RELATIONSHIP BETWEEN STOCK MARKET VOLATILITY AND MACROECONOMIC VARIABLES VOLATILITY IN MALAYSIA

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BY

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

(4) The word count of this research report is 18000.

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DEDICATION

Dedicated to:

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Lecturer

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AFC	Asian Financial Crisis
AR	Autoregressive
ARCH	Autoregressive Conditional Heteroscedasticty
CLRM	Classical Linear Regression Model
CLT	Central Limit Theorem
CPI	Consumer Price Index
DF	Dickey-Fuller
EGARCH	E-Generalized Autoregressive Conditional Heteroscedasticty
FTSE	Financial Times and London Stock Exchange
GARCH	Generalized Autoregressive Conditional Heteroscedasticty
GDP	Gross Domestic Product
GLS	Generalized Least Squares
IMF	International Monetary Fund
JB	Jarque-Bera Test
KLCI	Kuala Lumpur Composite Index
LM	Lagrange Multiplier Test
M2	Money Supply
OLS	Ordinary Least Square
PP	Phillips-Perrons
RESET	Regression Equation Specification Error Test
SIC	Schwarz Information Criterion
US	United States
VAR	Value-at-Risk
VECM	Vector Error Correction Model
WLS	Weighted Least Square

PREFACE

Final Year Project (FYP) is known as the research methodology and project. The final year students are required to conduct this research paper in the final year before graduation.

This research paper is conducted under the title of "The Relationship between Stock Market Volatility and Macroeconomic Variables Volatility". This research paper will be completed within 30 weeks.

The relationship between stock market and macroeconomic variables has attracted the concerns of many economists. Many researches had been conducted on this topic. However, the results obtained by these researches are inconclusive. In addition, the macroeconomic variables involved in their researches are inadequate. The results may be inconsistent in different countries.

In this research paper, the students are using the data in Malaysia to conduct the research. The students attempt to find out the relationship between stock market and macroeconomic variables in Malaysia by including more relevant macroeconomic variables.

In order to smooth the research process, the students have reviewed several previous studies and better understood the theory of the relationship between stock market and macroeconomic variables before conducting the research.

ABSTRACT

This paper examines the relationship between the stock market volatility and macroeconomic variables volatility in Malaysia. In the research have employ four macroeconomic variables monthly data and Kuala Lumpur Composite Index (KLCI) which range from January 2001 until December 2010. In the empirical analysis, this paper employed Ordinary Least Square (OLS) method to estimate the regression. Other than that, this study employed Breuseh-Godfrey Series LM test, Autoregressive Conditional Heteroscedasticty (ARCH) test, Ramsey RESET test, Normality test to counter the four econometric problems which is autocorrelation, heterscedasticity, model specification error and normality of error term. In the research, found highly negative significant relationship between stock market and interest rate and exchange rate while positive significant relationship for inflation and money supply by employing the Vector Error Correction Model (VECM). These empirical studies assist the policy makers in deploying monetary policy.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

In this chapter, readers can briefly understand the scope of this research and the ideas of the study through the research background and the problem statement. The objectives of the study, research questions and hypotheses of the study are provided in order to guide the flow of the research. Besides, this chapter also provides the significance of the study on stock market volatility and the contributions of this research. The contents of Chapter 1 are classified into several parts: first part Research background; second part Problem statement; third part Research objectives; fourth part Research questions; fifth part Hypotheses of the study; sixth part Significance of the study; seventh part Chapter layout.

1.1 Research Background

Stock market plays an important role in the economic development of country. For Malaysia, Bursa Malaysia identify and subscribing the global capital market's context. Besides, it gives the information regarding the stocks and provides information to investors to compare the performance of stock and manage their portfolio.

The Kuala Lumpur Composite Index (KLCI) is a major stock market index based in Malaysia that introduced in 1986. It is a capitalization-weighted stock market index. The purpose of KLCI is to provide Malaysian equity market's performance benchmark, reveal listed companies performance and reflect Malaysian corporate and economic sector's growth and development.

Besides, it also consists of the largest 30 companies listed on the Malaysia Main Market and meets the requirement of the FTSE Bursa Malaysia Index Ground Rules. The index is computed based on free float adjusted market capitalization. Each of the companies must have more than 15% of free float to be eligible for inclusion. Stock that have high free float will gain greater weightage in the index. KLCI changes rapidly to the market environment which is calculated every 15 seconds.

Regularly, Malaysia economies were very favorable and enjoy high growth, low inflation, virtual full employment and low foreign debt for about a decade before financial crisis attack. The 1997-98 Asian Financial Crisis (AFC) was began from Thailand and Malaysia is one of the victims. The GDP, balance on current account of Malaysia have drop during the period. The Kuala Lumpur Composite Index (KLCI) which is a major stock market index based in Malaysia also experiences an acute decline from 1997 until 1998. According to Hasan (2003), flight of foreign portfolio investment from the country was the cause of this phenomenon. Stock market plays an important role in the economic development of country.

Another financial crisis happened in the year 2008. It has been tremendously challenging for worldwide business. According to Chin (2009), KLCI have fell 38.9% at the year 2008. The market knocks down in the same year of March after the failure of Barisan National to win two thirds majority in Parliament. Generally, market in Malaysia is affected by the prices of commodities such as palm oil, levy plantation and corporate government issues. Based on the research done by Angabini and Wasiuzzaman, 2008 financial crisis has a huge impact to the world's financial market. For example, decline in liquidity in banking system, credit availability and investor confidence. Malaysia experiences a biggest decline in KLCI value after AFC which is around 45%.

According to the research of Hasan (2003) on the recovery of financial crisis, to put the economy back to track, International Monetary Fund (IMF) had implemented tight monetary, fiscal policies for Malaysia. As evident, the KLCI

recovered fast, foreign direct investment remained almost unaffected, GDP grown, unemployment rate decline and the overall balance of trade showed improvement.

Stock market volatility is measure of stock price movement going up or down. If the stock price increase or decrease rapidly in a short term period, it has high stock market volatility. If the stock price changing less or unchangeable in the short term period, it is less volatility. Based on previous researcher, macroeconomic variables volatility has the significant impact to the stock market volatility. Other than macroeconomic variables volatility, there also underlying factor will affect the stock market volatility. The first factor is economic growth in develop and developing countries. The better the economic growth, households will demand more goods and services and this will help firm generate more profit. Thus, it can increase the organization share price and organization dividends. Other than that, stability also is one of the factor will affect the stock market volatility. The news had been announced it could affect economic stability and future growth. Thus, the future growth volatility will fall if there is news on terrorist attacks. Another factor that could affect stock market volatility is the confidence and expectation of investors. If investors receive a good new from the economy and they expect the share price will increase, they will more likely to buy shares. If investors receive a bad news from the economy market and they expect the share price will drop, they will more likely to sell the share. The last but not least is the bandwagon effect. It means the stock market over react to the particular economic event. The stock market dropped too much according to certain event. The problem is investor may follow the mood, when price fall and people will need to follow get out of the market.

1.2 Problem Statement

From the previous researches, we realized that stock market volatility is a vital issue in the global economic perspective. However, there are very few studies have addressed more than two macroeconomic variables in the examination of the determinants of stock market volatility. For instance, Kadir, Selamat, Masuga & Taudi (2011) only discovered two macroeconomic variables which are interest rate and exchange rate in their study. Geetha, Mohidin, Chandra & Chong (2011) has examined the relationship between inflation and stock market. The study of the relationship between interest rate and stock market is proposed by Alam & Uddin (2009). Both of these researchers only included less than two macroeconomic variables.

Nevertheless, the findings obtained from the previous researches are inconsistent. Some empirical evidences (Hoseeini, Ahmad & Lai, 2011; Brahmasrene and Jiranyakul, 2007) highlighted that there is a positive relationship between money supply volatility and stock market volatility. But some researches (Habibullah and Baharumshah, 1996; Tessaromatis and Triantafillou, 2009) said there is a negative relationship between money supply volatility and stock market volatility. On the other hand, according Singh, Mehta and Varsha (2011), the money supply does not have a significant impact on the stock returns. These different results may be caused by the different model employed. Due to the contradict results as shown above, it motivate us to carry out further research in order to get more accurate results.

Other than that, there are evidences shown that financial crisis will lead to vary results of the determinants that affect stock market volatility. According to Chan, Gup and Pan (1997), it showed that there are two different findings for before and during the 1997 Asian financial crisis. Before 1997 Asian financial crisis, there is a significant relationship between exchange rate and stock prices. However, there is no significant relationship during the Asian financial crisis. Another authors proved that

Asian financial crisis causes sharp increases in unemployment, inflation and interest rate.

1.3 Research Objectives

The research objectives summarize what is to be achieved in this study. These objectives are closely related to the research problem of the study.

1.3.1 General Objective

Regarding the different findings from previous researches, we would like to investigate the relationship between macroeconomic variables volatility and stock market volatility in Malaysia. In our research, the macroeconomic variables include interest rate, exchange rate, inflation and money supply.

