR to select the maximum appropriate order of lag. The maximum lag length specified for the test is 12, as the study employs monthly data.
Table 5-14. The Selection of Optimal Lag Length under Unrestricted VAR

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>283.9371</td>
<td>NA</td>
<td>5.73E-11</td>
<td>-3.717276</td>
<td>-3.576151</td>
<td>-3.659939</td>
</tr>
<tr>
<td>6</td>
<td>2035.643</td>
<td>78.12071</td>
<td>2.05E-19</td>
<td>-23.2838</td>
<td>-17.21543</td>
<td>-20.81832</td>
</tr>
<tr>
<td>7</td>
<td>2084.448</td>
<td>64.85422</td>
<td>2.21E-19</td>
<td>-23.28118</td>
<td>-16.22493</td>
<td>-20.41434</td>
</tr>
<tr>
<td>9</td>
<td>2188.797</td>
<td>80.5209</td>
<td>2.55E-19</td>
<td>-23.3664</td>
<td>-14.3344</td>
<td>-19.69684</td>
</tr>
<tr>
<td>10</td>
<td>2359.626</td>
<td>178.8548</td>
<td>5.88E-20</td>
<td>-25.00169</td>
<td>-14.98181</td>
<td>-20.93078</td>
</tr>
<tr>
<td>12</td>
<td>2531.434</td>
<td><strong>73.49942</strong></td>
<td><strong>3.61E-20</strong></td>
<td><strong>-25.99240</strong></td>
<td>-13.99678</td>
<td>-21.11878</td>
</tr>
</tbody>
</table>

Source: Output of Lag Length Selection by Eviews 8.0

* indicates lag order selected by the criterion

Table 5-14 summarizes different lag orders selected by various methods. The Schwarz information criterion (SC) and the Hannan-Quinn information criterion (HQ) suggest a lag length of 2 while the remaining tests recommend a lag length of 12. In order to avoid overestimating the number of lag and within the context of relative small sample size, the research starts with a lag order of 2 recommended by the SC method. The lag order is then increased until the autocorrelation problem in the VAR system can be eliminated. The output of autocorrelation LM tests for serial correlation in residuals of various VAR models (with lag numbers are correspondingly selected at 5, 13, and 17) are exhibited in Table 5-15.

It can be seen that the null hypothesis of no autocorrelation is confirmed when the order of lag is as high as 13 or 17 (at 10% significance level). However, including too many lags in the VAR model may generate inefficient estimations (Brandt and Williams, 2007). For this reason, VAR (5) is selected as the most
appropriate model for the research. Even serial correlations are occurred at lag 5th and 12th; the estimated residuals behave mostly like white-noise series (Figure 5-9). Additionally, the VAR(5) model satisfies stability condition as illustrated in Figure 5-8.

Table 5-15. Results of Autocorrelation LM Test for the VAR Models

<table>
<thead>
<tr>
<th>Lags</th>
<th>VAR(5)</th>
<th></th>
<th>VAR(13)</th>
<th></th>
<th>VAR(17)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60.94</td>
<td>0.12</td>
<td>63.08</td>
<td>0.09</td>
<td>56.60</td>
<td>0.21</td>
</tr>
<tr>
<td>2</td>
<td>62.90</td>
<td>0.09</td>
<td>59.42</td>
<td>0.15</td>
<td>56.12</td>
<td>0.23</td>
</tr>
<tr>
<td>3</td>
<td>50.42</td>
<td>0.42</td>
<td>68.34</td>
<td>0.04</td>
<td>74.25</td>
<td>0.01</td>
</tr>
<tr>
<td>4</td>
<td>49.15</td>
<td>0.47</td>
<td>46.43</td>
<td>0.58</td>
<td>61.41</td>
<td>0.11</td>
</tr>
<tr>
<td>5</td>
<td>91.75</td>
<td>0.00</td>
<td>49.93</td>
<td>0.44</td>
<td>61.65</td>
<td>0.11</td>
</tr>
<tr>
<td>6</td>
<td>67.51</td>
<td>0.04</td>
<td>60.12</td>
<td>0.13</td>
<td>62.12</td>
<td>0.10</td>
</tr>
<tr>
<td>7</td>
<td>51.75</td>
<td>0.37</td>
<td>52.60</td>
<td>0.34</td>
<td>60.16</td>
<td>0.13</td>
</tr>
<tr>
<td>8</td>
<td>57.76</td>
<td>0.18</td>
<td>52.44</td>
<td>0.34</td>
<td>60.42</td>
<td>0.13</td>
</tr>
<tr>
<td>9</td>
<td>37.34</td>
<td>0.89</td>
<td>46.05</td>
<td>0.59</td>
<td>43.18</td>
<td>0.71</td>
</tr>
<tr>
<td>10</td>
<td>61.10</td>
<td>0.12</td>
<td>51.16</td>
<td>0.39</td>
<td>58.01</td>
<td>0.18</td>
</tr>
<tr>
<td>11</td>
<td>56.42</td>
<td>0.22</td>
<td>39.40</td>
<td>0.83</td>
<td>67.69</td>
<td>0.04</td>
</tr>
<tr>
<td>12</td>
<td>156.66</td>
<td>0.00</td>
<td>41.99</td>
<td>0.75</td>
<td>69.67</td>
<td>0.03</td>
</tr>
<tr>
<td>13</td>
<td>67.41</td>
<td>0.04</td>
<td>58.17</td>
<td>0.17</td>
<td>73.08</td>
<td>0.01</td>
</tr>
<tr>
<td>14</td>
<td>35.22</td>
<td>0.93</td>
<td>74.44</td>
<td>0.01</td>
<td>67.65</td>
<td>0.04</td>
</tr>
<tr>
<td>15</td>
<td>66.83</td>
<td>0.05</td>
<td>49.31</td>
<td>0.46</td>
<td>53.62</td>
<td>0.30</td>
</tr>
<tr>
<td>16</td>
<td>56.19</td>
<td>0.22</td>
<td>45.26</td>
<td>0.63</td>
<td>52.88</td>
<td>0.33</td>
</tr>
<tr>
<td>17</td>
<td>38.37</td>
<td>0.86</td>
<td>62.14</td>
<td>0.10</td>
<td>46.55</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Source: Output of Autocorrelation LM Test by Eviews 8.0
Figure 5-8. AR Roots Graph of the VAR(5) Model

Source: AR Roots Graph of VAR(5) by Eviews 8.0

Figure 5-9. The Estimated Residuals of the VAR(5) Model

Source: Residuals of VAR(5) by Eviews 8.0
5.5.2. Results of the Multivariate Johansen Cointegration Approach

The research employs the Johansen cointegration method under the VAR framework to study the long-run equilibrium relationship between Vietnam’s securities market returns and macroeconomic indicators. Since all the time series in the study are I(1), the VECM is afterwards estimated as a restricted form of VAR to investigate short-run dynamics among selected factors.

Assuming that all of the variables have stochastic trends, the research precedes the Johansen cointegration test using a VAR model included a linear trend, and the cointegration relationship included an intercept and no trend. The Johansen cointegration results illustrated in Table 5-16 specify three cointegrating vectors at the 5 percent level of significance via the trace statistic test and one vector of cointegration at the 5 percent significance level via the maximum eigenvalue statistic test. Johansen and Juselius (1990) and Enders (2004) suggest that further study allows for one cointegrating vector among variables of interest grounded on the output of max-eigenvalue test.
Table 5-16. Results of the Multivariate Johansen Cointegration Test

<table>
<thead>
<tr>
<th>Series: LRVNI LCPI LRGDP LRMS LRFR LREX LRFDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestricted Cointegration Rank Test (Trace)</td>
</tr>
<tr>
<td>No. of CE(s)</td>
</tr>
<tr>
<td>r = 0 *</td>
</tr>
<tr>
<td>r ≤ 1 *</td>
</tr>
<tr>
<td>r ≤ 2 *</td>
</tr>
<tr>
<td>r ≤ 3</td>
</tr>
<tr>
<td>r ≤ 4</td>
</tr>
<tr>
<td>r ≤ 5</td>
</tr>
<tr>
<td>r ≤ 6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unrestricted Cointegration Rank Test (Maximum Eigenvalue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of CE(s)</td>
</tr>
<tr>
<td>r = 0 *</td>
</tr>
<tr>
<td>r = 1</td>
</tr>
<tr>
<td>r = 2</td>
</tr>
<tr>
<td>r = 3</td>
</tr>
<tr>
<td>r = 4</td>
</tr>
<tr>
<td>r = 5</td>
</tr>
<tr>
<td>r = 6</td>
</tr>
</tbody>
</table>

* denotes rejection of the hypothesis at 5% level of significance

** MacKinnon-Haug-Michelis (1999) p-values

Source: Output of Johansen Cointegration Test by Eviews 8.0

In other words, it is practical to conclude that the Vietnam’s stock market prices and macroeconomic variables share a long-term path. The normalized equation below represents a cointegrating vector or a long-run connection that is established between VN-Index and six macroeconomic indicators.
$LRVNI = 125.26 + 7.97 LRGDP - 8.63 LCPI - 4.64 LRMS + 1.68 LRFR - 12.33 LREX + 0.35 LRFDI$

$\begin{pmatrix}
(1.4111) & (3.8142) & (0.5995) & (0.9109) & (2.4843) & (0.1275) \\
\end{pmatrix}$

(Eq. 5-4)

Note: Standard errors in parentheses and t-statistics in square brackets

The findings indicate that all of the coefficients are statistically significant at 5 percent significance level, as all of the t-statistics are greater than 2 in absolute values. In addition, real economic growth, real interest rate and real foreign direct investment positively affect the index of the Vietnam’s stock market, while the remaining variables show the negative effect. Put differently, any surge in real VNI can be caused by an increase in real GDP, real refinancing rate, or real FDI while any decline of real VNI can be explained by a rise in CPI, real M2, or real exchange rate (USD/VND).

The empirical findings above not only verify the establishment of a long-run equilibrium between equity market returns and the set of macroeconomic factors for the case of Vietnam, but also affirm the evidence of a short-run dynamics amongst these time series. Specifically, the coefficient of the lagged ECT signifies the speed of adjustment from short-run disequilibrium to restore back to the long-run position. In particular, the coefficient estimation of ECT (-1) is -0.0227, suggesting a moderate slowdown in the adjustment process. About 2.27% of the previous month’s disequilibrium in the stock market index from its equilibrium caused by changes in macroeconomic variables will be corrected in the current month. In respect to Engle-Granger (1987), there would be at least one unidirectional causal relationship between these variables. The subsequent section employs Granger causality analysis for multiple time series to find evidence of causality links between these indicators under the study in both long and short-run.
5.5.3. Results of the Multivariate Granger Causality Tests

To access both short- and long-run unidirectional causalities between the variables, the following analysis firstly applies the Wald Test/F-Test to the VECM. The bidirectional causality is further explored based on the TYDL (Toda and Yamamoto, 1995; Dolado and Lutkepohl, 1996) procedure within the VAR framework.

5.5.3.1. Granger Causality Results based on VECM

The lag length of 4 is suggested in order to eliminate autocorrelation problems in the VECM system. The results of autocorrelation LM Tests exhibit the free of serial correlation in residuals, as shown in Table 5-17.

Table 5-17. Results of Autocorrelation LM Test for the VECM(4)

<table>
<thead>
<tr>
<th>VEC Residual Serial Correlation LM Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null Hypothesis: no serial correlation at lag order h</td>
</tr>
<tr>
<td>Lags</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

Source: Output of Autocorrelation LM Test by Eviews 8.0

In order to establish short-run causality, the study applies the Wald Test to the VECM equation to investigate whether the lagged differedenced explanatory variables jointly influence equity returns (dependent variable). The results given in Table 5-18 indicate weak evidence of a unidirectional causal link from macroeconomic factors to stock market returns in short term. Specifically, causal links are found from interest rates to the stock market index at 5% significance level and from money supply to the stock market at 10% significance level.
On the contrary, the weak support for a long-run unidirectional causality from macroeconomic variables to stock market returns is statistically discovered by the negativity and significance of an error correction term at 10% conventional level (Table 5-18). However, this empirical result strongly verifies the conclusion from the Johansen cointegration test. Wherein, there exists a long-run unidirectional causal link originating from macroeconomic factors to stock returns within the context of Vietnam’s economy. Particularly, the previous values of macroeconomic variables can contribute to better verdict for VN-Index in the long run.

Table 5-18. Unidirectional Granger Causality based on ECM Model

<table>
<thead>
<tr>
<th>F-statistic (p-value)</th>
<th>t-statistic (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short-run Causality</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td>ΔLRGDP</td>
</tr>
<tr>
<td>ΔLRVNI</td>
<td>1.0448 (0.3869)</td>
</tr>
</tbody>
</table>

* and ** denote statistically significance at 5 percent and 10 percent, respectively.

5.5.3.2. Multivariate Granger Causality Results using TYDL Approach

Taking into consideration the bidirectional causal links between returns on Vietnam’s equity prices and macroeconomic factors, the research inserts the modified Granger causality test – the TYDL method (Toda and Yamamoto, 1995; Dolado and Lutkepohl, 1996).
Table 5-19. Bidirectional Granger Causality using the TYDL Approach

<table>
<thead>
<tr>
<th>Dependnat Variable</th>
<th>LRVNI</th>
<th>LRGDP</th>
<th>LCPI</th>
<th>LRMS</th>
<th>LRFR</th>
<th>LREX</th>
<th>LRFDI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>LRVNI</td>
<td>-----</td>
<td>4.4913(0.4810)</td>
<td>7.0811(0.2147)</td>
<td>11.5792*(0.0410)</td>
<td>15.0284*(0.0102)</td>
<td>3.4495(0.6310)</td>
<td>10.0719*(0.0732)</td>
</tr>
<tr>
<td>LRGDP</td>
<td>0.7189(0.9819)</td>
<td>-----</td>
<td>17.0509*(0.0044)</td>
<td>37.3811*(0.0000)</td>
<td>3.4326(0.6336)</td>
<td>4.8431(0.4353)</td>
<td>10.0223(0.0746)</td>
</tr>
<tr>
<td>LCPI</td>
<td>8.5423(0.1288)</td>
<td>2.9174(0.7127)</td>
<td>-----</td>
<td>5.4166(0.3672)</td>
<td>6.5225(0.2586)</td>
<td>2.5370(0.7709)</td>
<td>6.5674(0.2549)</td>
</tr>
<tr>
<td>LRMS</td>
<td>5.3649(0.3730)</td>
<td>31.3025*(0.0000)</td>
<td>22.2550*(0.0005)</td>
<td>-----</td>
<td>10.1989(0.0698)</td>
<td>5.7917(0.3270)</td>
<td>3.8402(0.5726)</td>
</tr>
<tr>
<td>LRFR</td>
<td>5.7970(0.3265)</td>
<td>1.1065(0.9535)</td>
<td>20.7483*(0.0009)</td>
<td>12.0663*(0.0339)</td>
<td>-----</td>
<td>4.6889(0.4550)</td>
<td>7.6383(0.1773)</td>
</tr>
<tr>
<td>LREX</td>
<td>2.3627(0.7970)</td>
<td>9.1062(0.1049)</td>
<td>27.0710*(0.0001)</td>
<td>3.7960(0.5791)</td>
<td>3.6007(0.6082)</td>
<td>-----</td>
<td>9.4023(0.0941)</td>
</tr>
<tr>
<td>LRFDI</td>
<td>4.9939(0.4166)</td>
<td>5.7784(0.3284)</td>
<td>5.7680(0.3295)</td>
<td>7.6579(0.1761)</td>
<td>9.0834(0.1058)</td>
<td>3.6998(0.5934)</td>
<td>-----</td>
</tr>
</tbody>
</table>

* and ** denote statistically significance at 5 percent and 10 percent, respectively.

Source: Output of Modified Wald Tests using TYDL Method by Eviews 8.0

Table 5-19 marks evidence of the dynamic links running from money supply and the refinancing rate to equity returns at the significance level of 5%. Another causal nexus is also uncovered at the significance level of 10%, from foreign direct investment to equity returns. These outcomes suggest that Vietnam’s stock market movements might be forecasted by historical values of diverse macroeconomic elements, i.e. money supply, interest rate, and foreign direct investment. Otherwise, there is no unidirectional causality generating from macroeconomic factors to VN-Index. Therefore, none of bidirectional causality has been established between Vietnam’s stock market index and macroeconomic variables.
5.6. **DYNAMIC ANALYSIS**

Although the roles of cointegration and causality tests are undeniably vital, none of them manages to identify the strength of the relation between the variables of interest as well as to describe these interactions over time. In the matter of examining the response of VN-Index to any shocks or innovations in specified macroeconomic series over the selected time period, the research conducts dynamic analysis by means of impulse response functions (IRF) and variance decomposition (VD).

5.6.1. **Impulse Response Functions**

As mentioned earlier in Chapter 4, the generalized impulse response functions (GIRF) is utilized to examine the response of Vietnam stock index to any macroeconomic innovations, and vice versa. It follows the method of Pesaran and Shin (1998) and Lanne and Nyberg (2014) in order to overcome the problems raised by the sensitivity of variables' ordering and the possibility of insufficient restrictions imposed to obtain a structural model (Luetkepohl, 1991; Lanne and Nyberg, 2014). In particular, GIRF is served as a random variable in the given model. The GIRF uses 12 periods and 36 periods to ensure sufficient time for tracing the impact of a one-time shock to variables in the system.

Table 5-20 represents the response of Vietnam stock prices to an innovation originating from each of macroeconomic variables over the 12-month period under the GIRF analysis. To observe how quickly the system returns to equilibrium after a shock, the GIRF extends the time period to 36 months. Figure 5-10 follows in sequence, demonstrating the response of VN-Indexto a generalized one standard deviation shock in individual macroeconomic forces. The accumulated impulse response functions between the variables are depicted in Figure 5-11.
Table 5-20. Impulse Response Functions of Stock Prices to Generalized One S.D Innovation in Macroeconomic Variables

<table>
<thead>
<tr>
<th>Period</th>
<th>LRGDP</th>
<th>LCPI</th>
<th>LRMS</th>
<th>LRFR</th>
<th>LREX</th>
<th>LRFDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.002932</td>
<td>-0.01107</td>
<td>0.009585</td>
<td>-0.004787</td>
<td>0.008817</td>
<td>0.001711</td>
</tr>
<tr>
<td></td>
<td>-0.00665</td>
<td>-0.00662</td>
<td>-0.00663</td>
<td>-0.00665</td>
<td>-0.00663</td>
<td>-0.00665</td>
</tr>
<tr>
<td>2</td>
<td>0.008996</td>
<td>-0.029476</td>
<td>0.036904</td>
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<td>0.009341</td>
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</tr>
<tr>
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<td>-0.01182</td>
<td>-0.01223</td>
<td>-0.01218</td>
<td>-0.01254</td>
<td>-0.01254</td>
<td>-0.01255</td>
</tr>
<tr>
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<td>0.014877</td>
<td>-0.027033</td>
<td>0.043245</td>
<td>0.006091</td>
<td>-0.001807</td>
<td>0.00915</td>
</tr>
<tr>
<td></td>
<td>-0.01643</td>
<td>-0.01687</td>
<td>-0.01675</td>
<td>-0.01715</td>
<td>-0.01715</td>
<td>-0.01715</td>
</tr>
<tr>
<td>4</td>
<td>0.023769</td>
<td>-0.036837</td>
<td>0.049973</td>
<td>0.022677</td>
<td>0.003341</td>
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</tr>
<tr>
<td></td>
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<td>-0.02039</td>
<td>-0.02039</td>
<td>-0.02039</td>
</tr>
<tr>
<td>5</td>
<td>0.030106</td>
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</tr>
<tr>
<td></td>
<td>-0.02223</td>
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<td>-0.02284</td>
<td>-0.02284</td>
</tr>
<tr>
<td>6</td>
<td>0.03815</td>
<td>-0.04458</td>
<td>0.066257</td>
<td>0.001015</td>
<td>0.007195</td>
<td>0.012023</td>
</tr>
<tr>
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<td>-0.02351</td>
<td>-0.0251</td>
<td>-0.0251</td>
<td>-0.0251</td>
</tr>
<tr>
<td>7</td>
<td>0.047338</td>
<td>-0.050625</td>
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<td>-0.009076</td>
<td>0.004171</td>
<td>0.004016</td>
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<td>-0.02515</td>
<td>-0.02703</td>
<td>-0.02703</td>
<td>-0.02703</td>
</tr>
<tr>
<td>8</td>
<td>0.051055</td>
<td>-0.050912</td>
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<td>-0.015234</td>
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</tr>
<tr>
<td>9</td>
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<td>0.0603</td>
<td>-0.019786</td>
<td>0.003988</td>
<td>-0.011803</td>
</tr>
<tr>
<td></td>
<td>-0.02761</td>
<td>-0.02556</td>
<td>-0.02784</td>
<td>-0.03054</td>
<td>-0.03054</td>
<td>-0.03054</td>
</tr>
<tr>
<td>10</td>
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<td>0.055492</td>
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<td>0.002587</td>
<td>-0.014568</td>
</tr>
<tr>
<td></td>
<td>-0.02701</td>
<td>-0.02623</td>
<td>-0.02849</td>
<td>-0.03202</td>
<td>-0.03202</td>
<td>-0.03202</td>
</tr>
<tr>
<td>11</td>
<td>0.042298</td>
<td>-0.03744</td>
<td>0.052486</td>
<td>-0.023847</td>
<td>0.001677</td>
<td>-0.015406</td>
</tr>
<tr>
<td></td>
<td>-0.0251</td>
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<td>-0.02861</td>
<td>-0.03328</td>
<td>-0.03328</td>
<td>-0.03328</td>
</tr>
<tr>
<td>12</td>
<td>0.037066</td>
<td>-0.031198</td>
<td>0.049745</td>
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</tr>
<tr>
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<td>-0.0281</td>
<td>-0.03424</td>
<td>-0.01576</td>
<td>-0.02897</td>
</tr>
</tbody>
</table>

Source: Output of Impulse Response Functions by Eviews 8.0

Overall, the results of the estimated generalized impulse response functions (Table 5-20) indicate a small impact of any macroeconomic shock on the VN-Index over the specified period (none of the changes in LRVNI are found beyond 7%). The response of VN-Index to a one standard deviation disturbance in each of the macroeconomic factors seems to simultaneously increase from the third month to the seventh, and then slow down after that. Most response functions approach constant values after a period of two years (Figure 5-10).
Figure 5-10. Impulse Response Functions of VN-Index to Generalized One S.D Innovation in Macroeconomic Variables

Source: Output of Impulse Response Functions by Eviews 8.0
The greatest response of VNI is recognized for the case of innovations originating from money supply. In particular, from the fifth month to the eighth month over the selected period, Vietnam stock prices increase by over 6% each month in response to a one standard deviation disturbance in money supply. It supports for the causality in the short run from money supply to equity prices provided by the Granger causality test under the ECM-ARDL framework. In contrast, the smallest response of VN-Index is found to news in the real exchange rate, compared to other macroeconomic factors. At the period of 12, a shock in the real exchange rate can only lead to a fall of 0.09% in securities prices. This outcome is reliable with the findings of the Granger causality tests, wherein no long- and short-run causal links occurs between exchange rate and Vietnam’s stock prices.