1.3.2 Specific Objectives

1. To examine the relationship between interest rate volatility and stock market volatility in Malaysia.
2. To highlight the significant impact of exchange rate volatility towards stock market volatility in Malaysia.
3. To determine the effect of inflation volatility on stock market volatility in Malaysia.
4. To prove the influence of money supply volatility towards stock market volatility in Malaysia.

1.4 Research Questions

1. How the interest rate volatility affects the stock market volatility in Malaysia?
2. How the exchange rate volatility influences the stock market volatility in Malaysia?
3. How the inflation volatility affects the stock market volatility in Malaysia?
4. How the money supply volatility influences the stock market volatility in Malaysia?

1.5 Hypotheses of the Study

The hypotheses of the study are the specific testable predictions made about the outcomes between the dependent variable and the independent variables in the study.

1.5.1 Interest Rate

The proposed framework indicated that the relationship between interest rate and stock market volatility. According to past researchers such as Ozbay (2009) highlighted that interest rate is one of the important determinants which will affect stock market volatility. This proposed the following hypothesis:

H_{0a}: There is no significant relationship between interest rate volatility and stock market volatility.

H_{1a}: There is significant relationship between interest rate volatility and stock market volatility.

1.5.2 Exchange Rate

Few previous studies have supported that there is a significant relationship between the exchange rate and the stock market volatility. According to Yang and Doong (2004), Kandir (2008), they have proved that the changes in the exchange rate will cause volatility in the stock market. This proposed the following hypothesis:

H_{0b} : There is no significant relationship between exchange rate volatility and stock market volatility.

H_{1b} : There is significant relationship between exchange rate volatility and stock market volatility.

1.5.3 Inflation

Regarding to the relationship between inflation and stock market volatility, are also substantial number of researchers such as Saryal (2007) and Wang (2011) had verified that inflation will impact the stock market volatility. This proposed the following hypothesis:

H_{0c} : There is no significant relationship between inflation volatility and stock market volatility.

H_{1c} : There is significant relationship between inflation volatility and stock market volatility.

1.5.4 Money Supply

According to the previous researchers, the empirical results showed there are significant relationship between money supply and stock market volatility. The relationship between this two have been proved by Alatiqi and Fazel (2008). This proposed the following hypothesis:

H_{0d} : There is no significant relationship between money supply volatility and stock market volatility.

H_{1d} : There is significant relationship between money supply volatility and stock market volatility.

1.6 Significance of the Study

This study examines how the macroeconomic variables volatility influences the stock market volatility in Malaysia. As stated by Schwert (1988), stock market volatility changes over time due to volatility of a variety of economic variables, including inflation, money growth, industrial production, and other measures of economic activity.

Commonly, investors have concerned about the stock market volatility level. As a rational investor, he or she always make their investment decisions in an efficient market. In addition, their purchase decisions are based on the returns and sale decisions by risk perceptions. The investors' returns will be affected by the stock market volatility. In such cases, as the stock market volatility increases, the risk taken by the investors will be higher, which will lead to lower return and vice versa.

Since the purpose of the investors is to generate extra ordinary profits, it is important for them to investigate the factors that will affect the stock market volatility. In our research, we provide the empirical evidences on the significance relationship between macroeconomic variables volatility and stock market volatility. These evidences contribute to the investors the factors that should be taken into consideration when making their investment decisions.

Other than investors, our evidences also contribute to the portfolio managers. Portfolio managers can aware of these macroeconomic variables volatility and cautious in advising their clients when in a dynamic situation. By considered the volatility of these macroeconomic variables, they are able to provide a better advice to their clients in term of investment decisions, in order to generate a higher return.

1.7 Chapter Layout

Our research consists of five Chapters. Chapter one provides the overall concept for the study. It clarifies the research background, problem statement, research objectives, research question and hypotheses that provide a clear direction for the following chapters.

Next, Chapter two discusses on all relevant aspects of each macroeconomic variable volatility and stock market volatility. It comprises the review of the literature, review of relevant theoretical models, proposed conceptual framework and hypotheses development.

After that, Chapter three is above the methodology used in the research. This chapter explains the ways to carry out the research such as research design, data collection methods, sampling design, research instrument, constructs measurement, data processing and data analysis.

Chapter four demonstrates the patterns of the results, including descriptive analysis, scale measurement and inferential analysis. In this chapter, it also analyses those results to answer the research questions and hypotheses developed in Chapter one.

Lastly, Chapter five summarizes the statistical analysis which stated in Chapter four. In addition, it also discusses on the major findings from the research and provides useful implications of the study. The limitations of the study and the recommendations for the future researches are included in this chapter as well.

1.8 Conclusion

Chapter one is to clarify the research background, problem statement and objectives for this study. It also stated the hypotheses and discussed the significance of our study. In addition, they made us have a clear direction to do research that underlines the influence of the stock market volatility in Malaysia. To make this study flow naturally, literature review from chapter two is always referred to Chapter one.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

After discussed the research background, problem statement, research objectives, research questions, hypotheses, and significance of the study in Chapter 1, this topic is to determine the impacts of the macroeconomic variables on dependent variable based on the previous studies. The purpose of this literature review is to provide readers with a better understanding about the relationship between stock market volatility and macroeconomic variables volatility. The contents of Chapter 2 are classified into several parts: (2.1) Review of the literature; (2.2) Review of relevant theoretical models; (2.3) Proposed conceptual framework; (2.4) Hypothesis development.

2.1 Review of the Literature

The review of the literature describes, summarizes, evaluates and clarifies the previous studies related to this research. It gives a theoretical basis for the research and helps in determining the nature of the research.

2.1.1 Stock Market Volatility

Stock market is playing an important role in every developed or developing countries, it helps to develop each country economic and political development. Economy downturn and the financial crisis are usually caused by the crumple of the stock market (Wang, 2011).

Based on the research of Fama and Schwert (1977), the study found that there is a significant relationship between stock returns and macroeconomic variables volatility. Besides, the efficient market hypothesis had showed that macroeconomic variable assist to forecast time series of stock returns for almost 30 years. In the creation of nation macroeconomic policy, the causal relation and dynamic interactions between macroeconomic variables volatility and stock price are significant which has done by the study of Maysami, Lee and Hamzah (2004).

According to research of Gan, Lee, Au Yong and Zhang (2006), New Zealand Stock Index has the long run relationship with macroeconomic variable volatility which using Johansen multivariate cointegration tests to investigate. Besides, they also using Granger Causality tests to study the New Zealand stock index are a leading indicator for macroeconomic variables. The empirical result shows New Zealand stock index are not a leading indicator for macroeconomic variables this is due to the New Zealand stock market is smaller than the stock market of other international market. This lead to the impact of capital market on the world wide economy becomes low. Other than that, this research also investigated the short run relationship between macroeconomic variables volatility and stock index by using impulse response function and Forecast Error Variance Decomposition.

Adam and George (2008) investigated the relationship of macroeconomic variables volatility and stock market by using the model of Error Correction Model. The result of using Error Correction is performing well and the Ghana stock markets have the significant impact with the macroeconomic variables volatility.

2.1.2 Interest Rate

Interest rate always been recognized as the important determinants that contribute to the stock market. The results proposed by previous studies are conclusive. There are negative relationship between interest rate and stock market volatility. According to Yusof and Majid (2007), it highlighted that the interest rate change affects the conventional stock market volatility but not the Islamic stock market volatility. In the conventional stock market, most of the investors seek to maximize their profit so they tend to be more sensitive towards the change of the interest rate. The instability in conventional stock market is caused by the fluctuation of the interest rate. While in the Islamic stock market, Muslim investors are not only seeking for the profits but they are more concerned whether the stocks are Shari'ah compliant. So, interest rate is not a significant factor in explaining stock market volatility.

By employing GARCH model, Kadir, Selamat, Masuga and Taudi (2011) indicated that they tend to be a negative relationship between KLCI returns and interest rate. It also shows that there is a weak predictive power in the interest rate. A higher interest rate will increases the motivation of the depositors to save money therefore the money will not driven to the stock market. A lower interest rate have a conversely result. Consistent with Adam and George (2008) revealed that there a negative relationship with real long-term interest rate and stock market movement in Ghana by using VECM model. In the late 90's, the Treasury bill were more profitable than stock market due to the high T-bill rate. So, most of the investors will investing in Treasury bill and decelerate the performance of the Ghana stock market.

Other past literature on these relation include that of Ozbay (2009) who investigated the negative significant relationship between the interest rate and stock prices based on the correlation analysis in Turkey. A reduce in the interest rate is to contribute the profitability of a firm by decreasing the cost of

capital, which lead to increase in the stock returns. Result of Rahman, Sidek and Tafri (2009) discovered that interest rate has a negatively influences to the KLCI in the long run which employing Johansen-Juselius (JJ) test for co-integrating. This is because contraction in money supply fuels to decrease interest rate, lead to lower the firm investment and consequently decreasing the attractiveness to invest in stock market.

There is no relationship between interest rate and share price but there is a negative relationship between the volatility of interest rate and fluctuation of share price in Malaysia. The point is highlighted by Alam and Udin (2009) who proposed that the interest rate expected to influence the stock price in fifteen developed and developing countries: Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippine, South Africa, Spain and Venezuela. In Malaysia, there is a negative relationship between the interest rate volatility and share price volatility. In theoretical, if the bank paid the interest rate to depositors is high, depositors will switch their money to the bank but not the stock market. This will lead to decreasing in investment in stock market.

2.1.3 Exchange Rate

The relationship between stock market volatility and exchange rate volatility is concerned by the financial economists and practitioners since these variables are vital in economic development and portfolio decisions. The past empirical studies regarding the exchange rate showed inconclusive results. Based on the past researches, Yang and Doong (2004) used the multivariate EGARCH model to study the volatility spillovers and dynamic price between stock market and exchange rate. The empirical evidence showed the significant volatility spillovers between the stock market and exchange rate. Usually, stock prices pulls down as currency depreciation, and conversely. In

long run, for the economy with a significant import or export sector, the unfavourable impact of currency movement which is depreciation (appreciation) of currency on the imports (exports) will lead to a bearish stock market. But, the effect of currency depreciation on the stock market may have opposite effect in short run due to the domestic counterpart of currency depreciation is inflation. This inflationary effect will cause international investors less invest on their portfolio of domestic assets, thus depress the stock market in long run.

Maysami, Howe and Hamzah (2004) supported that exchange rate and Singapore stock market has a positive relationship by applying Vector Error Correction Model (VECM). The results from their study on the relationship between macroeconomic variables and the Sector Stock Indices indicated the significant relationship which is consistent to Maysami and Koh (2000) by using the similar method. They explained that the country with a stronger domestic currency will have lower imported raw materials' costs and allow the local producers to be more competitive internationally. In turn, Ibrahim and Aziz (2003) determined that exchange rate is negatively related with the stock price. This is explained as the appreciation of the domestic currency lower down the cost of imported inputs but at the same time decreases the exports of the country.

Furthermore, multiple regression models were applied by some of the researches such as Kandir (2008), Ahmad, Rehman and Raoof (2010), and Anlas (2012) in the investigation of the relationship between stock market volatility and the exchange rate. These researchers consistently showed that the exchange rate is positively associated with the stock market volatility. Kandir (2008) stated that the exchange rate volatility has positively impact on all portfolio returns. He showed that the influential degree of the exchange rate volatility is greater on the volume of exports compared to the cost of

imported production's inputs in Turkey. Therefore, a positive relationship is observed in his study.

Besides, Ahmad, Rehman and Raoof (2010) showed the result of there is significant positive impact of changes in exchange rate on the stock returns. As there is increase in exchange rate, the costs of business decrease and lead to higher the stock return. While a decline in exchange rate gives a negative message to the stock market, thus lower the stock return. The results are supported by Anlas (2012). There is a statistically significant effect of exchange rates on ISE 100 Index (Anlas, 2012). From the hypothesis changes in exchange rates affect ISE 100 Index, Anlas (2012) found that changes in domestic U.S Dollar and Canadian Dollar have positive relationship with changes in ISE 100 Index. This supports the traditional approach for the relationship between the exchange rate volatility and the stock market volatility. Traditional approach stated that the exchange rate movement will affect both the international competitiveness and the international trade of a country. And, the stock value is defined as the present value of the future cash flows which is determined based on the economic environment.

2.1.4 Inflation Rate

Research have been done in the country Malaysia, United States and China by Geetha, Mohidin, Chandran, Chong (2011) to examine relationship between inflation and stock market. There are long run relationships between inflation rate and stock returns in the three research countries. In China, result from Vector Error-Correction Model (VECM) stated that expected inflation rates and China's stock market have short run relationship. Whereas in Malaysia and United States, result from VECM stated that no short run relationship in this two countries. When expected inflation happened, money will looses

value and people are less likely to hold it. Whereas, unexpected inflation cause redistribution of wealth between borrower or lender.

Besides, there are evidence from Turkey and Canada showing the impact of inflation on stock market volatility. Saryal (2007) have used ARCH and GARCH model to test the relationship. Results shows that inflation is one of the factors determine stock market volatility, the greater the CPI, the greater the fluactuation of stock market index. Countries that experience high inflation rate have higher volatilities than countries that have stable process.

According to Wang (2011), confirmed that the existence of feedback phenomenon of two way causation between China's consumer price index (CPI) and stock prices. It exist a bilateral causal relationship between inflation volatility and stock market volatility. The high rate inflation in China boosts up the living cost and shifted consumer from investment to consumption. Demand of domestic markets fall and finally lead to decrease of stock traded amount.

Fama and Schwert (1977) investigate the relationship between stock return, expected inflation and unexpected inflation in United States. Stock returns are negatively related to both expected and unexpected inflation which measure in CPI. However, Bhattacharya and Mukherjee(n.d) found that there are bidirectional relationship between stock price and inflation rate by using the result from Toda and Yamamoto Version of Granger Causality. It imply that stock market is informational inefficient with respect to the rate of inflation.

For a previous research about Singapore's relationship between macroeconomic variables and stock market indices done by Maysami, Lee and Hamzah (2004), the results get is opposing to the results done by other researchers. There are significant positive relationship between inflation and

stock return of Singapore. They provide a reasonable reason that governments have actively defenses the price appreciation as the economy improve constantly after 1997 crisis. The increase of the stock returns cause by increase of inflation. Increase of inflation caused by raise in real activity and production.

2.1.5 Money Supply

Money supply plays an important role in determining the stock market behavior. It is said to be changes in money supply would have to modify the money market equilibrium or real economic variables and thus affect stock returns. According to Hoseeini, Ahmad & Lai (2011), there is few approaches which the money supply is likely to affect the stock market index. Firstly, the money supply is positively affected the stock market index through the economic activity. Not only that, it is said to have a positive relationships given that there is a rise in the money supply.

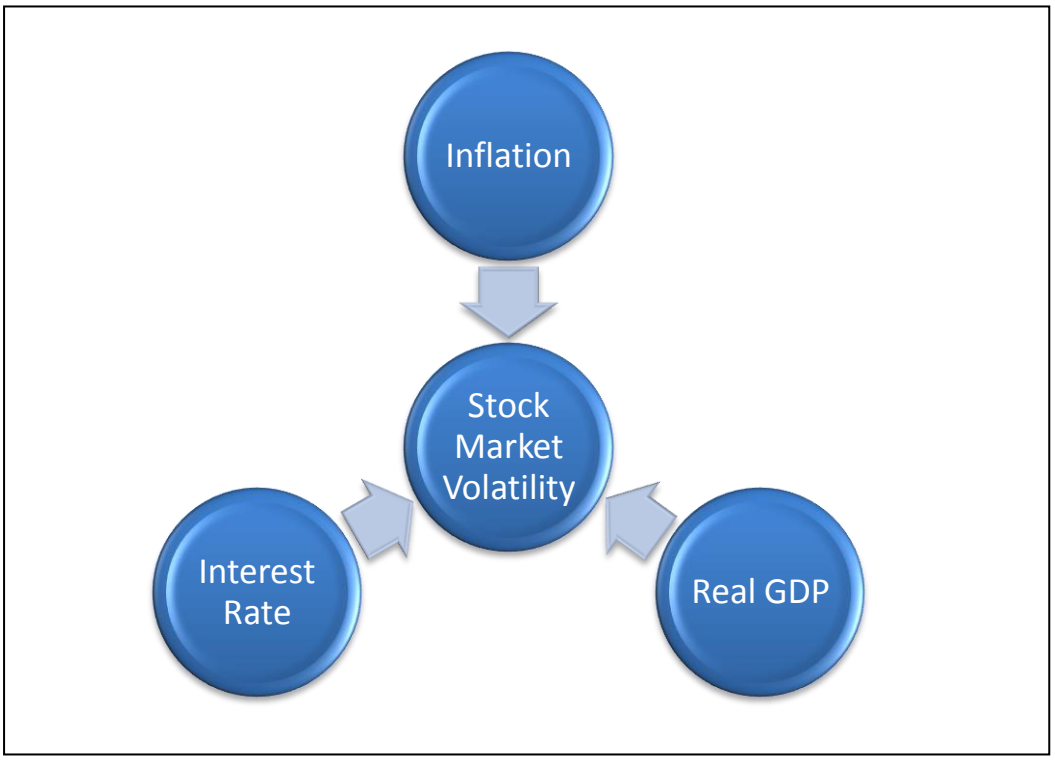
There are many empirical studies that have discussed the relationship between the money supply and stock market index. For instance, based on research of Brahmasrene and Jiranyakul (2007) the money supply has a positive impact on the stock market index by using the Johansen cointegration test which is based in Thailand. However, there are some points highlighted by the author for the future researchers to generate the causality effects between stock market and money supply. Additional economic or financial factors can help to estimate the model better this can be supported by more data. Not only that, Granger causality test also showed there is a positively affected the stock market returns. These results were supported by Fazel and Alatiqi (2008) which have also indicated that stock price has positively affected the money supply.