On the other hand, the immediate response of VN-Index to shocks in all the macro variables, except for the consumer price index (CPI), is positive. The responses of VNI to a one standard deviation change in either real economic output or real money supply remain positive for the whole period. The responses of Vietnam stock index to a one-time shock in the remaining macroeconomic variables seem to be more complex. The Vietnam’s stock prices originally respond positively to a shock in foreign direct investment, then negatively from the seventh month. Conversely, the response of VN-Index to a one-time innovation in the consumer price index stays negative for the first 16 months but becomes positive afterwards until it remains the same along the verticals from the 31st month (Figure 5-10). Over the same period, the most variation in the response impulse functions originates from the interest rate to equity prices. It is initially positive during the first six periods then remains negative after that.

The results given in Figure 5-11 contain the accumulated impulse responses of equity prices to a generalized one standard deviation shock deriving from individual macroeconomic variables. Over the specified period, there are positive accumulated responses of VNI to an innovation in real GDP and in real money supply. A reverse trend of response is seen for the rest of the macroeconomic factors. Noticeably, the stock market index experiences constant accumulated
responses to a one-time shock in the real exchange rate. Again, it confirms no permanent influence from an innovation in the real exchange rate to the stock market.

Figure 5-11. Accumulated Impulse Response Functions of Stock Prices to Generalized One S.D Innovation in Macroeconomic Variables

Source: Output of Accumulated Impulse Response Functions by Eviews 8.0
5.6.2. Variance Decomposition

Taking account into interactions between the variables and the response of one variable to a shock in another variable, the dynamic analysis also includes the variance decomposition that differentiates the impulse response function by splitting the variation in an endogenous variable into the component shocks to the VAR. The variance decomposition, also known as innovation accounting, measures the importance of each shock in the macroeconomic variables in explaining the variance in stock market index at different step-ahead forecasts. The study specifies the period of forecast as 36 months. Besides, to confront the issue involving the ordering of variables, three different orderings are used (Table 5-21).

Table 5-21. Variance Decomposition of VN-Index

<table>
<thead>
<tr>
<th>Period</th>
<th>LRVNI</th>
<th>LRGDP</th>
<th>LCPI</th>
<th>LRMS</th>
<th>LRFR</th>
<th>LREX</th>
<th>LRFDI</th>
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<td>7.8911</td>
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</table>

<table>
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### Cholesky Ordering:

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<th>LCPI</th>
<th>LRMS</th>
<th>LRFR</th>
<th>LREX</th>
<th>LRFDI</th>
</tr>
</thead>
<tbody>
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<td>0.0000</td>
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</tr>
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<td>4.4882</td>
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<td>1.2615</td>
<td>3.0880</td>
</tr>
</tbody>
</table>

*Source: Output of Variance Decomposition by Eviews 8.0*

The results from the different orderings of variables indicate the relative consistency in the final conclusion of the study. It reveals that money supply contributes the most significant portion in the variance in stock prices. From panel 1 and panel 2 in Table 5-21, money supply is able to explain more than 13% of the variations in the VN-Index over a three-year period (it is 12.4% given in the last panel). In contrast, a shock in the exchange rate is also realized as the least important factor in explaining stock market variances, which remains stable at around 1% only over 1 year, 2 years and 3 years. Consequently, these outcomes comprehend the findings from the above GIRF analysis.

Additionally, from 12 months onwards, individual macroeconomic variables exhibit a periodic constant contribution to the variations in stock prices. On average, a shock in real GDP, in CPI, in real money supply, in the real refinancing rate, in the exchange rate, and in foreign direct investment respectively contribute roughly 6%, 5%, 12%, 1.7%, 1.2%, and 3% to variances in real VNI. They reveal weak evidence for the importance of shocks in macroeconomic environment for explaining variations in the Vietnam’s stock market.
5.7. **CONCLUSIONS**

Based on statistical description of all selected variables under the research, this chapter provides evidence of the nexus between the Vietnam's equity market and macroeconomic factors in both bivariate and multivariate perspectives via cointegration and causality tests.

All of the time series within the research project are found as I(1), and are appropriate for the Johansen cointegration method. Under the bivariate analysis, the Johansen tests reveal that VN-index shares a long-run relationship with economic growth, consumer price index, and foreign direct investment. At least one causal link is found for each individual cointegrating relationship under the standard pairwise Granger causality tests. However, the TYDL method fails to show any evidence of causality between Vietnam stock index and economic growth, even though they are cointegrated. Other unidirectional causality is shown from interest rate to stock market index by two different Granger causality methods.

A similar statistical procedure is applied to the case of multivariate analysis. The Johansen cointegration test presents equilibrium amongst multiple time series. By the Granger causality test grounded on the VECM framework, a long-run causal link is established between VNI returns and a group of macroeconomic factors. Regarding to the short-run dynamics, one Granger causal link is found from the refinancing rate to the stock market at 5% significance level and another one from money supply to the stock market at the 10% significance level. Additionally, the TYDL Granger causality results suggest various factors that Granger cause Vietnam stock index in the system, including money supply, refinancing rate, and foreign direct investment. Nonetheless, none of bidirectional causal relationship is recognized between the VN-Index returns and selected macroeconomic variables.

Finally, a dynamic analysis comprising generalized impulse response functions and variance decomposition is employed to analyze the responses of the Vietnam’s stock index in the presence of shocks in macroeconomic variables, as
well as to determine how much each type of shock contributes to variations in the stock market. Among several findings, the largest response of real Vietnam’s stock market index is noticeably recognized to a shock originated from money supply, whilst the smallest one is to a shock flow from exchange rate. The accumulative analysis subsequently demonstrates positive responses of real VNI to a one-time innovation in GDP and in money supply, but negative to any other innovation in the rest of the macroeconomic variables over most of the time period sample. Under the variance decomposition study, a shock originated from real money supply seems to have the most influence on the variance in equity prices, while the smallest impact is found from a shock in exchange rate. Notably, the generalized impulse response function and variance decomposition both present weak evidence of a vital role of a shock in the macroeconomic environment to explain movement in the Vietnam’s stock market.
CHAPTER 6:

EMPIRICAL RESULTS OF THE GARCH MODELS

6.1. INTRODUCTION

6.2. STATISTICAL DESCRIPTION OF VIETNAM’S STOCK MARKET RETURNS

6.3. MODELING VOLATILITY CLUSTERING OF VIETNAM STOCK RETURNS

   6.3.1. Modeling the Conditional Mean Equation

   6.3.2 Estimation of Vietnam Stock Return Volatility

6.4. THE IMPACT OF MACROECONOMIC INDICATORS ON VIETNAM’S STOCK MARKET RETURN VOLATILITY

   6.4.1. Univariate GARCH (1,1) Analysis

   6.4.2. Multivariate GARCH (1,1) Analysis

6.5. FORECASTING OF VIETNAM’S STOCK MARKET RETURN VOLATILITY

6.6. CONCLUSIONS
6.1. INTRODUCTION

Having provided evidence of the nexus amongst the underlying variables within the context of Vietnam in the previous chapter, this chapter proposes to give an insight into whether or not macroeconomic factors influences Vietnam’s stock return volatility. To capture the dynamic clustering behavior of this financial time series, the generalized auto-regressive conditional heteroskedasticity (GARCH) model (developed by Bollerslev (1986) from ARCH model proposed by Engle (1982)) and its extensions are employed. In the family of GARCH (p,q), the GARCH (1,1) is the most widely-used version that has been proven to be an adequate model in many empirical cases (Brooks, 2008; Andersen et al., 2009; Gujarati, 2011). Furthermore, Engle (2001) suggested that higher order models of GARCH models with additional lag terms seem to be more useful for long periods of data (i.e. several decades of daily data or a year of hourly data). Since the data under this research is available on a monthly basis over 14 years only (from 2000 to 2013), it seems that the GARCH (1,1) model would be applicable. The standard GARCH (1,1) process includes two main equations:

- Equation of conditional mean:
  \[ Y_t = \mu_t + u_t \]  \hspace{1cm} (Eq. 6-1)

- Equation of conditional variance:
  \[ h_t = \omega + \alpha_1 u_{t-1}^2 + \beta_1 h_{t-1} \]  \hspace{1cm} (Eq. 6-2)

In which, time series \( Y_t \) is a dependent variable; \( u_t \) denotes residuals of the regression (Eq. 6-1) where \( u_t = \sqrt{h_t} \epsilon_t \); \( \mu_t \) and \( h_t \) respectively are mean and variance of the variable \( Y_t \).

The chapter subsequently represents three main sections to pursue its purpose. The first section comprehends the statistical nature of Vietnam’s stock market returns. The second section measures the volatility of stock return series based on the GARCH (1,1) model without the presence of exogenous variables. The final section utilizes three different versions of the GARCH models to estimate the influences deriving from macroeconomic perspective on the Vietnam stock market volatility. It is comprised of a traditional GARCH (1,1) and its two extensions,
EGARCH (1,1) and TARCH (1,1). Different GARCH models are distinct from their functional form for the conditional variance given in Eq. 6-2. Furthermore, each of the GARCH specifications is processed with three types of conditional densities for the error term ($u_t$), including Gaussian distribution, Student’s t-distribution, and generalized error distribution (GED). The best fitting model will be further verified with a wider variety of diagnostic checking.

6.2. STATISTICAL DESCRIPTION OF VIETNAM STOCK RETURNS

Analysis of a statistical description and a stationarity test must be carried out on the time series of Vietnam stock returns to ensure the appropriateness of generalized autoregressive conditional heteroskedasticity (GARCH) models (Bollerslev, 1986) to apply into the context of the Vietnam’s stock market. Given the results from the ADF, PP, and KPSS tests in the previous chapter (Section 5.3, Chapter 5), the real equity prices in Vietnam are found as a non-stationary time series at levels, but stationary at first differences. Thus, the study is progressed with a statistical description to check the other statistical properties of this underlying financial time series, including tail-heaviness, autocorrelation, and volatility clustering.

Table 6-1. Descriptive Statistics for Vietnam’s stock market Returns

<table>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0089</td>
<td>0.2778</td>
<td>-0.3053</td>
<td>0.1036</td>
<td>0.1865</td>
<td>3.6464</td>
<td>3.7130</td>
<td>0.1562</td>
<td>160</td>
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</table>

Source: Output of Descriptive Statistics of Vietnam’s stock market Returns by Eviews 8.0

The unconditional standard deviation of 0.1036 indicates a volatile level of 10.36% for Vietnam stock returns during the time span 2000 – 2013. The null hypothesis of non-normality is rejected for the case of Vietnam’s equity returns, according to the Jarque-Bera result. It suggests that Vietnam stock return series are normally distributed, supporting the Gaussian assumption of normal distribution in theory. However, the values of skewness and excess kurtosis are both greater than zero (0.18 and 0.64 respectively), which are different from those of a standard normality. It refers to a leptokurtic distribution for the series with a high peak, thin mid-range, and fat tails. The series also exhibits an asymmetric
skewed distribution, while the right tail is relatively heavier than the left. It implies that Vietnam’s stock investors tend to receive positive returns.

Overall, given the results from Table 6-1, the distribution of Vietnam’s stock market returns follows normality, but not in the standard form. This can be observed from the following graph of the histogram and the normal distribution of Vietnam stock returns (Figure 6-1).

**Figure 6-1. Histogram and the Normal Distribution of Vietnam’s stock market Returns**

![Histogram and Normal Distribution](image)

*Source: Output of Histogram and the Normal Distribution of Vietnam’s stock market Returns by Eviews 8.0*

An alternative visual method to check the validity of a given distribution is commonly known as a Quantile-Quantile (Q-Q) Plot. It displays the empirical quantile against the theoretical quantile of a certain distribution. The idea is that if the data comes from the assumed distribution, the Q-Q plot should fall approximately on a straight line.
Figure 6-2. The Q-Q Plot for Log Returns of Vietnam’s stock market Index

Source: Output of the Q-Q Plot for Vietnam’s stock market Returns by Eviews 8.0

The Q-Q plot specified in Figure 6-2 supports the above conclusion for the normality in Vietnam stock returns (Table 6-1), that is the log returns of VNI follow normal distribution fairly well except in the extreme tails.

Another statistical feature of Vietnam’s stock market returns is the evidence of serial dependence in the series during the period. The Ljung-Box Q-statistics results present the ACF coefficients of the raw, absolute, and squared values of Vietnam’s stock market returns and their corresponding p-values (Table 6-2).
### Table 6-2. Ljung-Box Q Statistics for Vietnam’s Stock Market Returns

<table>
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<tr>
<th>Lag</th>
<th>Raw Values of Vietnam Stock Returns</th>
<th>Absolute Values of Vietnam Stock Returns</th>
<th>Squared Values of Vietnam Stock Returns</th>
</tr>
</thead>
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<td>PAC</td>
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<td>0.497</td>
<td>40.197</td>
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<tr>
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<td>0.068</td>
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<td>100.930</td>
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</table>

*Source: Output of Ljung-Box Q Statistics of Vietnam’s stock market Returns by Eviews 8.0*

While all of the p-values are zero, the null hypothesis of no autocorrelation in this financial time series cannot be accepted up to 36 lags at 5% significance level. It not only exhibits the serial dependence in stock returns of the Vietnam market but also suggests the sign of long-range dependence in this series’ variance.

This refers to the last but not least characteristic of Vietnam stock returns, which is volatility clustering. This feature can be visually obtained from Figure 6-3. To attain better evidence for this property, Figure 6-3 recruits various graphical representations of Vietnam stock returns, subsequently in monthly raw values, in absolute values, and in squared values. Subsequently, all of the plots consistently demonstrate the volatility-clustering phenomenon in the returns of Vietnam’s stock market index while it visibly shows that large/small variations in VN-Index are likely to be followed by further large/small variations during the sample period.

The volatility of a return series is typically observed with spikes upwards in response to a new announcement, which then decay when the results of the announcement are known after a certain time. The decaying process remains until there is another spike. This phenomenon is named as heterogeneity of expectations, originally introduced by Harrison and Kreps (1978). Kirchler and Huber (2007) contributed to the understanding of heterogeneous expectations by
expressing that news generates higher volatility typically associated with higher returns at the beginning of each period and the returns may be lowered gradually as the result of the news is recognized over time.

**Figure 6-3. Return Values of Vietnam’s Stock Market Index**

*Panel (a): Raw Values of Vietnam’s Stock Market Returns*

*Panel (b): Absolute Values of Vietnam’s Stock Market Returns*

*Panel (c): Squared Values of Vietnam’s Stock Market Returns*

*Source: Output of Graphics of Vietnam’s stock market Returns by Eviews 8.0*
Additionally, an alternative method that can be used to identify the autocorrelations of the squared residuals (hence ARCH effects) of a time series is Ljung-Box $Q^2$-statistics. The result of table 6-3 further verifies the volatility clustering character of Vietnam’s stock market returns.

### Table 6-3. Ljung-Box $Q^2$ Statistics for Vietnam’s Stock Market Returns

<table>
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<tr>
<th>Lag</th>
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<th>PAC</th>
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<td>-0.018</td>
<td>88.862</td>
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*Source: Output of Ljung-Box Q Statistics of Vietnam’s stock market Returns by Eviews 8.0*

Given these above stylized facts of Vietnam’s stock market returns, it is appropriate to precede the following sections using the GARCH framework to model the volatility of the underlying return series.

### 6.3. MODELING VOLATILITY CLUSTERING FOR VIETNAM STOCK RETURNS

To apprehend the volatility of Vietnam’s stock market returns over the sample period August 2000 to December 2013, this section estimates the GARCH (1,1) model with no exogenous variables. These are comprised of two major stages: modeling the mean equation and estimating the variance equation. The residuals (or shocks) derived from the specified mean equation are used for the second equation conductive to the estimation of the Vietnam’s stock market return volatility.
6.3.1. Modeling the Conditional Mean Equation

As discussed in Chapter 4, the study follows the Box-Jenkins procedures in order to select an appropriate econometric model (that is, free of serial dependence) for a conditional mean equation. In particular, Hipel et al. (1977) summarized the procedure of selecting autoregressive-moving-average (ARMA) terms into three main steps: model identification, model estimation, and model diagnostic checks.

The right orders for the ARMA model might be found via visual examination of the autocorrelation function (ACF) and partial correlation function (PACF) of the stationaries series (Box-Jenkins, 1976; Tsay, 2010). Besides, given that the most autocorrelations that can be safely examined is up to one quarter of the number of observations (Enders 2015, p.130), the study uses the Ljung-Box Q-statistics test to plot the ACF and PACF for the 20 first autocorrelations (as the number of observations under the study is 160 in total).

Table 6-4. Correlogram of Vietnam’s Stock Market Returns

<table>
<thead>
<tr>
<th>Lag</th>
<th>Autocorrelation</th>
<th>Partial Correlation</th>
<th>AC</th>
<th>PAC</th>
<th>Q-Stat</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.</td>
<td>****</td>
<td></td>
<td>.</td>
<td>****</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.</td>
<td>*</td>
<td></td>
<td>*</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.</td>
<td>.</td>
<td></td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>.</td>
<td>.</td>
<td></td>
<td>.*</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>.*</td>
<td></td>
<td>.*</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>.</td>
<td>.</td>
<td></td>
<td>*</td>
<td>*.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>*.</td>
<td>.</td>
<td></td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>.</td>
<td>.</td>
<td></td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>.*</td>
<td></td>
<td>.*</td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>.</td>
<td>.</td>
<td></td>
<td>*.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>.</td>
<td>.</td>
<td></td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>*.</td>
<td>.</td>
<td></td>
<td>*.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>*.</td>
<td>.</td>
<td></td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>*.</td>
<td>.</td>
<td></td>
<td>*</td>
<td>*.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>*.</td>
<td>.</td>
<td></td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>*.</td>
<td>.</td>
<td></td>
<td>*.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>*.</td>
<td>.</td>
<td></td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
</tbody>
</table>
Both ACF and PACF geometrically decrease from their highest values from the first lag. However, they do not show any cut-off even at higher orders of autocorrelation. It suggests a possibility that either pure AR/MA term or a mixed ARMA term can be included in the conditional mean equation under GARCH models. Thus, in order to specify the best-fitting ARMA model, the study follows the trial and error method suggested from the current literature and uses a goodness-of-fit statistic with reference to smaller information criteria. The study estimates several combinations of ARMA (p,q) models up to five lags. Furthermore, the theory advocates that the lower order of AR/MA terms (means the simpler the model), the better it is; since the assembly of AR term and MA term is sometimes possible to cancel off each other’s effect. Therefore, a pure AR/MA order is also put in concern under this analysis.

The estimates of information criterion (including Schwartz information criterion (SIC) and Akaike information criterion (AIC)) from different possible ARMA models are reported in Table 6-5 as follows.

Table 6-5. Estimated Information Criterion for the ARMA Orders

<table>
<thead>
<tr>
<th>SIC</th>
<th>MA Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lag 0 1  2  3  4  5</td>
</tr>
<tr>
<td>AR Terms</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>-1.6706 -1.9013 -1.9200 -1.8883 -1.9131 -1.9107</td>
</tr>
<tr>
<td>1</td>
<td>-1.9159 -1.8969 -1.8824 -1.9373 -1.9028 -1.8733</td>
</tr>
<tr>
<td>2</td>
<td>-1.8993 -1.8897 -1.8731 -1.8416 -1.8820 -1.8574</td>
</tr>
<tr>
<td>3</td>
<td>-1.8769 -1.8631 -1.8572 -1.8426 -1.8571 -1.8862</td>
</tr>
<tr>
<td>4</td>
<td>-1.8575 -1.8339 -1.8018 -1.8231 -1.8306 -1.7983</td>
</tr>
<tr>
<td>5</td>
<td>-1.8393 -1.8841 -1.8554 -1.8576 -1.7964 -1.8396</td>
</tr>
</tbody>
</table>
There are some conflicts between the results of these two criteria. Individually, whilst the SIC estimates suggest an ARMA(1,3) model, the AIC estimates suggest an ARMA(5,5) model. At the same time, the study tempts to look for a simpler model with pure AR or pure MA order. It leads to a plausible consideration for the following models: AR(1), AR(2), MA(2), and MA(5). The best-fitted model should indicate a white noise process in its residuals (Enders, 2015). The results of the Ljung-Box test (given in Table 6-6) represent the estimates of the fitted errors for each of the selected model at different orders up to the 36th.

### Table 6-6. Ljung-Box Q-statistics for Different ARMA Models

<table>
<thead>
<tr>
<th></th>
<th>Q(2)</th>
<th>Q(4)</th>
<th>Q(8)</th>
<th>Q(12)</th>
<th>Q(16)</th>
<th>Q(20)</th>
<th>Q(24)</th>
<th>Q(28)</th>
<th>Q(32)</th>
<th>Q(36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARMA(1,0)</td>
<td>1.469</td>
<td>5.525</td>
<td>18.788</td>
<td>26.723</td>
<td>29.614</td>
<td>38.47</td>
<td>43.609</td>
<td>53.322</td>
<td>56.65</td>
<td>59.286</td>
</tr>
<tr>
<td></td>
<td>-0.225</td>
<td>-0.137</td>
<td>-0.009</td>
<td>-0.005</td>
<td>-0.013</td>
<td>-0.005</td>
<td>-0.006</td>
<td>-0.002</td>
<td>-0.003</td>
<td>-0.006</td>
</tr>
<tr>
<td>ARMA(2,0)</td>
<td>1.614</td>
<td>16.255</td>
<td>24.629</td>
<td>27.095</td>
<td>36.173</td>
<td>41.578</td>
<td>52.274</td>
<td>54.948</td>
<td>57.686</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.446</td>
<td>-0.012</td>
<td>-0.006</td>
<td>-0.019</td>
<td>-0.007</td>
<td>-0.007</td>
<td>-0.002</td>
<td>-0.004</td>
<td>-0.007</td>
<td></td>
</tr>
<tr>
<td>ARMA(0,2)</td>
<td>0.813</td>
<td>12.021</td>
<td>18.243</td>
<td>20.924</td>
<td>27.645</td>
<td>32.217</td>
<td>42.268</td>
<td>44.302</td>
<td>46.555</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.666</td>
<td>-0.062</td>
<td>-0.051</td>
<td>-0.104</td>
<td>-0.068</td>
<td>-0.074</td>
<td>-0.023</td>
<td>-0.045</td>
<td>-0.074</td>
<td></td>
</tr>
<tr>
<td>ARMA(0,5)</td>
<td>3.157</td>
<td>9.166</td>
<td>13.066</td>
<td>20.701</td>
<td>25.072</td>
<td>32.049</td>
<td>32.663</td>
<td>36.711</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.368</td>
<td>-0.241</td>
<td>-0.289</td>
<td>-0.147</td>
<td>-0.158</td>
<td>-0.099</td>
<td>-0.208</td>
<td>-0.221</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARMA(1,3)</td>
<td>12.488</td>
<td>18.818</td>
<td>20.759</td>
<td>27.542</td>
<td>31.639</td>
<td>41.872</td>
<td>43.752</td>
<td>45.818</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.014</td>
<td>-0.016</td>
<td>-0.054</td>
<td>-0.036</td>
<td>-0.047</td>
<td>-0.013</td>
<td>-0.029</td>
<td>-0.054</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARMA(5,5)</td>
<td>11.013</td>
<td>15.12</td>
<td>20.997</td>
<td>24.123</td>
<td>31.848</td>
<td>32.525</td>
<td>35.095</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.004</td>
<td>-0.019</td>
<td>-0.021</td>
<td>-0.044</td>
<td>-0.023</td>
<td>-0.069</td>
<td>-0.11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Output of Ljung Box Q Statistics by Eviews 8.0
As specified by the outcomes in Table 6-6, the lower order of AR/MA terms or the mixture of AR and MA terms seems to remain the problem of serial correlations in the disturbances. The most appropriate one is hence elected as ARMA(0,5) or a pure MA(5) model, where the residuals are found as a random process. The estimation of ARMA(0,5) via the least squares method is provided as follows.