From the research done by Singh, Mehta and Varsha (2011), the money supply have a negative relationship on the stock returns which is based in Taiwan. This result is taken from the linear regression which is employed to test the effects. The dependent variable is set to be the stock portfolio returns while the independent variables are the macroeconomics factors which are the money supply. On the other hand, the factor of money supply is very important in determining the stock prices and stock index in Hong Kong, Singapore and South Korea. For the country which are India, the effects of money supply is negative but in China is positively related. But all the impacts are insignificant (Hosseini, Ahmad & Lai, 2011).

However, there is a negative relationship between the money supply and stock market index which is supported on the research by Tessaromatis and Triantafillou (2009) based in United Kingdom. From the results tested, a negative result is announced through the coefficients of the regression model which concluded that when the money supply is higher, the stock price tend to decrease. Not only that, from the research done by Habibullah and Baharumshah(1996), the Malaysia stock market is informationally efficient with the money supply changes. As the researchers proposed in above, cointegration test is also used to the hypothesis to test the efficiency of the market. From the equation, narrow money (M1) and broad money (M2) is used.M1 includes currency in circulation and demand deposits while M2 contain M1 plus saving and fixed deposits, negotiable certificate of deposit and repos. Due to this, abnormal profit can be earned to predict the stock prices by using the growth of money supply. Moreover, from the conintegration test, it is concluded that the stock price index has already incorporated all the past information in the money supply and the output.

2.2 Review of Relevant Theoretical Models

Figure 2.1: Relevant Theoretical Models



A research had been done by Wang (2011) to examine the relationship between macroeconomic variables and stock market volatility in China. The author tested the relationship between ShangHai composite index and the three macroeconomic variables which are interest rate, inflation and real gross domestic product. The data is obtained from the China Economic Information Network which extracted the monthly reports of the stock price index from January 1992 to December 2008.

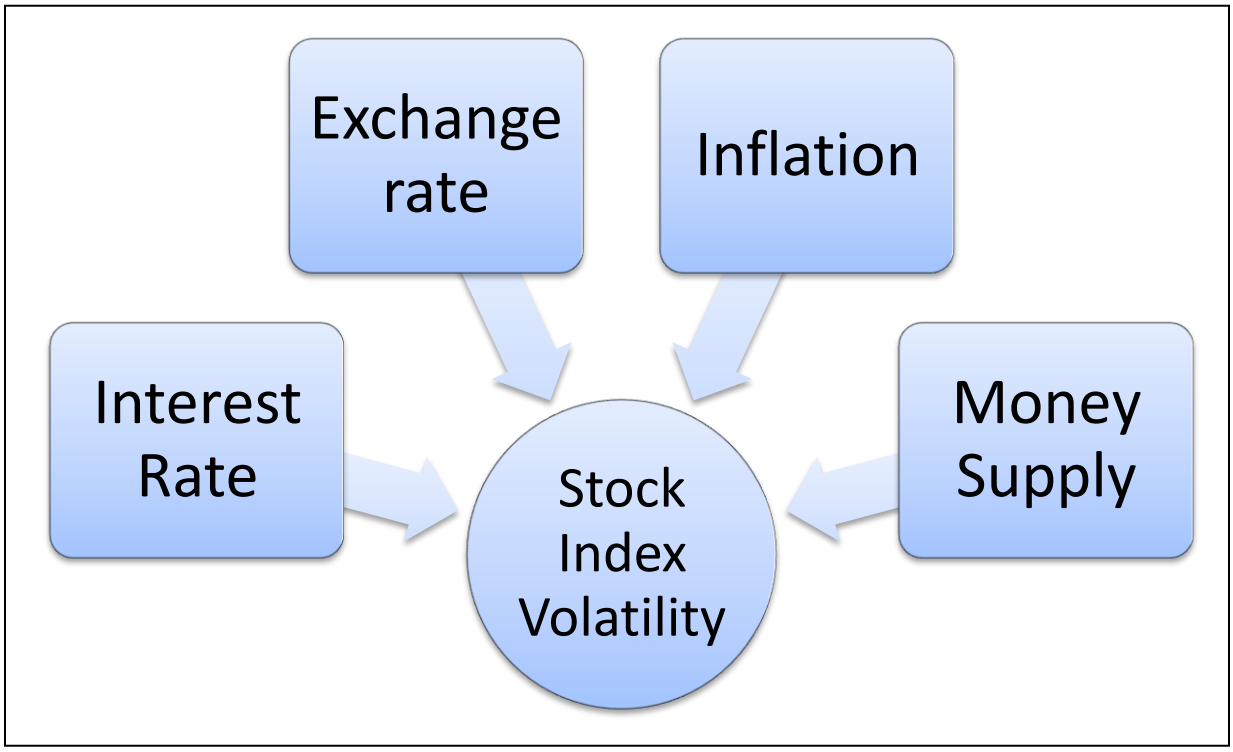
In order to proceeds the test, exponential generalized autoregressive conditional heteroscedasticity (EGARCH) and lag-augmented VAR (LA-VAR) models were employed. The author applied EGARCH model to estimate the stock market volatility and the macroeconomic variables volatility. In addition, LA-VAR

model and Granger-causality test were used to study the impact of the volatility of macroeconomic variables on the volatility of stock market.

The empirical evidences showed that stock market volatility and real GDP volatility have no causal linkage. Therefore, we have excluded the real GDP variable since it is insignificant to the stock market volatility. However, the author found that inflation volatility and stock market volatility are in bidirectional causal relationship. And, interest rate volatility and stock market volatility are in one-way causation, from stock price to the interest rate.

2.3 Proposed Conceptual Framework

Figure 2.2: Proposed Conceptual Framework



The proposed conceptual framework in Figure 2.3 is acting as a foundation of our research. The framework consists of four independent variables: interest rate, exchange rate, inflation and money supply that will affect the dependent variable which is stock market volatility. These macroeconomic variables will affect the investors' investment decisions and lead to changes in stock market. Thus, many researches discover about the relationship between macroeconomic variables and stock market.

Some of the past researches have indicated that interest rate volatility has negatively affected the stock market volatility (Yusof & Majid, 2007; Adam & George, 2008; Rahman & Sidek & Tafri, 2009; Ozbay 2009; Alam and Udin, 2009). There are also a substantial number of studies that showed a significant relationship between exchange rate and stock market (Maysami & Howe & Hamzah, 2004; Yang & Doong, 2004; Kandir, 2008; Ahmad & Rehman & Raoof, 2010; Anlas, 2012).

The previous studies of the relationship between inflation and stock market volatility showed contrary results. According to Maysami, Lee and Hamzah (2004) and Saryal (2007) concluded a positive relationship. Conversely, Fama and Schwert (1997) proved an opposite result. Regarding the relationship between money supply and stock market volatility, the results found by the past studies are not consistent. Brahmasrene and Jiranyakul (2007), Fazel and Alatiqi (2008), Hoseeini, Ahmad & Lai (2011) stated that there is a positive relationship between these two variables whereas Habibullah and Baharumshah (1996), Singh, Mehta and Varsha (2011), Hosseini, Ahmad & Lai (2011), and Tessaromatis and Triantafillou (2009) showed a negative relationship.

2.4 Hypothesis Development

The hypotheses of the study are developed to make the specific testable predictions about the outcomes between the dependent variable and the independent variables in the study.

2.4.1 Interest Rate

The proposed framework indicated that the relationship between interest rate and stock market volatility. According to past researchers such as Ozbay (2009), Rahman & Sidek & Tafri (2009) highlighted that interest rate is one of the important determinants which will affect stock market volatility. This proposed the following hypothesis:

H_{0a}: There is insignificant relationship between interest rate and stock market volatility.

H_{1a}: There is significant relationship between interest rate and stock market volatility.

2.4.2 Exchange rate

Few previous studies have supported that there is a significant relationship between the exchange rate and the stock market volatility. According to Yang and Doong (2004), Kandir (2008), they have proved that the changes in the exchange rate will cause volatility in the stock market. This proposed the following hypothesis:

H_{0b} : There is insignificant relationship between exchange rate and stock market volatility.

H_{1b} : There is significant relationship between exchange rate and stock market volatility.

2.4.3 Inflation Rate

Regarding to the relationship between inflation and stock market volatility, are also substantial number of researchers such as Saryal (2007) and Wang (2011) had verified that inflation will impact the stock market volatility. This proposed the following hypothesis:

H_{0c} : There is insignificant relationship between inflation and stock market volatility. .