Table 6-7. OLS Estimation of ARMA (0,5) Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.009085</td>
<td>0.013155</td>
<td>0.690595</td>
<td>0.4909</td>
</tr>
<tr>
<td>MA(1)</td>
<td>0.611844</td>
<td>0.079249</td>
<td>7.720518</td>
<td>0.0000</td>
</tr>
<tr>
<td>MA(2)</td>
<td>0.233479</td>
<td>0.092671</td>
<td>2.519438</td>
<td>0.0128</td>
</tr>
<tr>
<td>MA(3)</td>
<td>0.047212</td>
<td>0.094322</td>
<td>0.500544</td>
<td>0.6174</td>
</tr>
<tr>
<td>MA(4)</td>
<td>-0.13904</td>
<td>0.092694</td>
<td>-1.499995</td>
<td>0.1357</td>
</tr>
<tr>
<td>MA(5)</td>
<td>0.180873</td>
<td>0.079445</td>
<td>2.276718</td>
<td>0.0242</td>
</tr>
</tbody>
</table>

R-squared 0.3288  F-statistic (p-value) 15.0897 (0.0000)
Adjusted R-squared 0.3070  Durbin-Watson stat 1.9975

Source: Output of OLS Estimation by Eviews 8.0

The coefficients of the MA(3) and MA(4) terms do not appear significant according to t-statistics. It leads to a plausible option that these terms can be removed in order to enhance the regression results. However, as discussed in Enders (2015, p.93), no data set perfectly matches with all of the assumptions of the Box-Jenkins methodology. To avoid disjointing the lag orders of the model and the "overfitting" problem, the ARMA(0,5) process is selected for this empirical study. The important highlight is that the ARMA(0,5) model passes various important diagnostic checks. Firstly, the disturbances of the model vary randomly around the mean. The findings of serial independence are shown in Table 6-6 and further verified by the Breusch Godfrey test in Table 6-8. The alternative hypothesis of autocorrelation cannot be accepted up to the 12th lag given by the F-statistics. Secondly, all MA roots lie inside the unit circle (Figure 6-4). It implies that the ARMA process is covariance stationary.
Table 6.8. Breusch-Godfrey Test for Autocorrelations in ARMA(0,5) Model

<table>
<thead>
<tr>
<th>Lag</th>
<th>F-Test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0038</td>
<td>0.9507</td>
</tr>
<tr>
<td>2</td>
<td>0.2451</td>
<td>0.7829</td>
</tr>
<tr>
<td>4</td>
<td>0.8541</td>
<td>0.4932</td>
</tr>
<tr>
<td>8</td>
<td>0.6946</td>
<td>0.6959</td>
</tr>
<tr>
<td>12</td>
<td>0.8219</td>
<td>0.6277</td>
</tr>
</tbody>
</table>

*Source: Output of Breusch-Godfrey Test by Eviews 8.0*

Figure 6.4. ARMA Structure of the Regression Model

*Source: Output of ARMA Structure by Eviews 8.0*

Figure 6-5. Estimated Residuals of ARMA (0,5) Model

*Source: Output of Estimated Residuals of ARMA (0,5) Model by Eviews 8.0*
An alternative visual confirmation is depicted in Figure 6-5, which further authorizes these two characteristics of serial independence and stationarity on the residuals from the ARMA (0,5) model. As can be seen, the residuals series is captured as a stationary and nearly white noise process.

Additionally, the ARMA (0,5) model shows its error term as a normally distribution, while the Jarque-Bera test accepts the normality hypothesis (Figure 6-6). Although non-normality cannot be a reason to refuse the goodness of the model under some certain circumstances, this evidence strengthens the better performance of the selected model.

**Figure 6-6. Histogram-Normality Test for ARMA (0,5) Model**

Source: Output of Histogram-Normality Test for ARMA (0,5) Model by Eviews 8.0

The final and also key feature of the ARMA (0,5) model satisfies the requirements of GARCH appliance since the variance of the residuals derived from the regression is non-stationary and fails to behave as a random and independent series. The results for autocorrelations in the variance of the error terms obtained from Q²-statistics in the Ljung-Box test and the ARCH-LM test both illustrate the rejection of the null hypothesis (Table 6-9)
Table 6-9. Results of Heteroskedasticity in the ARMA(0,5) Model

<table>
<thead>
<tr>
<th>Panel (a): Ljung-Box Q²-statistic Test</th>
<th>Panel (b): ARCH-LM Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lag</td>
<td>ACF</td>
</tr>
<tr>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>4</td>
<td>0.365</td>
</tr>
<tr>
<td>8</td>
<td>0.092</td>
</tr>
<tr>
<td>12</td>
<td>-0.038</td>
</tr>
<tr>
<td>16</td>
<td>-0.062</td>
</tr>
<tr>
<td>20</td>
<td>-0.073</td>
</tr>
<tr>
<td>24</td>
<td>0.000</td>
</tr>
<tr>
<td>28</td>
<td>0.046</td>
</tr>
<tr>
<td>32</td>
<td>0.009</td>
</tr>
<tr>
<td>36</td>
<td>-0.075</td>
</tr>
</tbody>
</table>

Source: Output of Heteroskedasticity in ARMA (0,5) Model by Eviews 8.0

By successfully passing a sufficient robustness check together with firm evidence of autoregressive conditional heteroskedasticity or ARCH effect in the system, it consequently shows the suitability of the ARMA (0,5) specification for regressing the conditional mean equation. The residuals from the mean equation, hence, can be rationally employed to model the conditional variance equation following the GARCH procedure. Consequently, the next section based on the ARMA (0,5)–GARCH (1,1) models to provide the estimates of Vietnam stock return volatility over the period August 2000 to December 2013.

6.3.2 Estimation of Vietnam Stock Return Volatility

The conditional mean equation is well specified by adding five moving average terms; thus, the ARMA (0,5)-GARCH (1,1) process is applied to estimate the conditional volatility of Vietnam's stock market returns. This section runs a standard GARCH model at the first stage, and extends to two other advanced GARCH models in its family under the subsequent section to account for leverage effect – one common characteristic of a financial series.
6.3.2.1. Results of the ARMA(0,5)-GARCH(1,1) Model

Table 6-10, 6-11, and 6-12 in sequence report the estimates of the mean and variance equations of the ARMA(0,5)-GARCH(1,1) model for Vietnam’s stock market using three different types of distribution: normal (Gaussian) distribution, student’s t-distribution, and generalized error distribution (GED).

Table 6-10. ARMA(0,5)-GARCH(1,1) Estimates with Normal Distribution

<table>
<thead>
<tr>
<th>Panel (a): Mean Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>μ</td>
</tr>
<tr>
<td>MA(1)</td>
</tr>
<tr>
<td>MA(2)</td>
</tr>
<tr>
<td>MA(3)</td>
</tr>
<tr>
<td>MA(4)</td>
</tr>
<tr>
<td>MA(5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel (b): Variance Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>μ</td>
</tr>
<tr>
<td>MA(1)</td>
</tr>
</tbody>
</table>

Log-Likelihood = 185.657
AIC = -2.208
SIC = -2.035

Source: Output of ARMA (0,5) – GARCH(1,1) Estimation with Normal Distribution by Eviews 8.0

Table 6-11. ARMA(0,5)-GARCH(1,1) Estimates with Student’s t-Distribution

<table>
<thead>
<tr>
<th>Panel (a): Mean Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>μ</td>
</tr>
<tr>
<td>MA(1)</td>
</tr>
<tr>
<td>MA(2)</td>
</tr>
<tr>
<td>MA(3)</td>
</tr>
<tr>
<td>MA(4)</td>
</tr>
<tr>
<td>MA(5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel (b): Variance Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>μ</td>
</tr>
</tbody>
</table>
\[ h_{t-1} \begin{array}{|c|c|c|c|} \hline 0.5935 & 0.1473 & 4.0299 & 0.0001 \hline \end{array} \]

Log-Likelihood = 185.723

AIC = -2.209

SIC = -2.036

Source: Output of ARMA (0,5) – GARCH(1,1) Estimation with Student’s t-distribution by Eviews 8.0

Table 6-12. ARMA(0,5)-GARCH(1,1) Estimates with GE Distribution

<table>
<thead>
<tr>
<th>Panel (a): Mean Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>( \mu )</td>
</tr>
<tr>
<td>MA(1)</td>
</tr>
<tr>
<td>MA(2)</td>
</tr>
<tr>
<td>MA(3)</td>
</tr>
<tr>
<td>MA(4)</td>
</tr>
<tr>
<td>MA(5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel (b): Variance Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>( \omega )</td>
</tr>
<tr>
<td>( u_{t-1}^2 )</td>
</tr>
<tr>
<td>( h_{t-1} )</td>
</tr>
</tbody>
</table>

Log-Likelihood = 186.179

AIC = -2.215

SIC = -2.042

Source: Output of ARMA (0,5)-GARCH(1,1) Estimation with GE Distribution by Eviews 8.0

From the results of the log likelihood and information criterions (AIC and SIC) shown in the three relevant tables above, the model with conditional distribution of generalized error (GED) seems to be the most accurate one, as it exhibits larger log likelihood and smaller information criterion values in comparison with the estimates of normal and student’s distributions. This finding reveals its consistency with the recent results of Gao et.al (2012); who found that a GARCH model based on GED is the best fitted-model for volatility compared with two other densities (normal and student’s t). Thus, the following analysis focuses on the ARMA (0,5)-GARCH (1,1) model using GED distribution with fixed parameter at 1.5.
Considering Panel (a) in Table 6-12, the coefficient of the error term in the mean equation appears insignificant, but it is close to the value of the unconditional mean given in Table 6-1 (which are 0.005 and 0.009 respectively). Besides, the coefficients of the moving average terms show the significance at 5% conventional level at degree one and four only. This implies that Vietnam's stock returns follow a trend and can be predicted based on their historical values.

Panel (b) in Table 6-12 reveals that the coefficients of the error term, ARCH term and GARCH term have expected positive signs, which significantly satisfy the restriction on non-negativity in conditional variance. It signifies that this specified ARMA (0,5)-GARCH (1,1) model seems to be satisfactory to capture the Vietnam's stock return volatility.

Additionally, the sum of the ARCH coefficient ($\alpha_1$) and the GARCH coefficient ($\beta_1$) are less than one and nearly close to one, i.e., $\alpha_1 + \beta_1 = 0.9402 < 1$. It successively infers the stationarity of the unconditional variance ($h_t < 1$) and the high persistency of Vietnam's stock return volatility. The output of the Wald test is also supportive for the long memory of Vietnam stock return volatility in response to a shock (Table 6-13). In particular, the F-test result cannot reject the null hypothesis of the integration in the conditional volatility of the equity returns at the significance level of 5%.

| Table 6-13. Wald Test for the Persistence of Vietnam’s stock market Volatility |
|-----------------------------|---------------------|---------------------|---------------------|
| Test Statistic             | Value               | df                  | Probability         |
| t-statistic                | -0.6023             | 151                 | 0.5478              |
| F-statistic                | 0.3628              | (1, 151)            | 0.5478              |
| Chi-square                 | 0.3628              | 1                   | 0.5469              |
| Null Hypothesis: $\alpha_1 + \beta_1 = 1$ |                     |                     |                     |
| Null Hypothesis Summary:  |                     |                     |                     |
| Normalized Restriction (= 0) | Value               | Std. Err.           |                     |
| $-1 + \alpha_1 + \beta_1$ | -0.0598             | 0.0993              |                     |

Restrictions are linear in coefficients.

*Source: Output of Wald Test by Eviews 8.0*
Furthermore, since the coefficient of the ARCH term is less than the coefficient of the GARCH term ($\alpha_1 < \beta_1$), the Vietnam’s stock market volatility is likely influenced by the volatility rather than the related news from the previous period.

Table 6-14. Diagnostic Checks for Residuals from ARMA(0,5)-GARCH(1,1)

<table>
<thead>
<tr>
<th>Lag</th>
<th>Q-statistic (p-value)</th>
<th>Q^2-statistic (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>2.712</td>
<td>0.438</td>
</tr>
<tr>
<td>12</td>
<td>9.1331</td>
<td>0.243</td>
</tr>
<tr>
<td>16</td>
<td>10.989</td>
<td>0.444</td>
</tr>
<tr>
<td>20</td>
<td>18.663</td>
<td>0.229</td>
</tr>
<tr>
<td>24</td>
<td>25.054</td>
<td>0.159</td>
</tr>
<tr>
<td>28</td>
<td>33.024</td>
<td>0.081</td>
</tr>
<tr>
<td>32</td>
<td>34.128</td>
<td>0.162</td>
</tr>
<tr>
<td>36</td>
<td>40.11</td>
<td>0.127</td>
</tr>
</tbody>
</table>

Panel (b): ARCH-LM Test

<table>
<thead>
<tr>
<th>Lag</th>
<th>F-Test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0093</td>
<td>0.9233</td>
</tr>
<tr>
<td>2</td>
<td>0.7765</td>
<td>0.4618</td>
</tr>
<tr>
<td>4</td>
<td>0.54</td>
<td>0.7066</td>
</tr>
<tr>
<td>8</td>
<td>0.856862</td>
<td>0.5546</td>
</tr>
<tr>
<td>12</td>
<td>0.796237</td>
<td>0.6537</td>
</tr>
</tbody>
</table>

Panel (c): Normality Test

| Skewness | 0.2489 |
| Kurtosis | 3.323  |
| Jarque-Bera (p-value) | 2.3473 (0.3092) |

Source: Output of Ljung Box Q-statistics, ARCH-LM Test, and Normality Test by Eviews 8.0
To verify the satisfactoriness for the underlying ARMA (0,5)-GARCH (1,1) model with GED distribution, Table 6-13 above summarizes the results of a variety of diagnostic tests. Regarding the outcomes, the Q-statistics and Q²-statistics from the Ljung-Box test (Panel (a) in Table 6-14) respectively exhibit no serial correlation on standardized residuals and squared standardized residuals obtained from the ARMA (0,5)-GARCH (1,1) model up to the 36th lag at the significance level of 5%.

Panel (b) in Table 6-14 shows the evidence given by ARCH-LM test that all the ARCH effects are successfully removed from the residuals obtained from the ARMA (0,5)-GARCH (1,1) model since the F-statistics fails to reject the null hypothesis of hemoskedasticity on the residuals up to the 12th lag at 5% significance level.

The following graphs provide more evidence for freedom from autocorrelations in the standardized residuals, conditional standard deviation (S.D.) and conditional variance obtained from AMRA (0,5)-GARCH (1,1) model.

**Figure 6-7. Standardized Residuals of ARMA (0,5)-GARCH (1,1) Model**

*Source: Output of Estimated Residuals of ARMA (0,5) – GARCH (1,1) by Eviews 8.0*
Further, the series of residuals is revealed as normality since the null hypothesis is accepted by the Jarque-Bera statistic in Panel (c)-Table 6-14. Compared to the original data in Table 6.1, the excess kurtosis from Panel (c)-
Table 6-14 is obtained with a smaller value (reduce from 0.6464 to 0.3230) and seems to be closer to zero or a standard normality.

These above analyses strongly support the adequacy of the standard GARCH (1,1) process in modeling the volatility of Vietnam’s stock market returns. However, to the extent of the dynamic behavior of the Vietnam’s stock returns, the study further conducts two other models from the GARCH-family, which are EGARCH (1,1) and TARCH (1,1). The findings from these two models are presented in the following sub-section.

6.3.2.2. Extensions of the GARCH (1,1) Model

The purpose of employing EGARCH and TARCH models is to take into account the leverage effect in Vietnam’s stock market volatility, which is unable to be captured by a standard GARCH model. The so-called term “leverage effect”, originally introduced by Black (1976) and then attributed by Christie (1982), is used to describe an economic phenomenon: assuming other things being equal, a negative return of stock caused by a drop in its firm’s value increases the leverage of the stock or the debt-equity ratio, resulting in a higher level of risk to investors and increasing stock volatility. While a negative shock (i.e., a bad news) raises volatility, a positive shock (i.e., a good news) seems to reduce volatility. It refers to a possibility of asymmetric effect in the volatility of the stock market, which was acknowledged by Nelson (1991) and Engle and Ng (1993).

To deal with the presence of asymmetric volatility in response to the sign of a shock (which might be negative or positive), the simple GARCH model seems to be inadequate as it is based on the assumption of a symmetric effect on the volatility. More specifically, the variance equation of the simple GARCH model is formulated with the lagged squared residuals, resulting in the unawareness of the volatility sign. Therefore, another two modified GARCH models are employed to allow for accessing the asymmetric effect on the volatility: Exponential GARCH model (EGARCH, introduced by Nelson (1991)) and Threshold ARCH model (TARCH, developed by Zakoian (1991) and Glosten et al. (1993)).
The results of the EGARCH (1,1) and TARCH (1,1) models, jointly with the ARMA (0,5) process, are subsequently illustrated in Panel (a) and (b) in Table 6-15, with a wide range of distribution types in the residuals (including normal distribution, student’s t-distribution, and GED).

If the volatility of an asset has leverage effect, the coefficient of the parameter $\gamma_1$ must be negative and significant in the EGARCH model while that must be positive and significant in the TARCH model. However, Table 6-15 reveals that the outcomes of the ARMA (0,5)-EGARCH (1,1) and the ARMA (0,5)-TARCH (1,1) processes consistently unable to reject the null hypothesis of no leverage effect in Vietnam’s stock market volatility since the coefficient of the parameter $\gamma_1$ under the EGARCH model is positive and non-significant whilst the coefficient of $\gamma_1$ under the TARCH model is negative and also non-significant (assuming the significance level of 5%). In other words, it signifies that the volatility of the Vietnam’s equity market seems to have symmetrical magnitude to a shock, regardless of whether it is a positive or negative one.

**Table 6-15. Estimates of GARCH Extensions for Vietnam’s stock market Returns**

<table>
<thead>
<tr>
<th>Panel (a): ARMA(0,5)-EGARCH(1,1) Estimates</th>
<th>Panel (b): ARMA(0,5)-TARCH(1,1) Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Equation</td>
<td>Variance Equation</td>
</tr>
<tr>
<td>Variable</td>
<td>Normal</td>
</tr>
<tr>
<td>$\mu$</td>
<td>0.0145</td>
</tr>
<tr>
<td>MA(1)</td>
<td>0.5314</td>
</tr>
<tr>
<td>MA(2)</td>
<td>0.2051</td>
</tr>
<tr>
<td>MA(3)</td>
<td>0.0527</td>
</tr>
<tr>
<td>MA(4)</td>
<td>-0.1366</td>
</tr>
<tr>
<td>MA(5)</td>
<td>0.1284</td>
</tr>
<tr>
<td>$\omega$</td>
<td>-0.9993</td>
</tr>
<tr>
<td>$\gamma_1$</td>
<td>0.4896</td>
</tr>
<tr>
<td>$h_{t-1}$</td>
<td>0.0666</td>
</tr>
<tr>
<td>$h_{t-1}$</td>
<td>0.8820</td>
</tr>
<tr>
<td>LL</td>
<td>186.4860</td>
</tr>
<tr>
<td>AIC</td>
<td>-2.2061</td>
</tr>
<tr>
<td>SIC</td>
<td>-2.0139</td>
</tr>
</tbody>
</table>
Panel (b): ARMA(1,3)-TARCH(1,1) Estimates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Equation</th>
<th>Student’s t</th>
<th>GED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
<td>Prob.</td>
<td></td>
</tr>
<tr>
<td>$\mu$</td>
<td>0.0114</td>
<td>0.2884</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(1)$</td>
<td>0.5195</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(2)$</td>
<td>0.1833</td>
<td>0.0765</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(3)$</td>
<td>0.0414</td>
<td>0.6702</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(4)$</td>
<td>-0.1446</td>
<td>0.0673</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(5)$</td>
<td>0.1398</td>
<td>0.0489</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coefficient</td>
<td>Prob.</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(1)$</td>
<td>0.5131</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(2)$</td>
<td>0.1985</td>
<td>0.0396</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(3)$</td>
<td>0.0394</td>
<td>0.6727</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(4)$</td>
<td>-0.1883</td>
<td>0.0180</td>
<td></td>
</tr>
<tr>
<td>$\text{MA}(5)$</td>
<td>0.1035</td>
<td>0.1624</td>
<td></td>
</tr>
</tbody>
</table>

|          | Coefficient   | Prob.       |     |
| $\omega$ | 0.0006        | 0.1228      |     |
| $\gamma_1$ | 0.3689 | 0.0395      |     |
| $\gamma_2$ | -0.1150 | 0.4755      |     |
| $\gamma_3$ | 0.6132 | 0.0000      |     |

|          | Coefficient   | Prob.       |     |
| $\omega$ | 0.0006        | 0.1374      |     |
| $\gamma_1$ | 0.4054 | 0.0493      |     |
| $\gamma_2$ | -0.1683 | 0.3930      |     |
| $\gamma_3$ | 0.6181 | 0.0000      |     |

|          | Coefficient   | Prob.       |     |
| $\omega$ | 0.0006        | 0.1374      |     |
| $\gamma_1$ | 0.3903 | 0.0493      |     |
| $\gamma_2$ | -0.1413 | 0.4767      |     |
| $\gamma_3$ | 0.6187 | 0.0000      |     |

|       | Coefficient   | Prob.       |     |
| $\omega$ | 0.0006        | 0.0661      |     |
| $\gamma_1$ | 0.0390 | 0.0493      |     |
| $\gamma_2$ | -0.1143 | 0.4767      |     |
| $\gamma_3$ | 0.6187 | 0.0000      |     |

|       | Coefficient   | Prob.       |     |
| $\omega$ | 0.0006        | 0.0493      |     |
| $\gamma_1$ | 0.0390 | 0.0493      |     |
| $\gamma_2$ | -0.1143 | 0.4767      |     |
| $\gamma_3$ | 0.6187 | 0.0000      |     |

Source: Output of Estimated EGARCH(1,1) and TGARCH(1,1) by Eviews 8.0

Although the leverage effect is typically found on the stock return volatility for various markets (Engle and Ng, 1993; Goudarzi and Ramanarayanan, 2011; Long et al., 2014), few empirical papers have shown adverse results as the case of the Vietnam’s stock market. Specifically, none of evidence is found for the asymmetric volatility effect on stock market returns (Murinde and Poshakwale, 2001; Oskooe and Shamsavari, 2011). On the other hand, the sign of the asymmetric effect is likely to be more strongly revealed under the circumstance of a large change on the stock market (i.e. a crash or a financial crisis), and that stock market must be developed or a large emerging one to outperform the impact. Otherwise, the influences of good news and bad news on the conditional variance of stock returns seem difficult to define. This possibly explains the lack of any asymmetric effect in a new and small emerging stock market like Vietnam.