H_{1c} : There is significant relationship between inflation and stock market volatility.

2.4.4 Money Supply

According to the previous researchers, the empirical results showed there are significant relationship between money supply and stock market volatility. The relationship between this two have been proved by Ahmad and Husain (2007) and Fazel and Alatiqi (2008). This proposed the following hypothesis:

H_{0d} : There is insignificant relationship between money supply and stock market volatility.

H_{1d} : There is significant relationship between money supply and stock market volatility.

2.5 Conclusion

In recent decades, researchers have been studied numerous variables which have a relationship between stock market volatility and macroeconomic variables volatility. Interest rate, exchange rate, inflation and money supply were the four independent variables which were identified and supported with literature review. Besides, it gives readers a clear picture of how the four independent variables affect the stock market volatility and the relationship between them.

CHAPTER 3: METHODOLOGY

3.0 Introduction

Chapter 3 discussed the methodology that is used in this research. There are several sections in this chapter which have a discussion on the research design, data collection method, sampling design, research instruments, data processing and data analysis. These elements play an important role in estimating the research results accordingly. The results of the methodology are further explained in detail in this chapter.

3.1 Research Design

Research design is the foundation and structure of an investigation to obtain answers for research questions (Kerlinger, 1986). This is an initial stages expanding the research project and determining the direction at the outset.

The objective of this study is to investigate the relationship between macroeconomic variables volatility and stock market volatility in Malaysia. In this research, the macroeconomic variables include interest rate, exchange rate, inflation and money supply. Therefore, quantitative analysis is more suitable than qualitative analysis in this case. Quantitative analysis is a financial analysis technique that can use to estimate real world events by using composite mathematical and statistical method. For example, share price changes, simple financial ratios, discounted cash flow and option pricing. Quantitative analysis can be use as performance evaluation and financial instrument valuation.

3.2 Data Collection Method

Data collection is process of obtaining and collecting data. It is an important portion in any type of research study. Systematic data collection provides a valid and reliable data. Invalid results can be occurring due to inaccurate data collection. Data can be collect through two ways, primary and secondary. Primary data are original as it is collected by the researchers through interview and questionnaire. Whereas secondary data is making use historical data collected by other agencies such as annual report.

3.2.1 Secondary Data

In this study, secondary data had been use to investigate the relationship between macroeconomic variables volatility and stock market volatility. The data is collected at Datastream which are available in UTAR online databases. The data is regarding the research's dependent and independent variables. Price index have been collected as data for dependent variables while money supply (M2), consumer price index (CPI), treasury bills, and exchange rates have been collected as independent variables.

In this research, the selected relevant data for each independent variable is to test the hypotheses of the study. Treasury bill is represented to test the relationship between interest rate volatility and stock market volatility. Exchange rate is represented to test the relationship between exchange rate volatility and stock market volatility. Consumer price index (CPI) is represented to test the relationship between the inflation volatility and stock market volatility. Money supply (M2) is represented to test the relationship between money supply volatility and stock market volatility.

3.3 Sampling design

Generally, it is the discussion of techniques to select the experimental unit or data. Further words, it will be a working plan, specify population frame involve, how large is the sample size we decide to use, which method of sample selection and also the estimation method in details throughout whole of this research paper.

3.3.1 Target Population

Target population is numbers of years where the researcher is interested in examining to get information for research objective. In this research, it investigates the stock market volatility for 10 years which is from year 2001 to 2010. The data collected is in monthly basis, therefore it has 120 observations. The reason of using monthly data is due to the Central Limit Theorem (CLT) states that a sufficiently large sample size approached a normally distributive model. This will also provide more accurate results. The data collected for dependent variable is price index while independent variables are money supply (M1), consumer price index (CPI), treasury bills, and exchange rates.

3.3.2 Sampling Size

Sampling size is refers to how much or how long the number of units or size has been chosen in the research study. In this study, the sampling size is large enough and involves monthly data. Because the larger the sample size, it can obtain a more significant result and show a clear picture of the relationship between the explanatory variables. The sampling size of this research is 120 monthly data which is from January 2001 until December 2010.

3.4 Research instruments

Ordinary least square (OLS) measurement has been use in this study. OLS is the most common method of the statistical technique by minimizing the sum of the squared deviation between a dependent variable and one or more independent variables. The reason of choosing OLS in this study is because OLS is simplest and most common method in the statistical technique. The OLS equation models are formed for each independent variable with the dependent variable, KLCI. The independent variables in these models are interest rate, exchange rate, inflation rate and money supply. The models are named simple linear regression models since each model only consists of one independent variable. In addition, there is linear relationship between dependent variable and independent variable.

3.4.1 Interest rate

For the simple regression model between KLCI and interest rate, the equation model is as shown below:

MODEL 1:

$$Y_i = \beta_0 + \beta_1 IR_i + \varepsilon_i$$

Y_i = Kuala Lumpur Composite Index (KLCI) (1977=100) at ith term

β_0 = Constant coefficient, Y-intercept

β_1 = Coefficient of interest rate

IR_i = Interest rate in annually % at ith term

ε_i = Error term for the ith term

3.4.2 Exchange rate

For the simple regression model between KLCI and exchange rate, the equation model is as shown below:

MODEL 2:

$$Y_i = \beta_0 + \beta_1 ER_i + \varepsilon_i$$

Y_i = Kuala Lumpur Composite Index (KLCI) (1977=100) at ith term

β_0 = Constant coefficient, Y-intercept

β_1 = Coefficient of exchange rate

ER_i = Exchange Rate Index (2005=100) at ith term

ε_i = Error term for the ith term

3.4.3 Inflation rate

For the simple regression model between KLCI and inflation rate, the equation model is as shown below:

MODEL 3:

$$Y_i = \beta_0 + \beta_1 CPI_i + \varepsilon_i$$

Y_i = Kuala Lumpur Composite Index (KLCI) (1977=100) at ith term

β_0 = Constant coefficient, Y-intercept

β_1 = Coefficient of inflation rate

CPI_i = Inflation rate, Consumer Price Index (2005=100) at ith term

ε_i = Error term for the ith term

3.4.4 Money supply

For the simple regression model between KLCI and money supply, the equation model is as shown below:

MODEL 4:

$$Y_i = \beta_0 + \beta_1 MS_i + \varepsilon_i$$

Y_i = Kuala Lumpur Composite Index (KLCI) (1977=100) at ith term

β_0 = Constant coefficient, Y-intercept

β_1 = Coefficient of money supply

MS_i = Money supply in RM million at ith term

ε_i = Error term for the ith term

3.5 Data Processing

Before carry out the data analysis, the data collected will undergo data processing to ensure the standard quality of data. The data processing is the process of converting raw data into information in an appropriate form. Several hypotheses testing will be carried out for the data checking such as Heteroscedasticity and Autocorrelation. Moreover, Model Specification and Jarque-Bera tests will be employed for the testing of model significance and normality assumption of the model.

3.5.1 Heteroscedasticity

Heteroscedasticity problem exists when the variances of error terms are not constant. This problem will cause the statistics value, confidence interval and

probability value to be biased due to the variance of error not achieved at optimal level.

There are two ways to detect the heteroscedasticity problem which are via informal and formal methods. The informal method, also called graphical method which is using graph of the hypothetical patterns of estimated squared residuals to detect heteroscedasticity. The estimated squared residuals exhibit systematic pattern indicates the presence of the heteroscedasticity problem. On the other hand, the formal way is through hypothesis testing. There are many hypothesis testing to detect the heteroscedasticity problem, which are Park test, Goldfeld-Quandt test, Glejser test, White test, Breusch-Pagan-Godfrey test, Autoregressive Conditional Heteroscedasticty(ARCH) test and so on. These tests are associated with the null hypothesis of there is no heteroscedasticity. The decision rule based on the P-value for the calculated sample value of the test statistic is:

P-value	**Decision**
$< \alpha$	Reject H_0 at significance level α.
$> \alpha$	Do not reject H_0 at significance level α.

* $\alpha = 0.01$ (Confidential Interval = 99%)

H_0 = There is no heteroscedasticity.

The heteroscedasticity problem can be reduced by improved the OLS residual estimates, increased the sample size and variability of the regressors. In theoretical, heteroscedasticity problem can solve by using Generalized Least Squares (GLS), Weighted Least Square (WLS), White's heterosceddasticity-consistent variance and standard error and increase in sample size. The larger of the sample size can reduce the impact of missing value and outlier.

3.5.2 Autocorrelation

By definition, autocorrelation is known as lagged correlation or serial correlation which refers to the similarity between the agreed time series and the lagged version of its time interval. This problem arises when the errors in the data are correlated. A positive autocorrelation is referring to if there is a positive return in one period which is followed by another positive return for the next period. However, a negative autocorrelation occurs if positive returns are followed by negative returns.