Based on this empirical analysis, this section comes up with the following suggestions: (i) the standard ARMA (0,5)-GARCH (1,1) process is adequate in modeling Vietnam’s stock market return volatility (with GED as a preferable distribution form); (ii) no leverage effect is found in Vietnam’s stock market volatility; and (iii) a deeper analysis on Vietnam’s stock market returns must be
conducted using other explanatory variables. Thus, to confirm the suitability of the GARCH (1,1) model as well as find out whether there are any other significant factors that can jointly explain the volatility of Vietnam’s stock market returns together with the previous values of the volatility itself, the following section uses a number of GARCH processes to function the volatility under the impact of specified macroeconomic variables.

6.4. THE IMPACT OF MACROECONOMIC INDICATORS ON VIETNAM’S STOCK MARKET RETURN VOLATILITY

As the ARMA (0,5)-GARCH (1,1) model has proved its adequacy in modeling the volatility of Vietnam’s stock market returns, the following analysis is based on this specification to examine the stock return volatility together with the presence of other explanatory variables (i.e. macroeconomic factors). The following analysis is broken down into two sub-sections. The first part accounts for the impact of an individual macroeconomic variable (including real economic growth, consumer price index, real money supply, real refinancing rate, real exchange rate, and real foreign direct investment). Henceforward, six relevant univariate models are constructed. The second part investigates Vietnam stock return volatility under the aggregate influence of six selected macroeconomic variables by a multivariate GARCH model. It is noted that all of the models under this section are subsequently inspected with three types of distribution, where the most appropriate one is adopted using the same technique as in the previous analysis in Section 6.4.

6.4.1. The Univariate GARCH (1,1) Analysis

The estimates of the volatility of Vietnam’s stock market returns accounting for the impact of separate macroeconomic variable are organized in Table 6-16. The estimation of a univariate GARCH process in the current study includes two equations, which can be formulated as follows:

- Equation of conditional mean:
  \[ Y_t = \mu_t + u_t + \sum_{i=1}^{5} \theta_i u_{t-i} \]  \hspace{1cm} (Eq. 6-3)

- Equation of conditional variance:
\[ h_t = \omega_k + \alpha_{k1} u_{t-1}^2 + \beta_{k1} h_{t-1} + \varphi_{kt} X_{kt} \quad (\text{Eq. 6-4}) \]

The upper part of the table 6-16 (Panel (a)) exhibits the results of the conditional mean equation (Eq. 6-3), including coefficients and their estimated probabilities for intercepts and five moving average terms. The lower part of the table (Panel (b)) demonstrates the results of the conditional variance equation (Eq. 6-4). In particular, \( X_{kt} \) denotes a specified macroeconomic variable (where \( k=1,\ldots,6 \), relatively refers to six macroeconomic variables in real terms: economic growth, consumer price index, money supply, interest rate, exchange rate, and foreign direct investment). The individual influence of any macroeconomic factor on the volatility of Vietnam stock returns should be revealed by the significance of its corresponding coefficient (\( \varphi_{kt} \)).

Before proceeding with the GARCH model, the appropriate type of distribution for every individual GARCH process is selected using the same method used from section 6.4. Specifically, the estimated values of log likelihood and information criterions (AIC and SIC) are first reported for all of the GARCH models under consideration. The best-fitted model must then show the larger log-likelihood value and/or smaller AIC and SIC values.

Under the certain outcomes from Table 6-16, the generalized error distribution with fixed parameter at 1.5 seems to be an applicable choice for most of the models. One exceptional case is realized for the GARCH system where economic growth is added as an explanatory variable, and where student’s t-distribution is selected instead of GE.

### Table 6-16. Specification of Distribution Type for Different GARCH Models

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Student’s t</th>
<th>GED</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL ((\Delta RGDP))</td>
<td>188.3066</td>
<td><strong>188.3112</strong></td>
<td>188.1900</td>
</tr>
<tr>
<td>AIC ((\Delta RGDP))</td>
<td>-2.2288</td>
<td><strong>-2.2289</strong></td>
<td>-2.2274</td>
</tr>
<tr>
<td>SIC ((\Delta RGDP))</td>
<td>-2.0366</td>
<td><strong>-2.0367</strong></td>
<td>-2.0352</td>
</tr>
<tr>
<td>LL ((\Delta CPI))</td>
<td>187.1821</td>
<td>187.2973</td>
<td><strong>187.8106</strong></td>
</tr>
<tr>
<td>AIC ((\Delta CPI))</td>
<td>-2.2148</td>
<td>-2.2162</td>
<td><strong>-2.2226</strong></td>
</tr>
<tr>
<td>SIC ((\Delta CPI))</td>
<td>-2.0226</td>
<td>-2.0240</td>
<td><strong>-2.0304</strong></td>
</tr>
</tbody>
</table>
While the residuals or shocks of Vietnam stock returns are assumed to be the same, all of the specified models differ from the added explanatory variable. Panel (b) in Table 6-17 summarizes the results of all of the variance equations for six particular models. It can be seen that the six different models produce similar outcomes regarding the significance of the coefficients of error terms ($\omega$), ARCH terms ($\alpha_1$), and GARCH terms ($\beta_1$). Accordingly, they are all achieved with positive and significant values. It satisfies the conditions for a non-negativity of condition variance required by GARCH models. In addition, the ARCH coefficients are smaller than the GARCH coefficients under all of the cases in Panel (b) Table 6-17. It suggests the short-run dynamics of the volatility of Vietnam stock returns; that is, the volatility is influenced more by its previous period’s variance than by its previous period’s shock.

Furthermore, the sums of the ARCH and GARCH coefficients ($\alpha_1 + \beta_1$) are less than one and close to one for all of the corresponding models. It indicates the high persistence of Vietnam stock return volatility in response to a shock. This outcome is coherent with the results from the model without any exogenous macroeconomic variable in Section 6.4. In other words, either including one exogenous macroeconomic variable in the GARCH process or not, the impact of a
shock to the conditional variance is persisted for a long time span before dying off. It is likely reasonable that since Vietnam is known as a small economy, any shocks to the stock market seem to last longer in comparison with other developed economies due to the market’s slow adjustment process to adapt to any sudden change.

Regarding to the macroeconomic influences on the volatility of stock returns in Vietnam, there are three statistical significant relations recognized at the 5% significance level, which originated from economic growth, consumer price index and exchange rate. Put differently, any changes in these three macroeconomic indicators are expected to contribute to a better explanation for stock return volatility in the Vietnam’s market.

The negative coefficient of economic growth in the variance equation implies that the growth of real economic output may help the stock market be less volatile. Particularly, an increase of 1% in real GDP is expected to decrease the volatility of Vietnam stock returns by 1.6%. At the same time, stock return volatility is positively influenced by changes in CPI and in the real exchange rate USD/VND. A rise of 1% in CPI and 1% in real USD/VND can explain a 5.3% and 2.9% spread in stock return volatility respectively. The findings can be rationally explained by the fact that any surge in price level or depreciation in home currency may reflect the higher risk to investors in making investment decisions, less confidence then leads to higher volatility of stock market.

On the other hand, the coefficients associated with changes in real money supply, refinancing rate and foreign direct investment imply a non-significant impact on Vietnam stock return volatility at 5% significance level during the sample period. This means that there is no additional improvement in explaining the volatility of Vietnam’s stock market by containing these three macroeconomic variables to the current GARCH process.
Table 6-17. Estimates of Vietnam Stock Return Volatility under the Impact of Individual Macroeconomic Variable

Panel (a): The Conditional Mean Equation

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>$\Delta LRGD$</th>
<th>$\Delta LCPI$</th>
<th>$\Delta LRMS$</th>
<th>$\Delta LRFR$</th>
<th>$\Delta LREX$</th>
<th>$\Delta LRFDI$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters</td>
<td>Coefficient (p-value)</td>
<td>Coefficient (p-value)</td>
<td>Coefficient (p-value)</td>
<td>Coefficient (p-value)</td>
<td>Coefficient (p-value)</td>
<td>Coefficient (p-value)</td>
</tr>
<tr>
<td>$\mu$</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.007</td>
<td>0.005</td>
</tr>
<tr>
<td>$\Delta$ $\mu$</td>
<td>0.489</td>
<td>0.567</td>
<td>0.571</td>
<td>0.569</td>
<td>0.380</td>
<td>0.578</td>
</tr>
<tr>
<td>$MA(1)$</td>
<td>$0.444^*$</td>
<td>$0.539^*$</td>
<td>$0.525^*$</td>
<td>$0.526^*$</td>
<td>$0.531^*$</td>
<td>$0.526^*$</td>
</tr>
<tr>
<td>Coefficient (p-value)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>$MA(2)$</td>
<td>0.155</td>
<td>$0.200^*$</td>
<td>0.183</td>
<td>0.184</td>
<td>$0.175^*$</td>
<td>0.183</td>
</tr>
<tr>
<td>Coefficient (p-value)</td>
<td>0.091</td>
<td>0.035</td>
<td>0.061</td>
<td>0.059</td>
<td>0.022</td>
<td>0.059</td>
</tr>
<tr>
<td>$MA(3)$</td>
<td>-0.012</td>
<td>0.011</td>
<td>0.033</td>
<td>0.034</td>
<td>0.047</td>
<td>0.033</td>
</tr>
<tr>
<td>Coefficient (p-value)</td>
<td>0.877</td>
<td>0.901</td>
<td>0.727</td>
<td>0.716</td>
<td>0.591</td>
<td>0.717</td>
</tr>
<tr>
<td>$MA(4)$</td>
<td>$-0.206^*$</td>
<td>$-0.222^*$</td>
<td>$-0.160^*$</td>
<td>$-0.161^*$</td>
<td>$-0.113$</td>
<td>$-0.160^*$</td>
</tr>
<tr>
<td>Coefficient (p-value)</td>
<td>0.005</td>
<td>0.005</td>
<td>0.046</td>
<td>0.043</td>
<td>0.134</td>
<td>0.044</td>
</tr>
<tr>
<td>$MA(5)$</td>
<td>0.123</td>
<td>0.052</td>
<td>0.087</td>
<td>0.087</td>
<td>0.110</td>
<td>0.087</td>
</tr>
<tr>
<td>Coefficient (p-value)</td>
<td>0.091</td>
<td>0.461</td>
<td>0.244</td>
<td>0.240</td>
<td>0.061</td>
<td>0.238</td>
</tr>
</tbody>
</table>

Panel (b): The conditional Variance Equation

| $\omega$             | $0.001^*$    | $0.000^*$    | $0.001^*$    | $0.001^*$    | $0.001^*$    | $0.001^*$    |
| $u_{t-1}^2$          | $0.450^*$    | $0.306^*$    | $0.341^*$    | $0.344^*$    | $0.313^*$    | $0.344^*$    |
| Coefficient (p-value)| 0.040        | 0.096        | 0.324        | 0.164        | 0.137        | 0.191        |
| $h_{t-1}$            | $0.489^*$    | $0.653^*$    | $0.599^*$    | $0.596^*$    | $0.584^*$    | $0.596^*$    |
| Coefficient (p-value)| 0.027        | 0.028        | 0.039        | 0.038        | 0.004        | 0.037        |
| $\Delta LRGD$        | $-0.016^*$   | -            | -            | -            | -            | -            |
| $\Delta LCPI$        | -            | $0.053^*$    | -            | -            | -            | -            |
| $\Delta LRMS$        | -            | -            | $0.002$      | -            | -            | -            |
| $\Delta LRFR$        | -            | -            | -            | $0.000$      | -            | -            |
| $\Delta LREX$        | -            | -            | -            | -            | $0.029^*$    | -            |
| $\Delta LRFDI$       | -            | -            | -            | -            | -            | $0.047$      |
| $\Delta LRFDI$       | -            | -            | -            | -            | -            | 0.000        |

\[ \omega = 0.033 \]
Panel (c): Diagnostic Checking

<table>
<thead>
<tr>
<th>Ljung-Box Q-Statistics for Autocorrelations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q(6)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Q(12)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Q(36)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ljung-Box Q2-Statistics for Heteroskedasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2(1)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Q2(36)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ARCH-LM Test for Heteroskedasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH-LM(1)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>ARCH-LM(4)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>ARCH-LM(8)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>ARCH-LM(12)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Normality Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skewness</td>
</tr>
<tr>
<td>Jarque-Bera</td>
</tr>
<tr>
<td>p-value</td>
</tr>
</tbody>
</table>

* denotes the significance at 5% conventional level

Source: Output of Estimated ARMA (0.5) – GARCH(1,1) by Eviews 8.0

The lower part of Table 6-17 (Panel (c)) comprises of three major diagnostic tests (autocorrelation, heteroskedasticity, and normality) for different specified AMRA(0.5)-GARCH(1,1) models. For all the cases being studied, residuals obtained from each model reveal no autocorrelation problem (by the Ljung-box Q-
statistics), no ARCH effect left (by the results of Ljung-Box Q²-statistics and ARCH-LM tests), and are normally distributed (by Jarque-Bera tests). The satisfaction of various diagnostic checking promotes the fit of the ARMA(0,5)-GARCH(1,1) model for understanding the volatility clustering of Vietnam’s stock market returns under the individual impact of macroeconomic variables.

6.4.2. Multivariate GARCH(1,1) Analysis

Based on the motivated results from the univariate GARCH analysis, the study proceeds the multivariate ARMA(0,5)-GARCH(1,1) process by adding six specified macroeconomic indicators to the variance equation. Given the same conditional mean equation (Eq. 6-3), the conditional variance equation is adjusted as follows:

\[
h_t = \omega + \alpha_1 u_{t-1}^2 + \beta_1 h_{t-1} + \sum_{k=1}^6 \varphi_{kt} x_{kt}^2
\]

(Eq. 6-5)

The measured log likelihood (LL) and two other information criterions (AIC and SIC) all recommend the generalized error distribution (GED) for the ARMA(0,5)-GARCH(1,1) model based on the lowest values (Table 6-18).

<table>
<thead>
<tr>
<th>Table 6-18. Specification of Distribution Type for the ARMA(0,5)-GARCH(1,1) Model under the Impact of Macroeconomic Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>LL</td>
</tr>
<tr>
<td>AIC</td>
</tr>
<tr>
<td>SIC</td>
</tr>
</tbody>
</table>

Source: Output of Estimated Log Likelihood and Information Criterions of different Distribution Type for ARMA (0,5) – GARCH(1,1) under Macroeconomic Impact by Eviews 8.0

The estimation of the ARMA(0,5)-GARCH(1,1) model is presented in Table 6-19, including the conditional mean regression results (panel (a)) and the variance regression results (panel (b)). As provided by Panel (a) Table 6-19, the significant coefficients of moving average terms ordered 1, 2, and 4 at 5%
conventional level indicate the role of previous shocks in explaining the current equity returns.

**Table 6-19. Estimates of ARMA(0,5)-GARCH(1,1) under the Impact of Macroeconomic Variables**

<p>| Panel (a): The Conditional Mean Equation |
|-------------------------------|-----------------|-----------------|-----------------|-------------------|</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\mu$</td>
<td>0.0059</td>
<td>0.0074</td>
<td>0.8057</td>
<td>0.4204</td>
</tr>
<tr>
<td>$MA(1)$</td>
<td>0.4214</td>
<td>0.0895</td>
<td>4.7085</td>
<td>0.0000</td>
</tr>
<tr>
<td>$MA(2)$</td>
<td>0.1770</td>
<td>0.0848</td>
<td>2.0874</td>
<td>0.0369</td>
</tr>
<tr>
<td>$MA(3)$</td>
<td>0.0408</td>
<td>0.0801</td>
<td>0.5100</td>
<td>0.6101</td>
</tr>
<tr>
<td>$MA(4)$</td>
<td>-0.2342</td>
<td>0.0693</td>
<td>-3.3793</td>
<td>0.0007</td>
</tr>
<tr>
<td>$MA(5)$</td>
<td>0.1340</td>
<td>0.0688</td>
<td>1.9489</td>
<td>0.0513</td>
</tr>
</tbody>
</table>

<p>| Panel (b): The Conditional Variance Equation |
|-------------------------------|-----------------|-----------------|-----------------|-------------------|</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\omega$</td>
<td>0.0005</td>
<td>0.0005</td>
<td>1.0340</td>
<td>0.3011</td>
</tr>
<tr>
<td>$u_{t-1}^2$</td>
<td>0.3684</td>
<td>0.1663</td>
<td>2.2150</td>
<td>0.0268</td>
</tr>
<tr>
<td>$h_{t-1}$</td>
<td>0.5823</td>
<td>0.1237</td>
<td>4.7085</td>
<td>0.0000</td>
</tr>
<tr>
<td>$\Delta \text{LRGDP}$</td>
<td>-0.0113</td>
<td>0.0064</td>
<td>-1.7628</td>
<td>0.0779</td>
</tr>
<tr>
<td>$\Delta \text{LCPI}$</td>
<td>0.0835</td>
<td>0.0456</td>
<td>1.8316</td>
<td>0.0670</td>
</tr>
<tr>
<td>$\Delta \text{LRMS}$</td>
<td>0.0165</td>
<td>0.0217</td>
<td>0.7630</td>
<td>0.4455</td>
</tr>
<tr>
<td>$\Delta \text{LRFR}$</td>
<td>-0.0110</td>
<td>0.0071</td>
<td>-1.5599</td>
<td>0.1188</td>
</tr>
<tr>
<td>$\Delta \text{LREX}$</td>
<td>0.0201</td>
<td>0.0203</td>
<td>0.9895</td>
<td>0.3224</td>
</tr>
<tr>
<td>$\Delta \text{LRFDI}$</td>
<td>-0.0005</td>
<td>0.0007</td>
<td>-0.7348</td>
<td>0.4625</td>
</tr>
</tbody>
</table>

*Source: Output of Estimated ARMA (0.5) – GARCH(1,1) under Macroeconomic Impact by Eviews 8.0*

The upper part of the Panel (b) Table 6-19 shows the estimated coefficients of the intercept, ARCH and GARCH terms. While the error term’s coefficient is statistically non-significant, its value is very close to zero. In contrast, both the coefficients of ARCH and GARCH terms appear statistically significant and positive. Again, the condition of non-negative conditional variance is attained for the current specification of the GARCH model. Moreover, the value of ARCH coefficient
\( \alpha_1 = 0.3684 \) is smaller than that of GARCH coefficient \( \beta_1 = 0.5823 \). It implies that the current stock return volatility is less influenced by the past shocks than its past volatility. Also, while \( (\alpha_1 + \beta_1) \) is nearly one (i.e. approximately 0.95), the variance of stock market returns remains highly persistent over time.

The lower section of Panel (b) in Table 6-19 demonstrates the estimation results for the influence of various explanatory variables on the volatility of Vietnam’s stock market returns. Specifically, no macroeconomic variable under the research exposes its significant impact on Vietnam’s stock market returns at the 5% significance level. However, if the significance level is assumed at 10%, the empirical results may recommend that the volatility of Vietnam stock returns statistically influenced by economic growth and movements in the consumer price index. Accordingly, any 1% increase of monthly change in GDP is expected to reduce stock market volatility by 1.1%, whilst a 1% rise of monthly change in CPI possibly leads to an increase in volatility up to 8.35%. These findings corroborate with the previous outcomes of the univariate analysis (Section 6.4.1).

To confirm the validity of the ARMA (0,5)-GARCH model for this multivariate study, Table 6-20 provides the evidence from the Ljung-Box tests, ARCH-LM tests, and Normality tests. According to the Ljung-Box estimates, the Q-statistics and \( Q^2 \)-statistics respectively cannot reject the hypothesis about no serial correlation in standardized residuals and squared standardized residuals derived from the model, with up to 36 lags at the 5% level of significance (Panel (a) and (b) Table 6-20). Further, all of the ARCH effects on the residuals have been successfully removed, revealed by the rejection of the null hypothesis from the ARCH-LM tests up to 12 lags at 5% significance level. Besides, the Jarque-Bera value accepts the null of normality at 5% significance level, the series of residuals from the model remains normally distributed.
Table 6-20. Diagnostic Tests for the ARMA(0,5)-GARCH(1,1) Model under the Impact of Macroeconomic Variables

<table>
<thead>
<tr>
<th>Lag</th>
<th>Q-Stat</th>
<th>p-value</th>
<th>Lag</th>
<th>Q²-Stat</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>3.0718</td>
<td>0.080</td>
<td>1</td>
<td>0.0102</td>
<td>0.919</td>
</tr>
<tr>
<td>12</td>
<td>7.0814</td>
<td>0.420</td>
<td>8</td>
<td>5.1501</td>
<td>0.741</td>
</tr>
<tr>
<td>16</td>
<td>8.4175</td>
<td>0.675</td>
<td>16</td>
<td>16.349</td>
<td>0.429</td>
</tr>
<tr>
<td>20</td>
<td>14.724</td>
<td>0.471</td>
<td>20</td>
<td>19.133</td>
<td>0.513</td>
</tr>
<tr>
<td>24</td>
<td>22.031</td>
<td>0.283</td>
<td>24</td>
<td>23.057</td>
<td>0.516</td>
</tr>
<tr>
<td>28</td>
<td>31.085</td>
<td>0.121</td>
<td>28</td>
<td>24.864</td>
<td>0.635</td>
</tr>
<tr>
<td>32</td>
<td>31.980</td>
<td>0.233</td>
<td>32</td>
<td>27.889</td>
<td>0.675</td>
</tr>
<tr>
<td>36</td>
<td>36.709</td>
<td>0.221</td>
<td>36</td>
<td>28.248</td>
<td>0.818</td>
</tr>
</tbody>
</table>

Panel (c): ARCH-LM Test

<table>
<thead>
<tr>
<th>Lag</th>
<th>F-statistic</th>
<th>p-value</th>
<th>Skewness</th>
<th>0.3114</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0099</td>
<td>0.9211</td>
<td>Kurtosis</td>
<td>3.1533</td>
</tr>
<tr>
<td>4</td>
<td>0.6656</td>
<td>0.6168</td>
<td>Jarque-Bera</td>
<td>2.7427</td>
</tr>
<tr>
<td>8</td>
<td>0.5842</td>
<td>0.7897</td>
<td>p-value</td>
<td>0.2538</td>
</tr>
<tr>
<td>12</td>
<td>0.9875</td>
<td>0.4641</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel (d): Normality Test

Source: Output of Ljung Box Q-statistics, ARCH-LM, and Normality Tests for ARMA (0,5) – GARCH (1,1) under Macroeconomic Impact by Eviews 8.0

6.5. FORECASTING OF VIETNAM’S STOCK MARKET RETURN VOLATILITY

In respect of the empirical findings on the estimated VN-Index volatility, a variety of GARCH models are selected to forecast the volatility, including the standard GARCH(1,1) model without exogenous variables; three GARCH(1,1) models subsequently added one of the following significant explanatory variables to the variance equation: RGDP, CPI, and REX. The study afterwards performs an in-sample forecast from the 160 monthly observations for each of the selected models.
Table 6-21 presents an assessment of the predictive capacity generated from different GARCH models, including root mean squared error (RMSE), mean absolute error (MAE), mean absolute percent error (MAPE), Theil inequality coefficient (TIC), bias proportion (BP), variance proportion (VP), and covariance proportion (CP).

Table 6-21. Performance of In-Sample Forecasting

<table>
<thead>
<tr>
<th>Explanatory Variable added in Variance Equation</th>
<th>Dynamic Forecast</th>
<th>Static Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>RGDP</td>
<td>CPI</td>
</tr>
<tr>
<td>RMSE</td>
<td>0.102347</td>
<td>0.102352</td>
</tr>
<tr>
<td>MAE</td>
<td>0.075111</td>
<td>0.075097</td>
</tr>
<tr>
<td>MAPE</td>
<td>104.986</td>
<td>104.7301</td>
</tr>
<tr>
<td>TIC</td>
<td>0.951614</td>
<td>0.954714</td>
</tr>
<tr>
<td>BP</td>
<td>0.000071</td>
<td>0.000093</td>
</tr>
<tr>
<td>VP</td>
<td>0.999638</td>
<td>0.99956</td>
</tr>
<tr>
<td>CP</td>
<td>0.000291</td>
<td>0.000347</td>
</tr>
</tbody>
</table>

Source: Output of In-Sample Forecasting by Eviews 8.0

Given that smaller MAE and MAPE values are preferred, the GARCH model included consumer price index as an explanatory indicator in its conditional variance equation, which seems to be the most fitted one. This finding, again, highlights the most significant role of the consumer price index in determining the volatility of stock returns for the situation of Vietnam.

Particularly, it is able to forecast the volatility of Vietnam’s stock returns using the GARCH (1,1) model with CPI added as a variance regressor. Furthermore, the small values of the root mean squared error from dynamic and static forecasts (0.102 and 0.086, respectively, both nearly zero) imply that the actual volatility and forecasted volatility of stock returns move very closely. It also shows good predictive power of the selected model.
The graphs of forecasting for the variance of stock returns are presented in Figure 6-11.

Figure 6-11. Dynamic and Static Forecast of Stock Return Volatility

Source: Output of Dynamic and Static Forecast of Stock Market Volatility by Eviews 8.0
6.6. CONCLUSIONS

To summarize, this chapter employs a series of GARCH using three major types of distribution to model the volatility of Vietnam's equity returns over the time span from August 2000 to December 2013. While the generalized error distribution (GED) exposes its high power in most cases, the simplest form within the GARCH family (i.e. GARCH (1,1)) followed by a specification of ARMA orders (i.e. ARMA (0,5) were proven to be sufficient for the current research context.

By successfully passing a variety of diagnostic checks, the ARMA (0,5)-GARCH (1,1) model is able to verify its adequacy in modeling stock market returns for the case of Vietnam, both in univariate and in multivariate analyses. Either ignoring or including exogenous macroeconomic variables, the residuals produced from all of the models appear with freedom of autocorrelation up to the 36th lag, no presence of ARCH effect up to the 12th lag, and attain normal distribution.

In the consideration of the macroeconomic impacts on the volatility of Vietnam's stock returns, a number of important findings can be drawn from this chapter as follows:

(i) The volatility of Vietnam's stock market returns is highly persistent, suggesting a long memory of the volatility in response of a shock;

(ii) The current volatility of Vietnam's stock market is affected by the last previous shock more than by the last previous volatility itself;

(iii) No leverage effect is found in the case of Vietnam's stock market volatility;

(iv) A monthly change in consumer price index appears as the most essential indicator that help predicting the volatility of the Vietnam's stock market, since any 1% increase in CPI can explain an increase of the volatility by 5.3% under the univariate case (with the significance level of 5%) and correspondingly by 8.35% under the multivariate case (with the significance level of 10%);

(v) Any news about economic growth can be considered as the second significant factor in explaining Vietnam stock return
volatility as a 1% rise in real GDP is expected to be followed by a fall in volatility by 1.6% within the univariate study and by 1.1% within the multivariate study;

(vi) A statistical significant evidence under the univariate analysis is uncovered for the impact of a change in the exchange rate (USD/VNA) on Vietnam’s stock market volatility;

(vii) The GARCH (1,1) added consumer price index as a variance regressor can be considered the outperforming model in forecasting the volatility of Vietnam’s stock returns.
CHAPTER 7:

DISCUSSION OF EMPIRICAL FINDINGS AND IMPLICATION

7.1. INTRODUCTION

7.2. DISCUSSION OF EMPIRICAL FINDINGS

7.2.1. Executive Summary of Empirical Findings

7.2.2. Validity of Efficient Market Hypothesis for Vietnam

7.2.3. Validity of Arbitrage Pricing Theory for Vietnam

7.2.4. Comparison to Other Findings in Vietnam and Southeast Asia

7.3. IMPLICATIONS

7.3.1. Summary of Opinions from Questionnaires

7.3.2. Policy Implications

7.3.3. Investment Implications

7.4. CONCLUSIONS
7.1. INTRODUCTION

Against a background of a relatively sustainable socio-economic environment, the establishment of a stock market in late 2000 marked a milestone in the Vietnam’s capital market development as well as exposes an extension of its financial market sector. In line with Arbitrage Pricing Theory (APT) (Ross, 1976) and other relevant research (mentioned in Chapter 3), Vietnam’s stock market prices and macroeconomic variables are expected to strongly interact with each other. Based on the methodology developed in Chapter 4, the research has conducted various sophisticated tests, comprising Johansen cointegration tests, Granger causality tests and GARCH models to obtain the proposed objectives. The empirical results shown in Chapter 5 and Chapter 6 illustrate the existence of both long- and short-run linkages between Vietnam’s stock market returns and macroeconomic variables for the period from August 2000 to December 2013.

In order to strengthen the validity of the analysis, this chapter further discusses the empirical findings within the context of relevant literature and pertinent theories. Furthermore, questionnaires focusing on four groups – government officers, academia, stock investors and bankers – have been distributed. Together with an assessment of the underlying relationship among research variables under the current circumstance of Vietnam, the certain implications for the case of the country will be outlined at the end of this chapter.

7.2. DISCUSSION OF EMPIRICAL FINDINGS

This section concisely summarizes the research’s empirical findings and affirms the validity of relevant theories (i.e. efficient market hypothesis, and arbitrage pricing theory) within the context of Vietnam. A comparison to previous findings in Vietnam and other Southeast Asian economies is later provided in order to support the rationality of the current research outcomes.

7.2.1. Executive Summary of Empirical Findings

Based on the bivariate analysis, the Johansen cointegration tests find that Vietnam’s stock market index shares a significant relationship with economic growth, the consumer price index and foreign direct investment. Granger Causality
tests conducted following these cointegration findings revealed mixed results, wherein unidirectional causal links were shown originated from stock market returns to economic growth, consumer price index and foreign direct investment, and from money supply and interest rates to stock market returns. TYDL Granger Causality tests found different unidirectional causalities, which direct from stock market returns to the consumer price index and foreign direct investment, and from interest rates to stock market returns.

In terms of the multivariate analysis – where all selected macroeconomic variables were taken into account, the Johansen cointegration outcomes show a significant equilibrium link between returns on VNI and chosen macroeconomic indicators. Besides, the short-run causal effects are established from the money supply, the refinancing rate to stock market returns under the VECM causality tests; they are also found from the money supply, the refinancing rate and foreign direct investment to stock market returns under the TYDL method.

Additionally, dynamic analyses provide knowledge on the influence of a macroeconomic shock on the Vietnam’s securities market index. The impulse response function together with the variance decomposition results disclose weak support for the importance of innovations in macroeconomic factors in explaining the response of VNI. A shock initiated by the money supply accounts for the biggest response of VNI and also contributes the most significant portion of the stock market variances. The smallest response of VNI, in contrast, originated with the exchange rate.

Taking the volatility clustering into account, the GARCH analysis shows that stock market volatilities can be predicted using previous shocks (i.e. those originating from the consumer price index, economic growth and the exchange rate) rather than the previous volatility itself. Furthermore, the GARCH (1,1) model added the consumer price index as a variance regressor can be considered as the outperforming model in forecasting the volatility of Vietnamese stock returns.
7.2.2. Validity of Efficient Market Hypothesis for Vietnam

Based on the research’s outcomes, it is feasible to predict the returns on Vietnam’s stock market index as well as its volatility using macroeconomic information. This finding violates the efficient market hypothesis (EMH), which supports the view that the stock market index cannot be reckoned relying on available information. It implies the inefficiency of Vietnam’s stock market in respect of selected macroeconomic variables. The result supports the findings of Truong, Lanjouw and Lensink (2010) and Phan and Zhou (2014), who rejected the lowest form of efficiency in the context of Vietnam. This is as expected result since Vietnam has been a freshly emerging market in Southeast Asia since 2000, meaning that its equity market and regulatory framework are in the early stages of development.

This issue was discussed in Kim and Shamsuddin (2008), where they found the level of efficiency of the stock market possibly relied on its level of development and a regulatory framework conducive to transparent corporate governance. The authors examined several Asian markets and discovered that some of them (which have more developed equity markets, i.e. Hong Kong, Japan, Korea and Taiwan) were functioned as a weak form efficient market, while the remaining (which are emerging markets, i.e. Indonesia, Malaysia and the Philippines) were inefficient. Another research, by Hamid et al. (2010), involved random walk tests on 14 stock markets in Asia-Pacific. It also found that investors could make profits from these markets by an arbitrage process as no markets of interest were characterised as random walks. Therefore, the conclusion that the Vietnam’s stock market has been not satisfied efficient market requirements, even in a weak form, is consistent with the results of most other emerging markets in the Asia region.

7.2.3. Validity of Arbitrage Pricing Theory for Vietnam

Since the Vietnam’s stock market is predictable in terms of selected macroeconomic variables, investors may benefit and earn abnormal profits through an arbitrage process. The aim of the research project is to set up an equation that reflects the association between Vietnam’s stock returns and a
number of selected macroeconomic indicators against the background of Arbitrage Pricing Theory (APT).

From the first research on this topic, conducted by Chen et al. (1986), to the multiple subsequent studies (e.g. Zakaria and Shamsuddin, 2012; Bapci and Karaca, 2013), no standard set of macroeconomic indicators has been established. It is normally customized based on the different context of research. In the case of Vietnam, this project has built up a nexus between VNI and six macroeconomic factors in their real values, as follows:

\[
LRVNI = 7.97 \times LRGDP - 8.63 \times LCPI - 4.64 \times LRMS + 1.68 \times LRFR - 12.33 \times LREX + 0.35 \times LRFDI + 125.26
\]

While all the coefficients appear statistically significant at a 5% level of significance, the above equation seems satisfactory in reflecting the linkage between variables of interest. It also indicates the appropriateness of the macroeconomic selection under the APT in the context of this research project.

### 7.2.4. Comparison to other Findings in Vietnam and Southeast Asia

The results from the bivariate cointegration tests (Table 5-10, Chapter 5) suggest three cointegrating relationships with stock market prices, - namely economic growth, consumer price index, and foreign direct investment. These cointegrating relationships are all positive, as revealed by the normalized cointegrating equations in Table 5-11 (Chapter 5). These findings are consistent with the outcomes of the multivariate cointegration test; whereby, a long-term link is established between returns on VNI and a set of six macroeconomic variables. Whilst real economic growth, the real refinancing rate, and real foreign direct investment positively influence real VNI, the consumer price index, the real money supply and the real exchange rate negatively impacts on real VNI.

✓ **Stock Market Returns and Economic Growth**

The findings from empirical investigation indicate that Vietnam’s securities market returns significantly and positively interacts to economic growth of the country during the sample period of August 2000 to December 2013. This result is reliable with the previous findings for Vietnam over the period 2001–2008 by
Hussainey and Le (2009), who also showed there was a significant positive nexus between industrial production (represented for economic output) and equity prices. In other study for five Southeast Asian countries (namely Indonesia, Malaysia, Singapore, Thailand, and Philippines,), Wongbangpo and Sharma (2002) found that growth in output and stock price indices had a positive linkage. It is explained by an expansion in output promoting expected future cash flow, raising corporate profitability and then increasing securities prices.

✓ **Stock Market Returns and the Consumer Price Index**

The finding of a negative coefficient of CPI is rational under the expectation that high inflation might lower the confidence of investors to invest in the stock market, causing a fall in equity prices. A similar result was uncovered from the research of Wongbangpo and Sharma (2002) for various Southeast Asian economies, where CPI and stock prices were negatively associated. The explanation is given as an increased price level can raise the cost of production, and then reduce the expected profitability of the firm, causing a drop in securities prices.

However, this result is contradictory with the conclusions of Huynh et al. (2014), wherein CPI was found to share a positive relation with Vietnam stock index. Although this outcome does not follow the theory, it can be explained by equities themselves being used as a means for hedging against inflation (Hussainey and Le, 2009).

✓ **Stock Market Returns and Money Supply**

The empirical evidence of a contrary relation between money supply and VN-Index is discovered for the case of Vietnam during the period 2000–2013, similar to the conclusions for Indonesia and Philippines (Wongbangpo and Sharma, 2002). In theory, given other factors stay the same; a growth in money supply seems to be good news for investment flows into the economy. While more money is pumped into the market, the price of financial assets is expected to correspondingly increase.
However, in practical, the expansion in money supply can stimulate economic growth but may also drive up inflation. Once the impact from higher price levels dominates, the positive effect from economic growth is one considerable factor driving high inflation, causing a falling off in stock prices. In contrast, the stock prices climb if the impact from high inflation cannot over-perform the effect of an economic stimulus. This, in fact, was happened in some cases, such as Malaysia, Singapore and Thailand (Wongbangpo and Sharma, 2002).

Stock Market Returns and Interest Rates

Vietnam's stock market prices and refinancing rate (and interest rates in general) are positively related. Any rise in the refinancing rate possibly upsurge the cost of borrowings for the banks, leading to a reduction in borrowings. It results in a decrease in money supply, which eases the pressure of inflation, stimulates economic growth and then increases stock market prices.

This outcome is comparable to the studies of Huynh et al. (2014) and Hussainey and Le (2009), who also uncovered a significant positive link between the short-term interest rate and Vietnam's securities prices. Nonetheless, it is in contrast with the cases of the Philippines, Singapore and Thailand (Wongbangpo and Sharma, 2002) where a short-term interest rate in these countries might represent an alternative choice for investors. When an interest rate increases, investors lose their interest in investing in stocks, causing a drop in stock prices.

Stock Market Returns and Exchange Rate

The negative coefficient of an exchange rate in the regression reveals the adverse effect of the depreciation of a home currency to the stock market performance. When the local currency is devalued, implying its purchase value has declined against foreign currency, the inflation rate may increase, reducing economic growth, and then the stock market index will go down. Also observed in Singapore and Thailand (Wongbangpo and Sharma, 2002) was that the devaluation of local currencies resulted in investors being less willing to hold local assets, leading to a negative impact on the stock market. A converse situation happens when the depreciation of local currencies against the US dollar enhances
these countries’ competitiveness in exports, hence promoting their stock market performance (e.g. in Indonesia, the Philippines and Malaysia (Wongbangpo and Sharma, 2002)).

However, this finding was not appeared to support the results of Narayan and Narayan (2010), who found that the exchange rate shared a significant and positive relationship with VN-Index. The difference in the conclusions could be explained by the use of a nominal exchange rate by Narayan and Narayan (2010) instead of real values, as employed in the current research. The result was then affected by the domination of inflation rate effect, which seemed reasonable for the situation of Vietnam.

✓ **Stock Market Returns and Foreign Direct Investment**

The empirical results also show there was a positive connection between the series FDI and Vietnam’s stock market index. The more FDI flows inward, the more prospective investment opportunities the host country brought. Hence, an upsurge in stock prices is expected. Compared to other countries in the region, Vietnam has been one of the most attractive destinations for FDI inflows (the World Bank Data, [http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD](http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD)). Expanded FDI has brought more prospects for the domestic economy, promoting economic growth (FIA portal, [http://fia.mpi.gov.vn/news/77/economic-strength](http://fia.mpi.gov.vn/news/77/economic-strength)), and subsequently increasing stock prices.

So far, there has been no research conducted on the direct connection between foreign direct investment and stock market prices for Vietnam and the Southeast Asian region. However, a number of studies for Asian economies have exhibited the significant positive influence of inward FDI on economic growth (Bende-Nabende *et al.*, 2001; Baharumshah and Thanoon, 2006; Wang, 2009). Since economic growth and stock market prices are conclusively believed to have a positive relation, it supports the idea of FDI having a positive influence on equity market prices, which is in line with the findings of this research project for Vietnam.
To conclude, in the short run, real interest rates and real money supply are consistently found to Granger cause real stock market returns, either using the bivariate or the multivariate Granger tests (except for the causality from real money supply to RVNI in the bivariate TYDL test). In the way round, unidirectional causalities are discovered from the real stock market index to the consumer price index and real foreign direct investment under different bivariate Granger tests. These outcomes imply that the past values of real VN-Index contribute to explain the movements of consumer price index and real foreign direct investment, whilst real VNI can be predicted using the historical information of real money supply and the real refinancing rate.

Wongbangpo and Sharma (2002) also conducted causality tests to establish the dynamic links for stock market prices and macroeconomic factors in five Asian countries. The predictability of stock market prices was subsequently confirmed in respect of past values of macroeconomic variables. In specifically, causality links were found to originate from stock prices to money supply and interest rates for the cases of Indonesia, Malaysia and Thailand; to exchange rates for Philippines and Singapore; and to economic activity and inflation for all five Asian markets.

Regarding the response of VNI to macroeconomic innovation, the research has found that there is a small response in VNI to one innovation in macroeconomic variables by impulse response function and variance decomposition. It seems compatible with the results of impulse response function in Huynh et al. (2014), indicating that VNI responds to a shock in macroeconomic factors at a relatively low speed.

With respective of the Vietnam’s stock market index volatility, the GARCH models have been applied to the Vietnam context for the period 2000–2013. The research reveals the applicability of the GARCH (1,1) model to investigating the macroeconomic impacts on the volatility of Vietnam’s stock market returns. Inflation, economic growth, and exchange rate in order are discovered as key factors in interpreting stock market return volatility.

Only few studies have been constructed GARCH models for Vietnam and its neighbors in terms of macroeconomic influences on the volatility of stock market.
Ibrahim (2002) employed the ARCH (1) model for January 1977 to June 1996 in Malaysia and validated unidirectional causality from the volatility of few macroeconomic factors (i.e. exchange rate, reserve) to the stock market volatility, and bidirectional causality between the volatility of money supply and the volatility of Malaysia's stock market. Also, within the context of Malaysia, Zakaria and Shamsuddin (2012) estimated the GARCH (1,1) to concern the volatility of the stock market and its links to macroeconomic volatilities. However, only weak evidences were discovered for the linkage being studied. In particular, the volatility of stock market is found to be Granger caused by the volatility of inflation and the volatility of interest rates, while no significant causality was established between stock market volatility and macroeconomic indicators as a group.

Regarding to the research theme of the volatility of stock market returns in Asian emerging markets, Vrugt (2009) attempted to find the influence of international announcements on Asia-Pacific's stock market volatility under the GARCH framework. A significant impact of external macroeconomic news on conditional volatility of stock market was statistically verified. This study provided some new wider aspects that the research can further expand for the case of Vietnam in order to obtain more sufficient explanation for the VN-Index's movements.

7.3. IMPLICATIONS

As stated in the first chapter, the empirical findings of this research project may benefit investors in the Vietnam's stock market and support policy-makers in devising regulations. However, in order to build up implications with high practicality, the research additionally designs a questionnaire to gather perceptions and opinions from different group of experts on issues related to this topic research. The responses of chosen experts offer an alternative way to approach the linkage between macroeconomic environment and stock market in Vietnam.

With the support from the questionnaires together with the empirical results from statistics, the following section later provides various implications –
comprising policies and investment strategies, aiming to enhance the performance of the macro-economy as well as the Vietnam’s stock market.

7.3.1. Summary of Opinions from Questionnaires

The questionnaire was distributed to a small sample including four target groups: policy-makers, financial analysts, securities investors and academia. Out of 25 questionnaires that were distributed, 20 copies were returned. Based on their partaking in the macro-economy and stock market of Vietnam, the selected participants all have specific experience in the current research field. Their opinions regarding to this research’s topic are valuable to strengthen the validity of empirical results gained in Chapter 5 and Chapter 6.

The questionnaire contains 13, mixture of closed-ended and open-ended questions. In particular, the questionnaire subsequently seeks the opinions of specified experts in the following sections: the predictability of the movement of Vietnam stock index, the ability of explaining Vietnam’s stock market prices via a range of macroeconomic variables, the assessment of current macroeconomic environment and stock market in Vietnam, and policy recommendations. The copy of questionnaire is attached in the Appendix at the end of the research. The following section summarizes main opinions and comments of all the participants under the project, regarding to how the Vietnam’s stock market has been performed as well as its relation with macroeconomic indicators.

• The importance of the Vietnam’s stock market

Firstly, all the participants agreed that the Vietnamese government’s decision of setting up Vietnam stock exchange by the end of 2000 has had positive impact on the performance of macro-economy in general. From the beginning of 2000s, in addition to the comprehensive economic reform and the adoption of free-market policies, the retrieval of investors’ confidence in Asia markets after the financial crisis 1997-1998 were good signals at the early stage of launching the first securities trading floor in Vietnam. Against the circumstance that Vietnam’s stock market was the youngest stock market in the region - with only two listed
stocks on the first trading session, the new channel of investing and raising capital absolutely boosts the growth of the entire economy.

In fact, the number of listed companies was spread to nearly 700 on two stock exchanges (Ho Chi Minh and Hanoi) at year-end 2013, lifted the total market capitalization from USD 27.95 million as of July 2000 to USD 52.5 billion in early 2014 for both Ho Chi Minh and Hanoi stock exchanges (annual reports of Ho Chi Minh and Hanoi stock exchanges). Correspondingly, GDP in current USD noticeably increases from USD 33 billion in 2000 to over USD 186 billion at the end of 2014 (the World Bank Data).

- The determinants of the Vietnam’s stock market

The second interesting result from the answers is the contradictory opinions on whether Vietnam’s stock market prices (VN-Index or VNI) can be predicted or not. Among gathered responses, policy-makers, financial analysts and securities investors insist that VNI can be predicted based on certain factors (i.e. macroeconomic variables, cycle of the economy, etc.) while the group of academics rejects that possibility. The distinction can be explained by their different approaches to the stock market. Specifically, most people in academic area have no practical experience in investing, despite the fact they have strong academic background in stocks and financial market. In contrast, participants in other groups mostly manage their own investment portfolios and therefore have certain experience in investing in stocks.