There are few hypotheses testing to detect the autocorrelation problem, which are Durbin-Watson test, Durbin's h test and Breusch-Godfrey LM test. For the Durbin-Watson test, the Durbin-Watson d-statistic is always in the range between 0 and 4. A Durbin-Watson d-statistic close to 2 is consistent with no serial correlation. A value close to 0 indicates positive autocorrelation whilst a value approaching 4 indicates negative autocorrelation. In the case of the existence of lagged values of dependent variable on the right hand side of the model equation, Durbin's h test and Breusch-Godfrey LM test will be used instead of Durbin-Watson test. Durbin's h test is only used for AR (1) model while Breusch-Godfrey LM test can be used for AR (1) and higher orders of serial correlation. The decision rule based on the P-value for the calculated sample value of the Durbin's h-statistic and F-test statistic (Breusch-Godfrey LM test) is:

P-value	**Decision**
$< \alpha$	Reject H_0 at significance level α.
$> \alpha$	Do not reject H_0 at significance level α.

* $\alpha = 0.01$ (Confidential Interval = 99%)

H_0 = There is no autocorrelation.

If encounters autocorrelation problem, to reduce it by using Cochrane-Orcutt procedure which is for the pure autocorrelation or increase the sample size. The larger the observation or data sample, it will create a weaker autocorrelation problem.

3.5.3 Model Specification

According to the assumption of Classical Linear Regression Model (CLRM), the model must correctly specified, if it does not, model specification error will occur. There are six types of the model specification errors, which are omitting a relevant variable, including an unnecessary or irrelevant variable, wrong functional form, errors of measurement bias, incorrect specification of the stochastic error term and assumption that the error term is normally distributed.

There are few ways to detect the model specification error, one of it is Ramsey's RESET Test. It is a test whether the non-linear of the explanatory variables have any power in explaining the response variable, the model is mis-specified. The steps involved are, obtain the estimated Y from the model. Secondly, calculate F test in formula. If the computed F value is highly significant, it is indicating that the model is mis-specified.

$$F = \frac{(R^2_{new} - R^2_{old}) - number\ o\ fnew\ regressors}{(1 - R^2_{new})/\ (n - number\ of\ parameters\ in\ the\ new\ model)}$$

The P-value decision rule for the calculated sample value of the Ramsey's RESET test statistic is:

P-value	**Decision**
$< \alpha$	Reject H_0 at significance level α.
$> \alpha$	Do not reject H_0 at significance level α.

* $\alpha = 0.01$ (Confidential Interval = 99%)

H_0 = the model is correctly specified.

If the model is assume to be not correctly specified and hence, it indicated that the estimated slope are biased and inconsistent. In other words, the bias does not disappear as the sample size gets larger.

3.5.4 Jarque-Bera (JB) test

One of the important assumptions of a multiple regression model is normality assumption. Normality assumption assumed that the error terms in a multiple regression model are normally distributed. The assumption based on the normality test is needed in many statistic tests such as T-test and F-test, because all these tests are based on the normal distribution. Jarque-Bera test is the preferred to test the normality assumption where it uses skewness and kurtosis measurements. In the JB test, an unknown or parameters is to identify in order to obtain a null distribution.

$$JB = \frac{n}{6}\left(S^2 + \frac{1}{4}(K-3)^2\right)$$

The JB test is asymptotically with chi-squared distribution of two degree of freedom, so it can be used to test for the hypothesis testing. If the hypothesis testing result is rejecting the null hypothesis, H_0 then it is indicated that the test is non-constructive. However, if it is not rejecting the null

hypothesis, H_0 and hence the disturbance is assume to be symmetric. The null hypothesis will always rejecting because of the small samples of chi-squared. It is over sensitive towards the data distributed. Furthermore, small p-values will lead to a right-skewed distribution and will results to a large Type 1 error. In general, if the sample size is large enough, the chi-square will have two degree of freedom while if the sample size is small, table of critical values can be used.

The P-value decision rule for the calculated sample value of the Jarque-Bera test statistic is:

P-value	**Decision**
$< \alpha$	Reject H_0 at significance level α.
$> \alpha$	Do not reject H_0 at significance level α.

* $\alpha = 0.01$ (Confidential Interval = 99%)

H_0 = Error term is normally distributed.

If the normality assumption is rejected and so assume the data is not normality distributed. Hence, it indicated that the mean and standard deviation cannot precisely determine the sample size correctly. Alternatively, sample size also plays an important role in determining the result. It must large enough to detect the accuracy of the distribution. However, if the sample size is small the tendency of accuracy to detect if the model is normally distributed is very low.

3.6 Data Analysis

Data analysis is the process to evaluate data through logical and analytical reasoning to determine each element of the data collected. The objective of the data analysis is to identify the exact comparison and relationship to be estimated, determine the exact data required, and design charts, tables and graphs to present the results (Stern, Coe, Allan & Dale, 2003). The statistical analysis based on the quantitative data can help to measure the degree of volatility and allow making assessment about the consistency of data.

` 3.6.1 Descriptive Analysis

This study uses descriptive analysis to illustrate fundamental features of the data in the study. It also helps in summarizing and sustaining assertions of fact. In the research, it may have a lot of measures and in large form. So, descriptive analyses are used to present the quantitative description in a manageable and simpler form. Simple graphics analysis can be attached as it virtually concluding every quantitative analysis of data (Trochin, 2006).

3.6.2 Inferential Analysis

Inferential analysis is dealing with drawing conclusions and making predictions about the properties of a population from the analysis of the properties of data sample. The statistical tests which are chosen for the data analysis are Unit Root Test and Vector Error Correction Model (VECM). This model is employed to determine the relationship between macroeconomics variables volatility and stock market volatility.

3.6.2.1 Unit Root Test

The unit root test is to test the stationary and non-stationary of the model and it is suitable for time series data. The stationary of time series data will be tested by using Augmented Dickey-Fuller (ADF) and Phillips-Perrons (PP). These two methods are commonly use by the researchers to test the stationary of the time series data. ADF test is the new version of Dickey-Fuller (DF) test for the set of time series models which the data size is larger and more complicated compare to Dickey-Fuller test.

The Dickey-Fuller tests have three types of test equation which is the time series is flat and slowly turn become zero, the time series is flat and slowly turn to non zero value and lastly is the time series has a trend which either up and down and slowly turn to a trend line. The ADF test is most similar to the DF test but the differences between these two methods are the ADF tests only have 2 types equation which is flat and slowly turn to non-zero value and have a trend slowly turn to a trend line which always draws in the time series data.

Besides, Phillips-Perrons (PP) test were founded by Phillips and Perron (PP) which is an alternative method to test a unit root by controlling the series correlation of the time series data. The purpose of PP method is to determine the non-ADF test and modifies the ratio of a coefficient so that series correlation does not affect the asymptotic distribution of the test statistic.

3.6.2.2 VECM model

The Vector Error Correction Model (VECM) indicates the long and short-run dynamics of each variable in the system. It is a dynamical system that the deviation of the current state from its long-run relationship will be fed into its short-run dynamics.

There is a way to write a system that captures all the relationships and avoids unit roots. Consider:

$$\Delta x_t = \alpha_1(\beta_1 y_{t-1} + \beta_2 x_{t-1}) + \varepsilon_t + v_t$$
$$\Delta y_t = \alpha_2(\beta_1 y_{t-1} + \beta_2 x_{t-1}) + u_t + v_t$$

This is the vector error correction model. Cointegrating relationship creates the error correction. The betas contain the cointegrating equation and the alphas contain the speeds of adjustment. Y or x or both have to change if y and x are different from their equilibrium relationship. Besides, if the error terms are autocorrelated, the vector part of name applies to the model above.

In VECM, numbers of cointegrating vectors are shown in coimtegratiog rank. A rank of two indicates that two linearly independent combinations of non-stationary variables will be stationary. A negative and significant coefficient of VECM shows that any short-run fluctuations between independent variables and the dependent variables will give an increase to a stable long run relationship between variables.

3.7 Conclusion

Chapter three is to explain about the research design, data collection method, sampling design, research instruments, data processing and data analysis. This study is using quantitative analysis to perform evaluation. The data used in the study is secondary data with the sampling size of 120. Besides, hypotheses testing will be carried out for the data checking. In the study, descriptive analysis and inferential analysis are used to evaluate the data collected.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

After discussed the research design, data collection methods, sampling design, research instruments, data processing, and data analysis in Chapter 3. In Chapter 4 presents the patterns of the results and analyses of the results which are relevant to the research questions and hypotheses. There are several sections in this chapter which have a discussion on the description of the empirical models, descriptive analysis, model estimation and interpretation, and inferential analysis. Those patterns and analyses of the results are generated by using Eviews 6 software. This chapter plays an important role in the result of the research.

4.1 Model estimation and interpretation

The simple regression models used in this chapter is referring to the equation models formed in Chapter 3. In the regression models, the dependent variable, Y represents the Kuala Lumpur Composite Index (KLCI). Whilst, the independent variables in these regression models are interest rate, exchange rate, inflation rate and money supply. In this section, the simple regression models were constructed based on the E-view results.