Based on their personal experience, policy makers and securities investors suggest some specific techniques that can be used to forecast Vietnam’s stock market prices. These include econometric modeling, margin trading, chart analysis, top-down technical analysis, etc. One participant indicated that the fundamentals are the key to get the outperformance of the stock market. In which, they may observe some factors such as business cycle of the whole economy, crowd effects, flow of fund to the stock market, and capital management to obtain better prediction for the movement of the stock prices.
Regardless the agreement in the probability of predicting the Vietnam’s stock market returns, the academic participants agree with the rest (who are policy-makers, financial analysts and securities investors) that macroeconomic indicators have certain influences on the Vietnam’s stock market. They listed various factors that can be used as the determinants of stock market, either macroeconomic variables (i.e. GDP, inflation rate, interest rates, exchange rate, etc.) or microeconomic variables (i.e. dividend policies, firms’ performance, etc.). Wherein, all the experts consistently believe the strong influence on Vietnam’s stock market index from macroeconomic side.

These opinions essentially strengthen the validity of the existing linkage between macroeconomic series and Vietnam’s stock returns, which has been proven under the empirical chapters in the research.

- **The key macroeconomic variables in respect of its influence on Vietnam’s stock market returns**

In conjunction with the general agreement that the macro-economy and stock market performance in Vietnam have a significant relationship, a majority of the participants consider credit outstanding and interest rates as the most influential factors for the Vietnam’s stock market index (suggested by a half of participants). Due to the insufficiency in statistical figures for Vietnam’s credit outstanding over the period 2000-2013, this factor has not been included in the current research.

Irrespective this drawback, one remarkable empirical findings of the research is that interest rates significantly relate to stock returns under the case of Vietnam. Not only sharing a part in the long-run relationship with VN-Index, interest rates are also the only indicator (among six series in the research) that Granger causes the stock market index either under bivariate analysis (using pairwise Granger and TYDL Granger methods) or under multivariate analysis (using VECM Causality and TYDL tests).

In many countries, interest rate has been expressed as one crucial tool of monetary policies. Depending on a certain situation, the government appropriately
adjusts interest rate to obtain various objectives of the monetary policy on the part of stabilizing the money market as well as stimulating the development of banking system. The steady growth of money market warrants the confidence of stock investors, which is the fundamental key to surge up the stock market.

Practically in Vietnam, the fluctuation of interest rates year on year from 2000 to 2013 experienced a similar trend with the volatility of stock market. During this period, the interest rate policy had several major changes, towards market-determined interest rates. These changes were made in respective of restructuring financial market, specialized in banking system, which expressed in the strategy of the Socio-Development Plan for the 2011-2015 Period. Over the same period, the Vietnam’s stock market also had different variations.

More specifically, the State Bank of Vietnam (SBV) introduced the base-interest rate from 2000, as a replacement of the ceiling for lending rates in previous period. This base rate with an adjusted set margin was a benchmark for all the activities of commercial banks. After 2002, interest rates were liberalized, allowing commercial banks to set their own lending rates and deposit rates based on the current market situation. However, high inflation and sluggish growth since 2007 drastically raised the interest rates in Vietnam. Within two years 2010-2011, the deposit rates and lending rates of commercial banks peaked their high records at about 15-16% and 19-20%, respectively (SBV) (while the year on year inflation rate hit 23% as of August 2011). The volatility of interest rates mattered the confidence of securities investors. Under the pressure of the macroeconomic plunge together with the slowdown in global economy after the crisis 2007-2008, VN-Index plunged 66% over the year 2008 (HOSE’s annual report 2008) and fell below 300 points at the beginning of 2009 (reported by the Ministry of Finance, Vietnam10).

In order to ease the disadvantageous situation of a continuous rise in inflation rate due to the prolonged high increase in interest rates, the SBV implemented the caps on short-term deposit rates and also the caps on lending

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rates in some specific sectors from 2011. The quality of credit was also paid more attention in banking system, rather than its growth rate. By diminishing the ceilings of interest rates in Vietnam Dong, the burden of high inflation was released and the non-performance loan ratio decreased since 2013.

Meanwhile, the Vietnam’s stock market started to recover from 2009, while its index rebounded 57% compared to the last year. The Vietnam stock index, however, dropped 27% by the end of 2010 and then kept fluctuated around 500 points until 2013 (Figure 7-1). The reason why the stock market of Vietnam could not access the fully recovery was originated from the uncertainty and instability of the Vietnam’s macroeconomic environment (Mai Vu Thao, Director of Portfolio Management, Dong A Securities of Vietnam). In specific, most of the companies were severely impacted by the high inflation, increasing lending rate, and declining bank credit growth (caused by the tighter economic policies). The rising input cost as well as the difficulty to approach new capital explained the shrinkage in prices and returns for many securities during the period 2008-2012.

**Figure 7-1. Interest rates, Inflation rate, and VN-Index in Vietnam 2008-2013**

![Graph showing interest rates, inflation rate, and VN-Index in Vietnam from 2008 to 2013](image)


*Notes: inflation rate is calculated by the annual percentage change in consumer price index; lending rate and deposit rate respectively represent the annual lending rate and deposit rate on average that applied by commercial banks; and VN-Index is the index of Vietnam’s stock market on the last trading session of each year.*
After several efforts of the Vietnamese government, the macroeconomic performance and the confidence of stock investors were significantly improved from 2013, reflected by the regain of 22.3% in VN-index at the end of 2013 compared to as of 2012 together with the spread of US$8 billion in the total market capitalization over this one-year period 2012-2013.

Another macroeconomic factor suggested in questionnaires in respect of its important impact on VNI is money supply (5/20 answers). Excluding the results of the bivariate TYDL tests, the other causality tests consistently found a causal link originated from money supply to Vietnam’s stock market index. The dynamic analysis under the research additionally showed that a shock in money supply accounts for the biggest response of VNI as well as the stock market variances.

In reality, Vietnam is an economy absorbed a fast growth money supply. The growth in annual M2 of Vietnam exclusively hit 49.1% in 2007 after the country’s WTO accession. The chart below (Figure 7-2) illustrates that a change in money supply and VN-Index have the same trend over the period 2001-2014. Any increase in M2 tends to raise the Vietnam’s stock index, and vice versa. It is converse to the statistical outcome (Chapter 5, section 5.5.2), which shows that an increase in M2 leads to a drop in the VN-Index. This inconsistence may be explained by the difference in the data frequency. Whilst the statistical tests run the monthly data, the figure 7-2 uses aggregate money supply based yearly and year-end VN-Index (counted on the last day of the year).

In addition, a shock in money supply and a shock in the Vietnam’s stock market index seem to be related (Figure 7-2), which has been suggested by the statistical tests under the research project (Chapter 5, section 5.6). One example is the drastic decline in money supply between 2007 and 2008, after Vietnam officially joined the WTO but the world started struggling with economic slowdown and financial crisis. At the same time, the VN-Index dropped from 927.02 at the end of 2007 to 315.62 at the end of 2008, the biggest gap in the history of the Vietnam’s stock market from its first trading year.
In general, the opinions of the experts seem significantly support for the empirical results. Based on their outstanding experience, some recommendations will be added in the following section concerning to improve the Vietnam's macroeconomic performance as well as the present legitimate framework for the Vietnam's stock market.

- **Assessment of macroeconomic performance and current legal framework for the Vietnam's stock market**

  The importance of macroeconomic stability, which seems to be mostly driven by macroeconomic policies, is mentioned in respect of the Vietnam's stock market development. 15 out of 20 participants corresponded that the stability of macro-economy is one of the most vital keys for the efficient operation of the Vietnam's stock market.

  The Vietnamese macroeconomic performance recently looks considerably stable and is potentially able to continue this trend. It also reflects the flexibility and efficiency of the Vietnamese government to confront macroeconomic volatility (for examples, high inflation in 2008 and 2011 and high interest rates in 2011). Nevertheless, it is undeniable that an emerging economy as Vietnam is extremely vulnerable and can be drastically impacted by a number of external risks. For
instance, the global economic sluggish after the financial crisis 2007-2008 tends to cause the slowdown in the Vietnam’s economy, reflected by the downturn economic growth, together with high inflation rate and reluctant investment flow from the year 2008 until the present (2015). The Vietnam’s annual GDP growth reached 7.1% in 2007, but then diminished to fewer than 6% over the next two years (5.7% and 5.4% in 2008 and 2009, respectively). It picked up to 6.4% in 2010 and 6.2% in 2011, but dropped again to 5.2% in 2012 and 5.4% in 2013\(^\text{11}\).

Besides, the legal framework of Vietnam has been assessed as inadequate for the development of the stock market, which still lacks efficiency, transparency and comprehension. As briefly presented in Chapter 2 (Section 2.4), the Vietnam’s stock market is considerably young since the first securities trading session was not launched until July 2000. The establishment of stock market and stock trading floor in Vietnam remarks a new stage of progress in capital market and economic development. However, till June 2006, the Law on Securities was officially promulgated. Although this action states the significant change to the regulation of securities market in Vietnam, it reflects a need for the promptly response of the Vietnamese government to enact the legal system in order to adapt the current situation of market development (as the fact that Vietnam securities market had been operated for 6 years without a proper legal framework).

Throughout 15-year-history of trading, the Vietnam’s securities market has been operated more efficiently with several efforts of the government to modify current securities regulations and laws as well as to promulgate new regulations and laws\(^\text{12}\). The market capitalisation, the number of listed securities, the number of investors, the trading volume and value have been remarkably accelerated. Even though, the market has been suffered from a number of problems, such as the increased number of firms involving information closure violence, the inadequate technological infrastructure, and the high volatility of Vietnam’s stock prices, etc.


\(^{12}\)The latest amendment in the Securities Law was implemented on 18 Dec 2013.
To reach the international standards and to boost macroeconomic performance as well as the investment environment, the participants of the questionnaires proposed some recommendations as follows.

- **Restructuring the economy to improve the efficiency of capital investment**

  The Vietnamese government determines economic restructuring as an important step towards the growth quality, economy’s efficiency and competitiveness\(^\text{13}\). Several aspects under the economy-restructuring project have been undertaken in Vietnam, mainly focusing on investment, financial-banking system, and enterprises. In which, the private sector (including private investing activity) is encouraged to extend in the Vietnam’s economy. The stable and sound economic development ensure the confidence of all participants in the capital market, and also open favorable conditions to ease the capital sources into the economy.

- **Strictly supervising the banking system and the state-owned corporations**

  Firstly, the efficiency of the banking operation directly influences on the saving and borrowing activities in the economy, then further impacts on the health of the whole economy. The fluctuation of interest rates also impacts on the firms’ activities and their profits, afterwards affects investors’ decision-making. The race in increasing interest rates (both deposit rate and lending rate) during the period 2010-2011 inside the commercial banks in Vietnam reveals the high uncertainty and unhealthy in the banking system as well as the lack of efficiency in organizing and supervising the banking operation. The Vietnamese government has recently been putting a great effort to enhance the performance of the banking system, including limiting the number of credit organizations, clearing bad debts, encouraging mergers and acquisitions, etc.

  Secondly, the Vietnamese government has expressed the role of state-owned corporations in order to adapt the current situation of the economy. As a

  \(^{13}\)“Master plan on economic restructuring in association with conversion of the growth model towards improving quality, efficiency and competitiveness during the 2013-2020 period” – Decision 339/QD-TTg signed on 19 February 2013. (http://www.chinhphu.vn/portal/page/portal/English/strategies/strategiesdetails?categoryId=30&articleId=10052090).
consequence of the subsidy regime for a long time in Vietnam (1975-1986), the State apparatus has been cumbersomely organized. It results in the inefficiency and inadequate proficiency in organizing State-owned enterprises. Towards the open economy and acknowledge of the role of international integration, the Vietnamese government has restructured the enterprises by directing their attention on State-owned corporations and groups. Along with a number of State-owned organizations that have been successfully equitized, the market has been enlarged by the increasing quantity of stock and bond issuers.

The performance of the banking system and State-owned enterprises in Vietnam has been recently improved; however, strictly managing and developing the banking system and the State-owned firms remains necessary to improve the national economic outlook and enhance the stability of the macro-economy\textsuperscript{14}. These foundations are the key factors to boost up the growth and the health of the securities market.

\begin{itemize}
\item \textit{Enhancing the transparency of fiscal spending and the predictability of monetary policy}
\end{itemize}

In the transition market such as Vietnam, fiscal policy in association with monetary policy play significant role to assure the stability of the whole economy through retaining appropriate level of economic growth, controlling inflation rate, adjusting interest rates, and stabilizing domestic currency, etc. The enhanced transparency of fiscal spending as well as the reasonable predictability of monetary policy considerably contributes to the investors’ confidence in the stock market.

\begin{itemize}
\item \textit{Strictly regulating the listed companies concerning corporate governance practices and information closure}
\end{itemize}

Recently, more listed companies in the Vietnam's stock market have been forced to be delisted due to consecutive losses and violations of information closure. The weak corporate governance practices can directly influence on the

\textsuperscript{14} "Socio-Economic Development Plan for the 2011-2015 Period" (http://www.chinhphu.vn/portal/page/portal/English/strategies/strategiesdetails?categoryId=30 &articleId=10052505).
profitability of the firms, and then lead to the reluctant to invest on the stocks of these firms amongst their investors. Likewise, the deficiency of regulating information closure is able to lose the confidence of investors in the securities market and then adversely impact on the market liquidity.

The improvement of information quality and corporate governance practices is especially substantial when Vietnam fully integrates with the region and the world's economy while the firms experience the increasing level of competitiveness. The strict regulation on information closure and the enhanced corporate governance practices can importantly keep the Vietnam’s stock market healthy and capacity to reach the international standards.

✓ *Increasing the foreign ownership limitation*

A number of participants in the questionnaires comprehended the vital role of increasing the foreign ownership limitation to the emerging market such as Vietnam. In fact, from the beginning of September 2015, the foreign ownership restriction of 49% in Vietnamese public companies has been lifted in many business sectors\(^\text{15}\). This decree brings new opportunity for foreign investors to take up to 100% stakes in Vietnamese companies. In other words, it opens a great prospect for the country to attract more foreign direct investment, to ease capital flows. The liquidity and market value are expected to increase, and then to boost up the stock market.

Although the issuance of new regulation promises a significant openness to foreign investments, the foreign ownership cap remains unchanged to leading sectors such as banking (which is limited at 30%). A restriction of 49% foreign ownership will also not be removed in some certain business sectors; however, they have been not yet specified in the decree. Hence, these conditions must be shortly clarified in further guidance by the government.

### 7.3.2. Policy Implications

It is apparent that different countries in the world have different economic issues then require distinctive development strategies. However, one major aim of

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\(^{15}\) in accordance with the issuance of Decree No. 60/2015/ND-CP on 26 June 2015
economies is to build a stable macro-economy that includes maintaining sustainable economic growth and a stable low inflation rate. In relation to Vietnam, the socio-economic development targets from 2011 to 2015 have been determined as restructuring the economy, stabilising the macro-economy, constraining inflation and stabilising the purchase value of the local currency (Socio-Economic Development Plan for the 2011-2015 period, Vietnam Government Portal) Give full source.

With the ratio of market capitalisation over GDP having been significantly enlarged (from 0.4% in 2003 to 21.1% in 2012, according to the World Bank data) give full source, financial markets have been expressed as one significant part of the economy under the Vietnam government’s strategy. Along with this government plan and based on the outcomes of this research project, some policy implications are suggested as follows:

• Firstly, macroeconomic variables can be considered as leading indicators of the Vietnam’s stock market index and vice versa. The history as well as the present information on the macroeconomic indicators is useful for policy-makers amending or implementing new policies to enhance the securities market’s performance. Conversely, the history and current information of the stock market can be useful for policy-makers amending or implementing new policies to stimulate economic growth, improve the monetary environment or expand foreign investment.

• Secondly, monetary policies must take into account the stability of price levels, the restriction of money supply and the upsurge in interest rates. Any rise in inflation rate and in real money supply or any decrease in real refinancing rate possibly result in a drop in stock market returns in Vietnam under the circumstances of excessive growth. In other words, when real money supply grows, leading to increase in inflation rate increases, it adversely impacts on economic growth, with consequences for the downturn in stock market returns.

Similarly, any decrease in the real refinancing rate may encourage the banks’ borrowing as the cost of borrowing for the banks drops. This results
in an expansion of money supply, leading to a rise in the inflation rate, reducing economic growth and then cutting stock market returns.

- Thirdly, policy-makers must maintain the level of the VND/USD exchange rate. Any action involving increasing the exchange rate leading to depreciation of the local currency can increase the inflation rate (as the purchase value of VND falls) and decrease Vietnam’s stock market index as a consequence.

- Finally, Vietnamese policy-makers must also consider the importance of attracting FDI to Vietnam. The ratio of exports in the FDI sector has increased from 47% of the country's total exports in 2000 to 67% in 2013 (explain this, providing available statistics), and foreign invested enterprises’ share of GDP has grown from 13% to 18% over the same period (2014 Investment Climate Statement, Department of State). The growth of FDI, therefore, plays an undeniably vital role in Vietnam's economic growth and it explains why the growth of FDI is statistically proven to increase the Vietnam’s stock market index.

7.3.3. Investment Implications

The findings of the research point to how investors in the Vietnam’s stock market should consider the movement of macroeconomic variables. Any changes in the macro environment may signal the requirement of revising an investment strategy.

- According to the empirical results, inflation is considered as the most important indicator that impacts on the Vietnam’s stock market index. An increase in inflation probably originates a growth in money supply and then a rise in the interest rate. It subsequently reflects the overheating of an economy, which can be seen in Vietnam during the sample period 2000–2013.

- A decision by policy-makers about adjusting the exchange rate up or down may also impact on the behaviour of investors. An increase in USD/VND implies the devaluation of the Vietnam Dong or a decline in the purchase value of the local currency. It leads to an upward trend in inflation, a
reduction in economic growth and then a fall in the Vietnam’s stock market returns. Thus, investors must consider any factors that result in increasing USD/VND.

For example, the State Bank of Vietnam recently decided to devalue VND by 1% against the USD from July 2015 under the pressure from the dollar's appreciation in the banking system and in the international market earlier this year. It was also expected after the statement by the government about the trade deficit. The interbank average foreign exchange rate USD/VND then increased from 21,458 to 21,673 (SBV, data collected on July 5, 2015). The investors had to take into account this change in the exchange rate while making any investment decision.

- Any signal of an increased or decreased foreign direct investment inflow can be useful information for investors for making investment decisions. Recently, the Free Trade Agreement (FTA) between Europe and Vietnam was officially signed (August 2015). This agreement opens up more opportunities for both sides by easing market access in goods and services (Malmstrom, EU Trade Commissioner). It is important to heat up the economy while reflecting a better investment environment for foreigners, which will be accompanied by an expected rise in foreign direct investment. Because FDI and the Vietnam’s stock market index are found to have positive relationship, the VNI is consequently forecasted to rise if FDI continues its upward trend.

7.4. CONCLUSIONS

The study on how macroeconomic performance influences equity returns of the market in developing countries has been recently attracting a great interest from both regulators and academia. For the context of an emerging market such as Vietnam, the development of its stock market can be considered as a crucial benchmark for determining the prosperity and sustainability of the whole economy. This chapter sought to evaluate the empirical findings (that were presented in Chapter 5 and 6) by comparing them with previous research in the same topic undertaken on Vietnam and Southeast Asian countries. Moreover, to
analyse the results before suggesting some implications, the researcher gatherer opinions in questionnaires distributed to four main groups: policy-makers, financial analysts, securities investors and academics.

To sum up, the empirical results validate the evidence for the rationality of the theoretical framework. First, the Efficient Market Hypothesis is rejected, implying investment opportunities that possibly arise from the arbitrage process. There are suggestions that it enhances the efficiency and efficacy of the market, involving the quality of information closure, the transparency and comprehension of policies and legal framework, and the professionalism of investors. Second, the validity of Arbitrage Pricing Theory (APT) is verified. The research has constructed an equation that represents the interactions between the Vietnam’s stock market index and six macroeconomic indicators, while all of the coefficients are significant at a 5% conventional level.

In conjunction with the applicability of the theory, the outcomes from this research project seem to be consistent with other prior studies in Vietnam and some Southeast Asian countries. In particular, economic growth, money supply and foreign direct investment positively influences the stock market index (VNI), while the impact is found to be negative for consumer price index, interest rates and foreign exchange rate. Furthermore, the historical information of VN-Index can be used to explain changes in economic growth, inflation, and foreign direct investment, whilst the previous values of money supply and refinancing rate are found to contribute to the forecasting of VN-Index. These findings were correspondingly explained in brief under the actual situation of Vietnam’s economy during the period August 2000–December 2013.

Following the discussion on the empirical results and acknowledging opinions from experts, a number of implications – including policy implications and investment implications – were provided in order to achieve better macroeconomic as well as stock market performance. This section not only benefits policy-makers and securities investors in Vietnam, but also strengthens the originality and authenticity of the research derived from other studies.
CHAPTER 8:

CONCLUSIONS AND FURTHER RESEARCH

8.1. MAIN RESULTS OF THE RESEARCH

8.1.1 Executive Summary of the Research

8.1.2. Conclusions for the Hypotheses of the Research

8.2. CONTRIBUTIONS OF THE RESEARCH

8.3. RESEARCH LIMITATIONS

8.4. SUGGESTIONS FOR FURTHER RESEARCH
This research project was set out to investigate whether macroeconomic indicators influence Vietnam’s stock market returns and the index’s volatility, considering the period from August 2000 (the initial launch of the Vietnam’s stock market) to December 2013. The general theoretical literature on this research subject, given the context of an emerging market such as Vietnam, has been inconclusive in regard to the interactions between macroeconomic indicators and stock market performance. Among different aspects of the problem, this research sought to fulfill four major objectives:

- Examine the relevance of theoretical frameworks, including the efficient market hypotheses (EMH) and arbitrage pricing theory (APT) under the context of the Vietnam’s stock market.
- Assess whether the vector autoregressive (VAR) framework is appropriate for estimating the influence of macroeconomic variables, as defined by contemporary literature, on Vietnam’s stock market returns.
- Apply GARCH-based parametric model in estimating the influence of macroeconomic factors on the volatility of Vietnam's stock market returns.
- Rank macroeconomic factors with regard to their influence on Vietnam’s stock market returns and the index’s volatility.

This chapter expresses the significance of the study to the knowledge of the discipline by providing a synthesis of the key findings and discussion projected throughout the research. It further demonstrates the limitations of the research and suggests possibilities for future work where the current scopes could be addressed.

8.1. MAIN RESULTS OF THE RESEARCH

This section briefly summarizes the major outcomes of the research project, recapping the aim and the main methodology. Conclusions for all the hypotheses of the research are delivered afterwards, confirming whether specified hypothesis is accepted or not.
8.1.1 Executive Summary of the Research

After clarifying the aim and objectives of the research, Chapter 2, ‘Review of Vietnam’s Economy and Stock Market’, explored the importance of understanding Vietnam’s economic situation, including the development of its stock market. With the focus on the critical period 2000 to 2013, the research expanded the review to 1975, the year of unification in Vietnam. A basic understanding of the general economy and securities market is useful for validating the rationality of using macroeconomic variables and in helping to explain the empirical findings from later chapters.

Chapter 3 subsequently reviewed the relevant theories and literature, with the concentration on the theory of Efficient Market Hypothesis (EMH) and existing theoretical frameworks (i.e. DDM, CAPM, and APT). These backgrounds provide different explanations for the nexus between macroeconomic factors and stock market returns. Individually, APT was revealed to have the most applicability for explaining stock prices via multiple factors. The remaining sections in chapter 3 indicated inconclusive results on the interactions between macroeconomic variables and equity prices from the literature. Noticeably less attention has been paid to Southeast Asian emerging markets, especially Vietnam.

Therefore, in the following chapters, this research specified a wide set of macroeconomic variables applicable to Vietnam’s background and relevant theories. These macroeconomic variables under investigation - were: economic growth (GDP), the consumer price index (CPI), broad money supply (M2), interest rates (IR) (including refinancing rate – RR, deposit rate – DR, and lending rate – LR), foreign exchange rate (USD/VND) and foreign direct investment (FDI). The linkages in either long run or short run perspectives between returns on Vietnam stock index and six macroeconomic indicators were examined using 161 monthly observations for each of these variables over the sample period (August 2000-December 2013). Based on the data available, a comprehensive conceptual framework was designed in Chapter 4, along with different hypotheses in order to obtain the objectives of the research.
Also in chapter 4, the methodology of the study was clarified, with the use of VAR and GARCH models to provide both bivariate and multivariate perspectives. Johansen cointegration tests, Granger causality tests and dynamic analysis (containing impulse response function and variance decomposition) were employed in sequence within the VAR framework to discover the underlying linkages as listed in the objectives of the research. In addition, because the VAR framework is not designed for deliberating the nature of the financial time-series (i.e. stock prices), the research afterwards applied the GARCH models to measure the volatility cluster of the Vietnam’s stock market index and then to uncover the influence of macroeconomic series on Vietnam’s stock return volatility. Various models within the GARCH family were used, including GARCH (1,1), EGARCH (1,1), and TARCH (1,1)) with the addition of appropriate autoregressive-moving-average (ARMA) terms.

Empirical results were summarised within the respective empirical chapters (Chapter 5, ‘Empirical Findings of Cointegration and Causality’ and Chapter 6, ‘Empirical Findings of the GARCH Models’). To clarify, the findings from the developed conceptual framework will be synthesised in the following sections, thereby fulfilling the research’s aim and objectives.

8.1.2. Conclusions for the Hypotheses of the Research

Six null hypotheses were designated to tackle with different aspects of the interrelation between macroeconomic forces and returns on VN-Index, and also to achieve those objectives of the research that mentioned in the first chapter. The following table provides the conclusions for all the hypotheses with respect to the empirical findings of the research.
# Table 8-1. Conclusion for the Hypotheses via Empirical Results

<table>
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<tr>
<th>Null Hypotheses</th>
<th>Empirical Results</th>
<th>Conclusions</th>
</tr>
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<tbody>
<tr>
<td><strong>H₀a</strong>: All of the variables within the study are stationary.</td>
<td>All the variables within the research are integrated at level 1 or I(1), by the tests of ADF, PP, and KPSS. It implies that all the specified variables are non-stationary at levels, but stationary at first differences.</td>
<td>Rejected</td>
</tr>
</tbody>
</table>
| **H₀b**: There is no cointegrating relationship between VN-Index and macroeconomic variables i.e. RGDP, CPI, RMS, RIR, REX and RFDI, neither in bivariate nor multivariate perspectives. | - The bivariate Johansen cointegration tests provided evidences for three cointegrating vectors that established between returns on VN-Index and three macroeconomic factors (i.e. economic growth, consumer price index, and foreign direct investment).  
  - The multivariate Johansen cointegration test found the long-run relationship between VN-Index’s returns and a set of macroeconomic variables. | Rejected      |
| **H₀c**: There is no bidirectional or unidirectional causality between VNI and macroeconomic variables i.e. RGDP, CPI, RMS, RIR, REX and RFDI, neither in bivariate nor multivariate perspectives. | The results of the causality tests using standard Granger causality tests and TYDL causality tests show mixed results for causality links among macroeconomic series and VN-Index, corresponding to the presence of cointegrating relationships.  
  - Pair-wise Granger causality tests found unidirectional causal links from returns on VN-Index to economic growth, consumer price index and foreign direct investment, and from money supply and interest rates to returns on VN-Index.  
  - The bivariate TYDL Granger Causality tests shown unidirectional causality from VNI’s | Rejected      |
returns to consumer price index and foreign direct investment, and from interest rates to VNI's returns.

Furthermore, under the multivariate analysis:

- A long-run causal link was found between returns on Vietnam stock index and the macroeconomic set.
- In short-run, refinancing rate and money supply are shown to Granger cause stock market returns under both VECM and TYDL Granger causality-testing methods.
- The Vietnam’s stock market index was also found to be Granger caused by foreign direct investment within the TYDL tests.

<table>
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<tr>
<th>$H_0^d$: Vietnam's stock market returns within this research do not have volatility clustering.</th>
<th>$H_0^e$: Vietnam stock index is proven to have volatility clustering.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rejected</td>
<td>Under the univariate analysis:</td>
</tr>
<tr>
<td>$H_0^d$: There is no statistically significant influence of each macroeconomic variable on the volatility of Vietnam’s stock market returns.</td>
<td>Under the univariate analysis:</td>
</tr>
</tbody>
</table>
| Rejected | - A monthly change in CPI series appears as the most important factor in predicting the volatility of the Vietnam's stock market since any 1% increase in CPI can explain an increase in the volatility by 5.3%.
- Any news about economic growth can be considered as the second significant factor in |
explaining Vietnam's stock return volatility because a 1% rise in real GDP is expected to be followed by a fall in volatility by 1.6%.

- In addition, the influence of a variation in USD/VND exchange rate on the Vietnam's stock return volatility appears statistically significant; hence this factor should be also paid attention.

| $H_0$: There is no statistically significant influence of macroeconomic variables as a group on the volatility of Vietnam's stock market returns. |
| Under multivariate case, similar results were found as in the univariate study for the influences on the volatility of Vietnam's stock returns – except for the foreign exchange rate. |
| Rejected |

- The most important factor that influences Vietnam's stock return volatility is a monthly change in the consumer price index. Any 1% increase in CPI can lead to a rise in the volatility by 8.35%.

- Any 1% change in real economic growth can significantly explain a 1.1% increase in Vietnam’s stock return volatility.

**Source: Synthesized by the Researcher**

Further to the findings from cointegration and causality tests and GARCH models, a dynamic analysis was conducted to account for the response of dependent variable (VNI) by a shock in macroeconomic factors.

- By impulse response function, the largest response of VNI is acknowledged by a shock originating in the money supply, whilst the smallest one is found in a shock from the exchange rate. The accumulative analysis subsequently demonstrates positive responses of VNI to a one-time innovation in GDP and in the money supply, but negatively to other innovations in the rest of the macroeconomic variables over most of the period.
Under the variance decomposition study, any innovation from the money supply seems to have the most influence on the variance in equity prices, while the lowest impact was found from a shock in the exchange rate. However, both the generalised impulse response function and variance decomposition present weak evidence of the vital role of a shock in the macroeconomic environment for explaining the movement of the Vietnam’s stock market.

In summary, the evidences from these empirical findings are sufficient to reject all the null hypotheses stated in the research. With respect to the conceptual framework, the following diagram (Figure 8-1) briefly inserts all the highlights withdrawn from the empirical analysis.

**Figure 8-1. Empirical Findings of the Research**
Stage 2: Results of Causality Relationships

Bivariate Causality
- Pair-wise
  - GDP
  - VNI
  - CPI
  - FDI

Multivariate Causality
- TYDL
  - VNI
  - CPI
  - VNI
  - FDI

Short-run Causality
- VECM
  - MS
  - VNI
  - IR

Long-run Causality
- TYDL
  - MS
  - IR

Stage 3: Results of GARCH Models

Univariate GARCH
- GDP
  - CPI
  - EX
  - VNI Volatility

Multivariate GARCH
- GDP
  - CPI
  - VNI Volatility

Source: Synthesized by the Researcher
Wherein, VNI denotes Vietnam’s stock market Index; GDP, CPI, MS, IR, EX, FDI respectively stand for economic growth, consumer price index, money supply M2, interest rates, foreign exchange rate USD/VND, foreign direct investment.

As a consequence of these empirical findings, the efficient market hypothesis (EMH) within the context of Vietnam is rejected. It implies the presence of inefficiency in the Vietnam’s stock market, or the Vietnam stock index (VN-Index) did not follow a random walk for the time span being studied 2000-2013. Furthermore, the empirical results validate the relevance of the APT framework to the Vietnam’s stock market, once Vietnam’s stock market movement is possibly explained by more than one macroeconomic variable. These outcomes confirm the relevance of existing theories to the research’s context, which reflect the reliability of the first objective.

To conclude, the aim of the research project, which was to determine macroeconomic influences on Vietnam’s stock market returns and the index’s volatility, is fulfilled. Particularly, the empirical evidence demonstrates the applicability of existing theoretical frameworks and the reliability of the conceptual framework (VAR and GARCH models) applied to the current research. These satisfy the first three objectives of the research. Furthermore, the order of the macroeconomic variables in respect of their importance to Vietnam’s stock market returns in different dimensions has also been identified, which meets the forth objective of the study. The last objective has also been achieved by the outcome of the empirical survey.

8.2. CONTRIBUTIONS OF THE RESEARCH

The expected contributions were spelled out in the first chapter of the research project. Based on the empirical findings, this section reaffirms the contributions of the research taking into account the existing literature, methodology and implications for the current situation in Vietnam.

(i) The outcomes of this research have enhanced the existing knowledge of the interactions between macro-indicators and stock market returns in emerging economies, especially Vietnam.
The improvement in macroeconomic stability and the reforms of the financial market have been emphasised as the foremost targets in Vietnam, as clarified in the Five-year Socio-Economic Development Plan 2011-2015, the draft 2016-2020, and the Socio-Economic Development Strategies 2011-2020. Taken with its well-managed domestic resources and improved integration with other countries, Vietnam had been recorded as one fastest growing economy in Asia and the world over the 2000s. The growth rate reached 6.3% during the first half of 2015 while the year-on-year consumer price index increased at 0.6% in August 2015 – in comparison with a 4.3% increase in the same period in the previous year (GSO Database).

Meanwhile, the market capitalisation of the Ho Chi Minh Stock Exchange surged to nearly US$47.2 billion (shifting the total market capitalisation in Vietnam’s two bourses up to over US$53.7 billion) with 307 listed companies (as of March 2015, as reported by the OECD (2015)) from $70 million with only five firms in 2000 (Ho Chi Minh Stock Exchange – HOSE website). Also stated in the OECD report is that the average daily turnover of HOSE reached $91.589 million, counted until March 2015 (OECD, 2015).

However, as far as its potential growth opportunity, the Vietnam’s stock market under the view of this research has not adequately developed. First, given the fact that Vietnam’s capital market is the youngest one in the region, it appears relatively small in comparison with other Asian countries. The graph below illustrates the total market capitalization of listed companies in six Southeast Asia countries, provided by the World Bank data for five years from 2008 to 2012 (Figure 8-2).
As of the end of December 2014, the Financial Time Stock Exchange (FTSE, [http://www.ftse.com/products/indices/](http://www.ftse.com/products/indices/)) updated that the total equity market capitalisation in Vietnam jumped to $52.4 billion from $39.5 billion in 2013, equivalent to an increase of 32.6%. However, this figure remains substantial small compared to $261.8 billion in the Philippines, $422.1 billion in Indonesia, $430.4 billion in Thailand, $459 billion in Malaysia, and $752.8 billion in Singapore (FTSE).

Second, due to the insufficiency in information closure’s transparency and efficiency, the weak professionalism of most investors, also the insufficiency of legal regulations, the stock market of Vietnam has encountered a high fragility. For example, these insecure fundamentals led the youngest market in Southeast Asia suffering the first speculative bubble in 2008 after the booming years 2006-2007. In specific, the VN-Index reached a high record of 1,170.67 point as of March 12, 2007 and this year ended up with the surge in the VN-Index of 23%. Nonetheless, followed by the acceleration in inflation in the subsequent years (noticeably high at 12.6% by the end of 2007 and 25.2% as of May 2008, GSO Database), picking up the intense rise in interest rates (the SBV increased the annual refinancing rate up
to 14% by 2008 from 6.5% in 2007 – which was the highest record in the past of the Vietnam’s economy), the VN-Index experienced the worst drop from its trading history – losing more than two-third of its value by the end of 2008.

A comprehensive study, therefore, to promote the functioning of the Vietnam’s stock market given the certain context of the macroeconomic environment appears as a priority necessity. Although analyses on the nexus between macroeconomic factors and stock market have recently paid increasing attention to the literature from around the world, the results have been inconclusive. Only some research has been conducted on emerging markets, and very little on Vietnam. Thus, the results gained from this research project provide a significant contribution to filling the gap in knowledge on the correlation between macroeconomic indicators and Vietnam’s stock market returns.

(ii) The widest set of macroeconomic variables has been so far utilized under the research within the context of Vietnam.

Six macroeconomic variables were selected for the research, covering internal factors (economic activity, price level and monetary segment) and external factors (foreign exchange rate and foreign direct investment). The series being studies were specified as gross domestic production (GDP), consumer price index (CPI), broad money supply (MS), interest rates (IR), USD/VND exchange rate (EX) and inward foreign direct investment (FDI).

Apart from GDP, data on the factors are available on a monthly basis. The use of GDP has been rarely used in the literature because of its lack of availability. On the same line of topic, some papers have ignored this indicator, whereas others have tried alternative forms of economic output (e.g. Industrial Production Index, Gross National Production). However, quarterly data of GDP were successfully converted into monthly data via the statistics software Eviews 8.0. It, therefore, offered adequate observations for generating empirical results for the research.

In addition to some popular variables in the existing literature (i.e. inflation rate, interest rate, money supply), the research added foreign direct investment (FDI) to the set of macroeconomic variables to gain sufficient answers for the
influence of the Vietnam’s stock market. As stated earlier in the research, the influences from economic growth on stock market and from FDI on economic growth have been widely examined in the literature. Notwithstanding that, the analysis on the direct impact of FDI on the stock market seems limited.

Only a few papers on emerging markets were found, such as Issahaku, Ustarz and Domanban (2013) and Pilinkus (2010), which explored Ghana and the Baltic States respectively. There has been so far no study on this relationship for Vietnam and the Asian markets. Given that the importance of FDI has been confirmed for Vietnam’s economy, the empirical results gained from this research, which indicated the significant positive influence of FDI on stock market returns, are clearly crucial.

(iii) VAR and GARCH models are subsequently elaborated in the research under the context of a new emerging market – Vietnam.

In the empirical chapters, different specifications for VAR and GARCH were established to define the determinants of macroeconomic factors on VN-index and its volatility. This research is not only the first study on this subject applying these frameworks to Vietnam, but also shows their applicability to new settings like Vietnam.

(iv) A specific equation that represents the influences of six nominated macroeconomic variables on the Vietnam’s stock market index was identified.

All the coefficients of this equation are significant, implying its capability and sufficiency in finding the linkage that the research set out to pursue. Although the legitimacy of Arbitrage Pricing Theory in explaining stock prices has been indecisive in the current literature, this outcome verifies its validity for the case of Vietnam.

(v) This is a unique study using questionnaires to extend the discussion on the empirical results in the existing literature.

Even though questionnaires cannot contribute to the validity of empirical results in terms of statistical aspect in the research, the responses distinctly help in
explaining the practicality of these findings. Questionnaires were distributed to four target groups: policymakers, financial analysts, securities investors and academics. All of the participants selected had certain knowledge and/or experience in the Vietnam’s stock market. In fact, their views on the specified relationship under the circumstance of Vietnam are likely to provoke more discussion on the empirical results of the research, along with the existing theories.

Not only consistently admitted the vital role of launching stock trading floor from 2000 for Vietnam’s economy, but all the participants under the investigation also agreed that macroeconomic indicators have a specific dominance on the Vietnam’s securities market. More specifically, credit outstanding and interest rates are suggested as the most important indicators amongst macroeconomic variables in respect of the performance of Vietnam’s stock market returns. These views support for the empirical findings of the research, where interest rates are also found to significantly associate with stock market returns of Vietnam throughout various statistical tests.

Since the macroeconomic stability is acknowledged as one essential key to warrant the sustainable growth of the stock market, the experts from the selected groups recommended valuable policy implications to improve the performance of the macro-economy, and in sequence to enhance the development of the stock market within the context of Vietnam. These include comprehensively restructuring the economy to improve the efficiency of capital investment, strictly supervising the banking system and listed companies, and managing information closure, etc.

All the opinions and comments gathered from selected professional people via questionnaires are trusted to bring practical values to the research, which could not be generated by statistical methods.

(vi) The research outperforms other studies in the same field by proposing a number of implications for benefiting the Vietnam’s stock market itself and its various participants, from practitioners (i.e. investors, portfolio managers and financial consultants) to academics (i.e. researchers and financial analysts).
The efficiency of legal scheme plays a vital role in respect of the economy’s development. It must be taken more judiciously in the case of Vietnam, where the legal framework of this new emerging market seems insufficient regarding transparency, systematic consistency and efficiency.

The macroeconomic variables, including economic growth, consumer price index, money supply, interest rates, USD/VND exchange rate and foreign direct investment, have been proven to significantly interact with Vietnam’s stock market returns and the index’s volatility either in long or short-run via the presence of cointegrating relationship and various Granger causal links. Given these outcomes, together with opinions of the experts gathered from questionnaires, policy implications and investment implications are suggested to enhance the sustainability in the macro-economy’s growth as well as to improve the development of the Vietnam’s securities market.

Any macroeconomic movement may affect how the Vietnam’s stock market performs. It suggests the necessity of careful consideration before implementing or amending macroeconomic policies to avoid any adverse effect on the equity market. Based on the equation (Eq. 8-1) generated from the empirical results, policy-makers are advised to maintain sustainable economic growth, constrain inflation, control money supply expansion, raise interest rates, moderate depreciation of the local currency and encourage FDI inflows in regarding with promoting the progress of the Vietnam’s securities market in the long term. However, these suggestions should be revised regarding to the real situation of the Vietnam’s economy at a specific time period, as there are always other external explanatory factors which excluded from the current research, such as the trend of the economy over the world and in the Asia region, or the possible changes in the Vietnam’s political system.

On the other hand, the investment implications suggest the revision of investment strategies is needed when any macroeconomic changes occur. Investors or financial consultants, hence, must consider all of the factors that affect the macroeconomic environment. These factors can be any signals that slow down economic growth (e.g. a global financial crisis), increase money supply and then
raise inflation (i.e. the overheating of the economy), devalue local currency (i.e. a trade deficit), or a surge in FDI inflows (i.e. a free trade agreement).

These implications are expected to have a direct impact on policymakers’ and investors’ behaviour, which then bring benefits for the strengthening of the legal framework as well as investment environment improvement in Vietnam’s case.

8.3. RESEARCH LIMITATIONS

There were some limitations to the research in this thesis. The major one seems to be a concern with the statistical sample chosen for the research. Firstly, the sample size of the study was relatively small due to the time limitation. There is no doubt that the significance of the results would be improved by applying a longer period. However, the Vietnam’s stock market was launched as recently as August 2000. Using monthly intervals up to December 2013 provided only 161 observations for the research. Some indicators were obtainable for the shorter term (i.e. daily ones, such as VN-Index, interest rates and USD/VND exchange rate). Nonetheless, most of the macroeconomic variables were available in a monthly or quarterly form. The unavailability of GDP on a monthly basis also affected the empirical results. The alternative proxy for economic activity (i.e. the Industrial Production Index) was not available for Vietnam for the selected period (2000-2013).

Secondly, the research’s outcomes are dependent primarily on the quality of statistics data. In the case of Vietnam, except for the data of the stock market – which officially quoted the websites of the stock market exchange, the General Statistics Office of Vietnam (GSO) has a duty on managing all of the macroeconomic statistics. Over the years, the quality of macroeconomic publications has been substantially improved, mostly reflected by the enhanced accuracy and transparency in statistics and statistical methodology. These are mentioned as principal targets in the Vietnam Statistics Law 2003, which were revised in 2015. Some achievements have been obtained, such as the official announcement of a CPI calculation method in 2009 and the insertion of an important macroeconomic indicator – industrial production – in 2008.
However, given that the procedure for collecting and processing data in Vietnam has been improved, a number of restrictions apply to the users of such data. Remarkably, in the short term, any change in statistical methodology (e.g. in the case of CPI) or the introduction of any new indicator can limit the number of observations in respect of a given time period, leading to obstacles in strategic planning, policy-making and economy forecasting. Furthermore, it is challenging to detect fraud or incorrect statistics data in the context of Vietnam, a developing country. The statistics reports of corresponding ministries might be not always consistent with the final publication of the General Statistics Office, as they manage their own independent sections in gathering and processing the figures.

Putting the concern of statistics quality aside, another imperfection of the research relates to the limited number of factors that may influence Vietnam’s stock market prices. This research selected both common macroeconomic variables from the literature (i.e. GDP, CPI, money supply and the foreign exchange rate) and uncommon factors (i.e. the refinancing rate, FDI). Nevertheless, some factors also expected to coordinate with Vietnam’s stock market performance and they were not included in the conceptual framework. These are other macroeconomic factors (e.g. the unemployment rate, trade deficit, U.S. stock market prices and oil prices) or microeconomic factors (e.g. firm performance, dividend policies and capital structure).

Moreover, selected macroeconomic indicators possibly contain volatility clustering (e.g. the interest rate and the foreign exchange rate), which were not studied in the research. The inclusion of both macroeconomic and microeconomic indicators, together with consideration of their volatilities, may contribute more to the explanation of what affects Vietnam’s stock market returns.

The research selects the Vietnam’s stock market index (VNI) as the dependent variable, which does not fully reflect the performance of the stock market in Vietnam. Other major stock indexes - could also have been considered, such as the HNX-Index (which shows the change of prices of all stocks traded on the Hanoi Stock Exchange) or the UPCoM-Index (which reflects the price fluctuation of all stocks traded on the Unlisted Public Company Market).
Furthermore, the empirical results of the research may not apply to individual stocks or individual industries in the economy. Due to their different structures, different stocks or industries are unlikely to have the same impact in respect of macroeconomic variables.

A further limitation of the research concerns the amount of questionnaires that were distributed. Apart from the fact that the significance of empirical results under the research from econometric models for explaining the specified relationship is incontrovertible, the research also acknowledged the significance of the comments and opinions of practitioners and academics on the topic of research for the case of Vietnam. However, the size of the participant sample was small, at 25 people, while only 20 responses were received. The implications of the results from the questionnaires would have been substantially enhanced if the research had involved more participants.