4.1.1 Interest rate

Table 4.1: Result of the OLS equation for MODEL 1

Dependent Variable: Y
Method: Least Squares
Date: 01/29/13 Time: 21:45
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.183619	0.137446	1.335937	0.0024
C	6.657316	0.140959	47.22867	0.0000

R-squared	0.714819	Mean dependent var	6.842789
Adjusted R-squared	0.006551	S.D. dependent var	0.268037
S.E. of regression	0.267158	Akaike info criterion	0.214570
Sum squared resid	8.422030	Schwarz criterion	0.261028
Log likelihood	-10.87417	Hannan-Quinn criter.	0.233436
F-statistic	1.784728	Durbin-Watson stat	0.035585
Prob(F-statistic)	0.018441		

Based on the result from Table 4.1, the equation model is as follow:

MODEL 1:

$$Y_i = 6.657316 - 0.183619IR_i$$

Y_i = Kuala Lumpur Composite Index (KLCI) (1977=100) at ith term

IR_i = Interest rate in annually % at ith term

In the above regressions model, β_0 is 6.657316 which means that the KLCI will be equal to 6.657316 points compared to the base year 1977 (1977=100) when interest rate is zero. Next, β_1 is -0.183619 which means that for every additional 1% increased annually in the interest rate, on average, the

KLCI will be decreased by 0.183619 points compared to the base year 1977 (1977=100).

4.1.2 Exchange rate

Table 4.2: Result of the OLS equation for MODEL 2

Dependent Variable: Y
Method: Least Squares
Date: 01/29/13 Time: 21:47
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER	0.719777	0.505997	-1.422494	0.0015
C	10.18764	2.351528	4.332351	0.0000

R-squared	0.689521	Mean dependent var	6.842789
Adjusted R-squared	0.008527	S.D. dependent var	0.268037
S.E. of regression	0.266892	Akaike info criterion	0.212578
Sum squared resid	8.405276	Schwarz criterion	0.259036
Log likelihood	-10.75470	Hannan-Quinn criter.	0.231445
F-statistic	2.023489	Durbin-Watson stat	0.033091
Prob(F-statistic)	0.057521		

Based on the result from Table 4.2, the equation model is as follow:

MODEL 2:

$$Y_i = 10.18764 + 0.719777ER_i$$

Y_i = Kuala Lumpur Composite Index (KLCI) (1977=100) at i^{th} term

ER_i = Exchange Rate Index (2005=100) at i^{th} term

In the above regressions model, β_0 is 10.18764 which means that the KLCI will be equal to 10.18764 points compared to the base year 1977 (1977=100) when interest rate is zero. Next, β_1 is 0.719777 which means that for every additional 1 increased in the exchange rate index compared to the base year 2005 (2005=100), on average, the KLCI will be increased by 0.719777 points compared to the base year 1977 (1977=100).

4.1.3 Inflation rate

Table 4.3: Result of the OLS equation for MODEL 3

Dependent Variable: Y
Method: Least Squares
Date: 01/29/13 Time: 21:46
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-3.111955	0.183052	17.00039	0.0000
C	-7.564121	0.847549	-8.924702	0.0000

R-squared	0.710083	Mean dependent var	6.842789
Adjusted R-squared	0.707626	S.D. dependent var	0.268037
S.E. of regression	0.144932	Akaike info criterion	-1.008580
Sum squared resid	2.478618	Schwarz criterion	-0.962122
Log likelihood	62.51482	Hannan-Quinn criter.	-0.989713
F-statistic	289.0134	Durbin-Watson stat	0.122451
Prob(F-statistic)	0.000000		

Based on the result from Table 4.3, the equation model is as follow:

MODEL 3:

$$Y_i = -7.564121 - 3.111955CPI_i$$

Y_i = Kuala Lumpur Composite Index (KLCI) (1977=100) at ith term

CPI_i = Inflation rate, Consumer Price Index (2005=100) at ith term

In the above regressions model, β_0 is -7.564121 which means that the KLCI will be equal to -7.564121 points compared to the base year 1977 (1977=100) when interest rate is zero. Next, β_1 is -3.111955 which means that for every additional 1 increased in the Consumer Price Index compared to the base year 2005 (2005=100), on average, the KLCI will be decreased by 3.111955 points compared to the base year 1977 (1977=100).

4.1.3 Money supply

Table 4.4: Result of the OLS equation for MODEL 4

Dependent Variable: Y
Method: Least Squares
Date: 01/29/13 Time: 21:49
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MS	0.632039	0.029476	21.44236	0.0000
C	-1.565219	0.392279	-3.990069	0.0001

R-squared	0.795768	Mean dependent var	6.842789
Adjusted R-squared	0.794037	S.D. dependent var	0.268037
S.E. of regression	0.121643	Akaike info criterion	-1.358918
Sum squared resid	1.746062	Schwarz criterion	-1.312460

Log likelihood	83.53510	Hannan-Quinn criter.	-1.340051
F-statistic	459.7747	Durbin-Watson stat	0.145112
Prob(F-statistic)	0.000000		

Based on the result from Table 4.4, the equation model is as follow:

MODEL 4:

$$Y_i = -1.565219 + 0.632039MS_i$$

Y_i = Kuala Lumpur Composite Index (KLCI) (1977=100) at ith term

MS_i = Money supply in RM million at ith term

In the above regressions model, β_0 is -1.565219 which means that the KLCI will be equal to -1.565219 points compared to the base year 1977 (1977=100) when interest rate is zero. Next, β_1 is 0.632039 which means that for every additional RM1 million increased in the money supply, on average, the KLCI will be increased by 0.632039 points compared to the base year 1977 (1977=100).

4.2 Hypothesis Testing

In this section, hypothesis testing was carried out to define the relationship between the independent variables and the dependent variable. Firstly, t-test was carried out to test for the significance of the individual independent variables. After that, F-test was carried out to test for the significance of the whole model.

4.2.1 Interest Rate

The hypothesis testing was carried out based on the result in Table 4.1.

H_0: There is insignificant relationship between interest rate and stock market volatility.

$H_{1:}$ There is significant relationship between interest rate and stock market volatility.

Significance level, $\alpha = 0.01$

Decision Rule: Reject H_0 if the probability value of t-test is smaller than the significance level of 0.01, otherwise do not reject H_0.

Probability (t-statistic) value: 0.0024

Decision: Reject H_0 since the probability value of t-test is 0.0024 which is smaller than significance level of 0.01.

Conclusion: There is enough evidence to conclude that there is significant relationship between interest rate and stock market volatility at significance level of 0.01.

4.2.2 Exchange Rate

The hypothesis testing was carried out based on the result in Table 4.2.

H_0: There is insignificant relationship between exchange rate and stock market volatility.

$H_{1:}$ There is significant relationship between exchange rate and stock market volatility.

Significance level, $\alpha = 0.01$

Decision Rule: Reject H_0 if the probability value of t-test is smaller than the significance level of 0.01, otherwise do not reject H_0.

Probability (t-statistic) value: 0.0015

Decision: Reject H_0 since the probability value of t-test is 0.0015 which is smaller than significance level of 0.01.

Conclusion: There is enough evidence to conclude that there is significant relationship between exchange rate and stock market volatility at significance level of 0.01.

4.2.3 Inflation rate

The hypothesis testing was carried out based on the result in Table 4.3.

H_0: There is insignificant relationship between inflation rate and stock market volatility.

$H_{1:}$ There is significant relationship between inflation rate and stock market volatility.

Significance level, $\alpha = 0.01$

Decision Rule: Reject H_0 if the probability value of t-test is smaller than the significance level of 0.01, otherwise do not reject H_0.

Probability (t-statistic) value: 0.0000

Decision: Reject H_0 since the probability value of t-test is 0.0000 which is smaller than significance level of 0.01.

Conclusion: There is enough evidence to conclude that there is significant relationship between inflation and stock market volatility at significance level of 0.01.

4.2.4 Money Supply

The hypothesis testing was carried out based on the result in Table 4.4.

H_0: There is insignificant relationship between money supply and stock market volatility.

$H_{1:}$ There is significant relationship between money supply and stock market volatility.

Significance level, $\alpha = 0.01$

Decision Rule: Reject H_0 if the probability value of t-test is smaller than the significance level of 0.01, otherwise do not reject H_0.

Probability (t-statistic) value: 0.0000

Decision: Reject H_0 since the probability value of t-test is 0.0000 which is smaller than significance level of 0.01.

Conclusion: There is enough evidence to conclude that there is significant relationship between money supply and stock market volatility at significance level of 0.01.

4.3 Diagnostic Checking

4.3.1 AUTOCORRELATION

Autocorrelation problem exists when there is relationship between error terms in the model. This may lead the estimated parameters to be biased, inefficient, and inconsistent. Therefore, this study carries out diagnostic checking for the autocorrelation problem in the model.