Finally, the research has been focused on Vietnam only – as an example of emerging market. The results and their subsequent implications are therefore narrowed within the context of Vietnam, which may not be applicable for other emerging economies.

8.4. SUGGESTIONS FOR FURTHER RESEARCH

The research employed various methodological approaches to identify the linkage between Vietnam’s stock market returns and various macroeconomic indicators. Regarding to the empirical conclusions, along with certain limitations of the research, some recommendations for further study are proposed as follows.

Firstly, the rejection of the efficiency hypothesis in the Vietnam’s stock market from the empirical results suggests research could be undertaken to properly investigate the inefficiency degree of the market (i.e. not in weak form or semi-strong form or strong efficiency form). Understanding the level of Vietnam’s stock market’s inefficiency over specified time period could be better in clarifying the influences of macroeconomic aspects on stock market prices.

The second suggestion is that macroeconomic variables can be enlarged in number and classified into different specific groups: internal factors (economic
activity, price level, unemployment, and monetary activities) and external factors (foreign exchange rate, foreign direct investment, U.S. stock prices, and oil prices). Also, involving the specified variables’ volatilities to the research might extend the general knowledge on the interactions between macroeconomic indicators and Vietnam’s stock market. Thus, an additional study in terms of macroeconomic volatility and their influence on the volatility of stock returns in the case of Vietnam should be conducted.

The research assumed that the impact of external shocks (i.e. global financial crisis 2007–2008) is not clear and insignificant on the stock market in the circumstances of a developing and emerging market, i.e. Vietnam. The third suggestion for future study is to include external shocks as appropriate dummy variables to test their significance for the movement of the Vietnam’s stock market.

The fourth option is that, given an adequate time period, the study of different portfolios of stocks (VN30-Index, HNX-Index, HNX30-Index, UPCoM-Index) rather than only a VN-Index might generate more significant results vis-à-vis their exposure to selected macroeconomic variables. Moreover, the determinants of macroeconomic forces on the performance of some specific industries is additionally expected to be an interesting topic, which would potentially provide a comparable study for the empirical findings of the current research as well as increasing the benefits for policymakers and investors in Vietnam market.

Finally, a comparative research between the Vietnam’s stock market and other dynamic Southeast Asia markets (i.e. Malaysia, Indonesia, and Philippines) is recommended to enrich the picture of the macro-economy and stock market returns for emerging economies. Instead of using a time series method individually, the conceptual framework could be extended, using a panel approach for time series data. This research might take into account the degree of integration between Vietnam and other economies in the region – one significant factor of an open and emerging market economy such as Vietnam.

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<thead>
<tr>
<th>Year</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>- Announcement of “Doi Moi” program in the Sixth National Communist Party</td>
</tr>
</tbody>
</table>
| 1987 | - Issue the Central Committee Policy  
      - Adjustment of prices of non-essential consumer products  
      - Devaluation of Exchange rate  
      - Remove restrictions on private sector trade  
      - Promulgation of the Law on Export and Import Duties on Commercial Goods  
      - Approval of the Law on Foreign Direct Investment |
| 1988 | - Promulgation of the Law on Land  
      - Enhancement of the rights of rural families by the Party Resolution No.10  
      - Promulgation of the Law on Foreign Investment  
      - Increased autonomy for managers of state-owned enterprises  
      - Separation of functions of central banking and commercial banking, establishment of four state-owned banks: the Bank for Foreign Trade of Vietnam (Vietcombank), the Bank for Investment and Development of Vietnam (BIDV), the Industrial and Commercial Bank (Incombank) and the Agriculture Development Bank (Agribank)  
      - Foreign exchange controls liberalized  
      - Devaluation of exchange rates |
| 1989 | - Foreign Trade Liberalization, reduce import quotas and tariffs  
      - Adoption of a policy of floating foreign exchange rates  
      - Abolition of the dual price system  
      - Elimination of subsidies to consumers and exporters  
      - Renovation of monetary policy carried out, keeping positive real interest rate  
      - Promulgation of Decree No.196-HDBT to determine the task, authority and responsibility of different Ministries on State Management |
| 1990 | - Law on Foreign Investment enacted  
      - Approval of the Law on Private Enterprises and the Law on Companies |
- Promulgation of the Law on State Bank of Vietnam (SBVN) and the Law on Banks, Cooperative Credit Institutions and Financial Institutions
- Laws on taxation applied to all economic sectors: the Law on the Tax on Business Receipts, the Law on Income Taxes, the Law on Special Consumption

<table>
<thead>
<tr>
<th>Year</th>
<th>Events</th>
</tr>
</thead>
</table>
| 1991 | • Tight monetary policy implemented to reduce inflation rate  
      • State enterprise restructuring  
      • Private companies allowed to engage to international trade  
      • Introduction of Export Processing Zones (EPZs)  
      • First opening of foreign exchange trading floor in SBVN  
      • Establishment of foreign bank branches permitted  
      • Agriculture Bank of Vietnam allowed to lend to households |
| 1992 | • Amendment of the Law on Foreign Investment  
      • Initial Trade Agreement signed with the EU  
      • The adjustments of interest rate policy implemented by the SBVN: ensure a positive interest rate; fix a maximum interest rates for loans and a minimum interest rate for deposits and commercial banks decide their own specific interest rates; apply equal interest rates to all economic sectors |
| 1993 | • Amendment of the Law on Land  
      • Approval of the Law on Bankruptcy, the Law on Oil and Gas, and the Law on Environment Protection  
      • Relaxation of export shipment licensing, introduction of 90 day duty suspension system |
| 1994 | • The US lifted its trade embargo against Vietnam  
      • Economic court established  
      • Law on Promotion of Domestic Investment approved  
      • Decree 82-CP on statute for foreign and international organizations, 191-CP on FDI project management |
| 1995 | • Promulgation of the Law on State-owned Enterprises (SEs)  
      • Launch of Public Administration Reform, reducing number of ministries  
      • Joined ASEAN and committed to AFTA (Decree 91-CP on commodities list |
for CEPT/AFTA)

- Reduced number of turnover tax rate from 18 to 11
- Application for WTO membership submitted

<table>
<thead>
<tr>
<th>Year</th>
<th>Events</th>
</tr>
</thead>
</table>
| 1996 | - Promulgation of the Law on Cooperatives  
      - Introduction of Tax and Expenditure responsibilities of different level of government in the Law on State Budget  
      - Reduction of import duty exemptions for FDI projects in new Law on Foreign Investment  
      - Inward foreign exchange remittance tax lifted |
| 1997 | - Approval of Commercial Code  
      - Specified roles and functions of SBVN by promulgating the Law on SBVN  
      - Introduced basis for supervision and regulation of banking system in the Law on Credit Institutions  
      - Promulgation of 195-QD/NH in interest rate adjustment  
      - Maximum import tariff lowered to 50% except for six groups, number of tariff rates reduced to 15 |
| 1998 | - Forward and swap foreign exchange transactions permitted  
      - Domestic enterprises allowed to export production directly without an import/export license  
      - Maximum tariff rate reduced to 60% |
| 1999 | - Approval of the Law on Enterprise  
      - Turnover tax replaced by VAT, profit tax by company tax  
      - Improved external economic relations: Initial agreement on US-Vietnam bilateral trade agreement; Vietnam-China agreement on land boundaries increased economic cooperation |

Appendix 2. The Implementations of Economic Targets for two periods
2001-2005 and 2006-2010

The objective and economic results over ten years 2001-2010, approved by the National Assembly of the Socialist Republic of Vietnam, are briefly presented as follows:

<table>
<thead>
<tr>
<th>Targets</th>
<th>Unit</th>
<th>Planned target</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) GDP growth rate</td>
<td>%</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>2) Growth rate of agricultural, forestry and fisheries production value</td>
<td>%</td>
<td>4.8</td>
<td>5.4</td>
</tr>
<tr>
<td>3) Growth rate of industry production value</td>
<td>%</td>
<td>13.1</td>
<td>106</td>
</tr>
<tr>
<td>4) Growth rate of services value</td>
<td>%</td>
<td>7.5</td>
<td>7.6</td>
</tr>
<tr>
<td>5) Growth rate of export turnover</td>
<td>%</td>
<td>14-16</td>
<td>17.5</td>
</tr>
<tr>
<td>6) Economic structure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Agriculture, forestry and fisheries</td>
<td>%</td>
<td>21-22</td>
<td>20.89</td>
</tr>
<tr>
<td>- Industry and construction</td>
<td>%</td>
<td>38-39</td>
<td>41.03</td>
</tr>
<tr>
<td>- Services</td>
<td>%</td>
<td>41-42</td>
<td>38.08</td>
</tr>
</tbody>
</table>

Ratio of total mobilized funds in GDP up to 2005 | % | 35.9 | 37.5

**Five-Year Socio-Economic Plan 2006-2010**

**Objective:** "Boost the economic growth rate, achieving rapid and sustainable development, quickly bringing our country out of the low development state. Significantly improve people’s material, cultural, and spiritual life. Boost the industrialization and modernization process and gradually develop the knowledge-based economy, creating foundations to make our country basically become a modern industrial country by 2020. Stabilize politics, orders, and social security. Firmly protect our independence, sovereign, territory, and national security. Continue strengthening and expanding foreign relations and improve Vietnam’s status in the region and the world."^17

<table>
<thead>
<tr>
<th>Targets</th>
<th>Unit</th>
<th>Planned target</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) GDP growth rate</td>
<td>%</td>
<td>7.5-8%</td>
<td>7</td>
</tr>
<tr>
<td>2) Economic structure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Agricultural value</td>
<td>%</td>
<td>15-16</td>
<td>20.58</td>
</tr>
<tr>
<td>- Industry and construction</td>
<td>%</td>
<td>43-44</td>
<td>41.10</td>
</tr>
<tr>
<td>- Services</td>
<td>%</td>
<td>40-41</td>
<td>38.33</td>
</tr>
<tr>
<td>3) Growth rate of total export turnover</td>
<td>%</td>
<td>16</td>
<td>18.2</td>
</tr>
<tr>
<td>4) Ratio of National budget revenue in GDP</td>
<td>%</td>
<td>21-22</td>
<td>20.5</td>
</tr>
<tr>
<td>5) Ratio of Annual total social investment in GDP</td>
<td>%</td>
<td>40</td>
<td>42.8</td>
</tr>
</tbody>
</table>


Appendix 3. Questionnaire

PARTICIPANT INFORMATION SHEET

Title of Project: Macroeconomic Factors and Vietnam’s stock market Performance

We would like to invite you to take part in our research project. This Participant Information Sheet will help you understand what the research is about and what it would involve for you. Feel free if you wish to talk to others about this project before you decide.

If you agree to take part in this project, we will then ask you to sign the Consent Form. This form can be found on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

What is the project about?

The purpose of this research is to find out the relationship between major macroeconomic factors (economic growth, inflation, interest rates, money supply, foreign exchange rate, and foreign direct investment) and Vietnam’s stock market performance (represented by the movement of VN-Index).

Why is the project taken?

Vietnam is recognized as a new dynamic economy in Asia and in the world with rapid economic growth, wherein its stock market has been attracting a huge attention of both domestic and foreign investors. However, the performance of macro-economy and stock market has been revealed as to remain under instable and large volatile condition. Hence, the expected outcome of the project will benefit a number of investors, financial analysts, policy makers, and also other researchers in this area.

Why have you been invited?

You have been asked to participate because your profile is fit to our study criteria. You are known as a broker/ a security investor/ a financial analyst/ a government officer, who have background and experiences in Vietnam equity market. Your participant will enhance the expected outcome of the research from statistical techniques, and then provide better understand of the linkage between macroeconomic factors and Vietnam stock prices.
Do you have to take part?

It is absolutely voluntary and no obligation to join the study. Please accept our apologies for contacting you if you are not ready for any interview about this topic.

What are the possible risks of taking part?

We do not think that there are any significant risks associated with this research. Also, there are no foreseeable risks to you, as we are not seeking to collect any sensitive data on you. If you feel there are inappropriate questions, it is up to you to stop at any time.

What if you change your mind?

You are fully reserved a right to withdraw your decision of taking part at any time, without giving a reason.

How we protect your privacy?

Any information you provide will be held strictly confidential. Any information about you, including personal details and your interview record, will be kept in secure locations/sources and will be accessed only by the research team. Your personal details, including name, address, and signature, will be removed before publishing our study to ensure that you cannot be recognized. After we have finished the project and analyzed all data, all the documentation and information collected from you will be kept in a specified period as instructed by the Cardiff Metropolitan University Ethics Committee, then they will be destroyed.

What if you want more information about this project?

If you have any question about any aspect of the research project or your participant in it, please contact:

Thuy Thu Nguyen
London School of Commerce – An Association of Cardiff Metropolitan University
Tel: +447784133910
Email: L0298DHDH0813@student.lsclondon.c
PARTICIPANT CONSENT FORM

Reference Number:
Participant name or Study ID Number:
Title of Project: Macroeconomic Factors and Vietnam’s stock market Performance
Name of Researcher: Thuy Thu Nguyen

Participant to complete this section: Please initial each box.

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

3. I agree to take part in the above study.

The following statements could also be included on the consent form if appropriate:

1. I agree to the interview / focus group / consultation being audio recorded

2. I agree to the interview / focus group / consultation being video recorded

3. I agree to the use of anonymised quotes in publications

_______________________________________   __________________
Signature of Participant                      Date

_______________________________________   __________________
Name of person taking consent                  Date

_______________________________________
Signature of person taking consent

* When completed, 1 copy for participant & 1 copy for researcher site file
QUESTIONNAIRE

Reference Number: ...........................................................................................................................................

Title of project: Macroeconomic Indicators and Vietnam’s stock market Performance

Name of Researcher: Thuy Thu Nguyen

Participant Name: ...........................................................................................................................................

Title: .......................................................................................................................... Academic Degree: ..........................................................

Thank you for taking the time to fill in this questionnaire. There may be more than one answer you want to select, please answer as honestly as possible.

1. Have you invested in stocks?

☐ Yes          ☐ No

2. Do you have any principles or philosophy to make your investment portfolio?

☐ Yes. Please indicate: ...................................................

☐ No. Reason: ..............................................................

3. Do you think Vietnam stock prices can be predicted?

☐ Yes          ☐ No

If yes, what is your main technique using to forecast the stock prices?

If no, please indicate why?

4. Which of the following factors might be the most determination on investors’ decision in the Vietnam’s stock market?

☐ Macroeconomic Factors (Growth rate, Interest Rates, Money Supply...)

☐ Microeconomic Factors (Dividend Policy, Firm Performance...)
5. What do you think about the Vietnam macroeconomic performance over recent years?
   - Remain stability
   - Instability and unpredictability
   - Your opinion: .......................................................... ..................................................

6. Which factors do you think that can majorly impact on the Vietnam macroeconomic performance?
   - The global economy
   - Macroeconomic policies
   - Your opinion: .......................................................... ..................................................

7. What do you think about the relationship between macroeconomic indicators and Vietnam’s stock market performance?
   - Significant relationship
   - Significant but with some lags
   - Insignificant relationship
   - No relationship

8. Which of the following macroeconomic factor do you think most influences in Vietnam stock prices recently?
   - Inflation
   - Interest Rates
   - Credit Outstanding
   - USD/VND exchange rate
   - Money supply
   - Foreign Direct Investment
   - Other. Please indicate: ..........................

9. Please indicate the main reasons for your answer in the previous question (Question 6).
10. What do you think about the impact of launching stock market in Vietnam in Aug 2000 on the economy?

☐ Positive  ☐ Negative  ☐ Cannot conclude

11. What do you think about the current legal framework for the Vietnam’s stock market?

☐ Adequate transparency and information  ☐ Lack of transparency and information  ☐ Your opinion:..............................................................

12. Please give some opinions to improve the performance of the Vietnam’s stock market (i.e. investment policy).


13. Please give some opinions to improve the performance of Vietnam’s macroeconomic environment (i.e. monetary policy).


I am pleased to receive your answer, as well as any enquiry about the questionnaire, either via post or email. Please choose the best way that suits you.

Post Address: E206, Golden Westlake, 151 Thuy Khue Street, Tay Ho District, Hanoi, Vietnam.

Email: nguyenthuthuy279@gmail.com

Thank you again for your cooperation!
Appendix 4. Exemplar Questionnaire’s Response 1

Reference Number: .............................................................................................................

Title of project: Macroeconomic Indicators and Vietnam Stock Market Performance

Name of Researcher: Thuy Thu Nguyen

Participant Name: Vu Bang

Title: The Chairman of the State Securities Commission of Vietnam

Academic Degree: PhD

Thank you for taking the time to fill in this questionnaire. There may be more than one answer you want to select, please answer as honestly as possible.

1. Have you invested in stocks?
   - Yes ☑
   - No □

2. Do you have any principles or philosophy to make your investment portfolio?
   - Yes. Please indicate: The fundamentals are key to get the outperformance of the market.
   - No. Reason: .................................................................

3. Do you think Vietnam stock prices can be predicted?
   - Yes ☑
   - No □

   If yes, what is your main technique using to forecast the stock prices?

   If no, please indicate why?

4. Which of the following factors might be the most determination on investors’ decision in the Vietnam Stock Market?
Macroeconomic Factors (Growth rate, Interest Rates, Money Supply...)
Microeconomic Factors (Dividend Policy, Firm Performance...)
☐ Other. Please indicate: .................................................................

5. What do you think about the Vietnam macroeconomic performance over recent years?

☑ Remain stability ☐ Instability and unpredictability

☐ Your opinion: The Vietnam’s economy has faced with the severe aftermaths of the global financial crisis in 2008 with slowdown in growth, high inflation, etc. However, because the macroeconomic stabilization policies have been consistently implemented by the Vietnamese Government since 2009, the Vietnam’s economy conditions have improved considerably recently with a curbed inflation and gradually higher growth rate.

6. Which factors do you think that can majorly impact on the Vietnam macroeconomic performance?

☑ The global economy ☐ Macroeconomic policies

☐ Your opinion: ..................................................................................

7. What do you think about the relationship between macroeconomic indicators and Vietnam stock market performance?

☐ Significant relationship ☑ Significant but with some lags
☐ Insignificant relationship ☐ No relationship

8. Which of the following macroeconomic factor do you think most influences in Vietnam stock prices recently?

☐ Inflation ☐ Interest Rates

☐ Credit Outstanding ☑ VND exchange rate
☐ Money supply ☐ Foreign Direct Investment
☐ Other. Please indicate: .................................

9. Please indicate the main reasons for your answer in the previous question (Question 6).
The Vietnam’s economy is quite open to the global market when the ratio of total export and import over GDP gets around 160% and the contribution of foreign direct investment to GDP is about 20%. As a result, the global economy is considered a strong impact on the Vietnam’s economy.

The macroeconomic policies naturally have a significant impact on the macroeconomic performance. The clear evidence is that in recent years when the Vietnamese Government has carried out the tightening monetary policy and strict fiscal policy, the macroeconomic conditions have improved in a positive manner.

10. What do you think about the impact of launching stock market in Vietnam in Aug 2000 on the economy?

<table>
<thead>
<tr>
<th></th>
<th>Positive</th>
<th>Negative</th>
<th>Cannot conclude</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. What do you think about the current legal framework for the Vietnam Stock Market?

<table>
<thead>
<tr>
<th></th>
<th>Adequate transparency and information</th>
<th>Lack of transparency and information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

□Your opinion: ........................................................................................................................................

12. Please give some opinions to improve the performance of the Vietnam Stock Market (i.e. investment policy).

- The listed companies should observe strictly the regulation concerning information disclosure and corporate governance practices. They also need to restructure the performance to come into profitability in a sustainable way.

- The investment chance for foreign investors should be enhanced by increasing the foreign ownership limit.

13. Please give some opinions to improve the performance of Vietnam’s macroeconomic environment (i.e. monetary policy).

- The structure of the economy should keep on being changed like promoting the SOE’s equitization program and investment exit to focus on the major business lines or the industry and region development also need to be restructured. By that way, the space for monetary and fiscal policies becomes easier.
Appendix 5. Exemplar Questionnaire’s Response 2

<table>
<thead>
<tr>
<th>Reference Number: ………………………………………………………………………………………</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of project: Macroeconomic Indicators and Vietnam Stock Market Performance</td>
</tr>
<tr>
<td>Name of Researcher: Thuy Thu Nguyen</td>
</tr>
<tr>
<td>Participant Name: Hong Ha Duong</td>
</tr>
<tr>
<td>Title: Analyst at The National Financial Supervisory Commission of Vietnam</td>
</tr>
<tr>
<td>Academic Degree: MSc of International Money and Banking</td>
</tr>
</tbody>
</table>

Thank you for taking the time to fill in this questionnaire. There may be more than one answer you want to select, please answer as honestly as possible.

1. Have you invested in stocks?
   - Yes
   - No

2. Do you have any principles or philosophy to make your investment portfolio?
   - Yes. Please indicate: Good combination between fundamental and momentum stocks
   - No. Reason: ..........................................................

3. Do you think Vietnam stock prices can be predicted?
   - Yes
   - No

   If yes, what is your main technique using to forecast the stock prices?
   - Fundamental valuation techniques (DCF, EV, Ratios...) + technical analysis + market intelligence.

   If no, please indicate why?

4. Which of the following factors might be the most determination on investors’ decision in the Vietnam Stock Market?
   - Macroeconomic Factors (Growth rate, Interest Rates, Money Supply...)
5. What do you think about the Vietnam macroeconomic performance over recent years?
   - Remain stability
   - Instability and unpredictability
   - Your opinion: becoming more stable

6. Which factors do you think that can majorly impact on the Vietnam macroeconomic performance?
   - The global economy
   - Macroeconomic policies
   - Your opinion:……………………………………………………………………………......

7. What do you think about the relationship between macroeconomic indicators and Vietnam stock market performance?
   - Significant relationship
   - Significant but with some lags
   - Insignificant relationship
   - No relationship

8. Which of the following macroeconomic factor do you think most influences in Vietnam stock prices recently?
   - Inflation
   - Interest Rates
   - Credit Outstanding
   - USD/VND exchange rate
   - Money supply
   - Foreign Direct Investment
   - Other. Please indicate: Foreign Indirect Investment

9. Please indicate the main reasons for your answer in the previous question (Question 6).

Because Vietnam's economy is more integrated in the world economy and financial system. Our own policies could make us more beneficial or vulnerable from changes from the world system.
10. What do you think about the impact of launching stock market in Vietnam in Aug 2000 on the economy?
- Positive
- Negative
- Cannot conclude

11. What do you think about the current legal framework for the Vietnam Stock Market?
- Adequate transparency and information
- Lack of transparency and information
- Your opinion: still developing

12. Please give some opinions to improve the performance of the Vietnam Stock Market (i.e. investment policy).
- Should rise foreign limit on ownerships of listed companies quickly
- Should sell more stocks to public in IPO of privatized companies
- Should give more support to private firms to make them better before listing

13. Please give some opinions to improve the performance of Vietnam's macroeconomic environment (i.e. monetary policy).
- Restructure the economy to efficient use of capital investment
- Improve human capital and infrastructure
- Supervise banking system, state-owned corporations more strictly
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