4.3.1.1 Interest rate

Table 4.5: Result of the BG Serial Correlation LM test for MODEL 1

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1368.639	Prob. F(2,116)	0.0248
Obs*R-squared	115.1214	Prob. Chi-Square(2)	0.0743

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/31/13 Time: 00:10
Sample: 2001M01 2010M12
Included observations: 120
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.

IR	-0.059189	0.028696	-2.062640	0.0414
C	0.063187	0.029492	2.142522	0.0342
RESID(-1)	1.129549	0.091751	12.31097	0.0000
RESID(-2)	-0.141035	0.093250	-1.512441	0.1331

R-squared	0.959345	Mean dependent var	-1.34E-16
Adjusted R-squared	0.958294	S.D. dependent var	0.266033
S.E. of regression	0.054330	Akaike info criterion	-2.954731
Sum squared resid	0.342398	Schwarz criterion	-2.861814
Log likelihood	181.2838	Hannan-Quinn criter.	-2.916997
F-statistic	912.4260	Durbin-Watson stat	1.762924
Prob(F-statistic)	0.021738		

Based on the result in Table 4.5, the diagnostic checking for autocorrelation was carried out.

H_0 : There is no autocorrelation problem.
H_1 : There is autocorrelation problem.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(2,116) = 0.0248

Decision: Do not reject H_0 since the probability value is 0.0248 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that there is autocorrelation problem in the model at significance level of 0.01.

From the Serial Correlation LM Test, obtain the probability value greater than the significance level of 0.01. Therefore, do not reject H_0 which meaning that there is no autocorrelation problem.

4.3.1.2 Exchange Rate

Table 4.6: Result of the BG Serial Correlation LM test for MODEL 2

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	1508.575	Prob. F(2,116)		0.0129
Obs*R-squared	115.5572	Prob. Chi-Square(2)		0.0323
Test Equation:				
Dependent Variable: RESID				
Method: Least Squares				
Date: 01/31/13 Time: 00:19				
Sample: 2001M01 2010M12				
Included observations: 120				
Presample missing value lagged residuals set to zero.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER	-0.057779	0.098398	-0.587201	0.5582
C	0.271907	0.457313	0.594576	0.5533
RESID(-1)	1.201703	0.090828	13.23058	0.0000
RESID(-2)	-0.212509	0.092272	-2.303081	0.0231
R-squared	0.962977	Mean dependent var		-1.04E-15
Adjusted R-squared	0.962019	S.D. dependent var		0.265768
S.E. of regression	0.051795	Akaike info criterion		-3.050292
Sum squared resid	0.311192	Schwarz criterion		-2.957376
Log likelihood	187.0175	Hannan-Quinn criter.		-3.012558
F-statistic	1005.716	Durbin-Watson stat		1.868854
Prob(F-statistic)	0.034211			

Based on the result in Table 4.6, the diagnostic checking for autocorrelation was carried out.

H_0 : There is no autocorrelation problem.
H_1 : There is autocorrelation problem.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(2,116) = 0.0129

Decision: Do not reject H_0 since the probability value is 0.0129 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that there is autocorrelation problem in the model at significance level of 0.01.

From the Serial Correlation LM Test, obtain the probability value greater than the significance level of 0.01. Therefore, do not reject H_0 which meaning that there is no autocorrelation problem.

4.3.1.3 Inflation

Table 4.7: Result of the BG Serial Correlation LM test for MODEL 3

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	445.4433	Prob. F(2,116)	0.0438
Obs*R-squared	106.1752	Prob. Chi-Square(2)	0.0892

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/31/13 Time: 00:27
Sample: 2001M01 2010M12
Included observations: 120
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.013833	0.062695	-0.220646	0.8258
C	0.064744	0.290287	0.223034	0.8239
RESID(-1)	1.126364	0.091037	12.37258	0.0000
RESID(-2)	-0.198529	0.091256	-2.175515	0.0316

R-squared	0.884793	Mean dependent var	-6.52E-16
Adjusted R-squared	0.881814	S.D. dependent var	0.144322
S.E. of regression	0.049615	Akaike info criterion	-3.136275
Sum squared resid	0.285553	Schwarz criterion	-3.043359
Log likelihood	192.1765	Hannan-Quinn criter.	-3.098541
F-statistic	296.9622	Durbin-Watson stat	2.018775
Prob(F-statistic)	0.035621		

Based on the result in Table 4.7, the diagnostic checking for autocorrelation was carried out.

H_0 : There is no autocorrelation problem.

H_1 : There is autocorrelation problem.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F (2,116) = 0.0438

Decision: Do not reject H_0 since the probability value is 0.0438 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that there is autocorrelation problem in the model at significance level of 0.01.

From the Serial Correlation LM Test, obtain the probability value greater than the significance level of 0.01. Therefore, do not reject H_0 which meaning that there is no autocorrelation problem.

4.3.1.4 Money Supply

Table 4.8: Result of the BG Serial Correlation LM test for MODEL 4

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	365.6798	Prob. F(2,116)	0.0321
Obs*R-squared	103.5725	Prob. Chi-Square(2)	0.0476

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/31/13 Time: 00:38
Sample: 2001M01 2010M12

Included observations: 120

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MS	0.002218	0.011004	0.201608	0.8406
C	-0.028769	0.146442	-0.196455	0.8446
RESID(-1)	1.125481	0.090844	12.38913	0.0000
RESID(-2)	-0.212436	0.091154	-2.330505	0.0215

R-squared	0.863104	Mean dependent var	1.11E-16
Adjusted R-squared	0.859564	S.D. dependent var	0.121131
S.E. of regression	0.045394	Akaike info criterion	-3.314120
Sum squared resid	0.239029	Schwarz criterion	-3.221204
Log likelihood	202.8472	Hannan-Quinn criter.	-3.276386
F-statistic	243.7866	Durbin-Watson stat	1.997479
Prob(F-statistic)	0.031082		

Based on the result in Table 4.8, the diagnostic checking for autocorrelation was carried out.

H_0 : There is no autocorrelation problem.

H_1 : There is autocorrelation problem.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(2,116) = 0.0321

Decision: Do not reject H_0 since the probability value is 0.0321 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that there is autocorrelation problem in the model at significance level of 0.01.

From the Serial Correlation LM Test, obtain the probability value greater than the significance level of 0.01. Therefore, do not reject H_0 which meaning that there is no autocorrelation problem.

4.3.2 Heteroscedascity

Heteroscedasticity problem exists when the variances of error terms are not constant. In this study had carries out ARCH test in order to detect the heteroscedasticity problem in our model.

4.3.2.1 Interest rate

Table 4.9: Result of the ARCH test for MODEL 1

Heteroskedasticity Test: ARCH			
F-statistic	732.0920	Prob. F(1,117)	0.0351
Obs*R-squared	102.6025	Prob. Chi-Square(1)	0.0633

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/31/13 Time: 00:11
Sample (adjusted): 2001M02 2010M12
Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004667	0.003327	1.402778	0.1633
RESID^2(-1)	0.951517	0.035167	27.05720	0.0000

R-squared	0.862206	Mean dependent var	0.070187
Adjusted R-squared	0.861028	S.D. dependent var	0.066774
S.E. of regression	0.024893	Akaike info criterion	-4.531827
Sum squared resid	0.072498	Schwarz criterion	-4.485119
Log likelihood	271.6437	Hannan-Quinn criter.	-4.512860
F-statistic	732.0920	Durbin-Watson stat	1.540237
Prob(F-statistic)	0.031100		

Based on the result in Table 4.9, diagnostic checking for heteroscedasticity was carried out.

H_0 : There is no heteroscedasticity problem.

H_1 : There is heteroscedasticity problem.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(1,117) = 0.0351

Decision: Do not reject H_0 since the probability value is 0.0351 which is greater than the significance level of 0.01.

Conclusion: There is no enough evidence to conclude that there is heteroscedasticity problem at significance level of 0.01.

From the ARCH test result, conclude that the model does not have heteroscedasticity problem. So, do not reject the H_0 since the probability value is greater than 0.01, meaning that there is no heteroscedasticity problem.

4.3.2.2 Exchange Rate

Table 4.10: Result of the ARCH test for MODEL 2

Heteroskedasticity Test: ARCH			
F-statistic	772.6729	Prob. F(1,117)	0.0190
Obs*R-squared	103.3504	Prob. Chi-Square(1)	0.0211

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/31/13 Time: 00:21
Sample (adjusted): 2001M02 2010M12
Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004005	0.003278	1.221649	0.2243
RESID^2(-1)	0.968198	0.034831	27.79700	0.0000

R-squared	0.868491	Mean dependent var	0.070204
Adjusted R-squared	0.867367	S.D. dependent var	0.067476

S.E. of regression	0.024574	Akaike info criterion	-4.557604
Sum squared resid	0.070653	Schwarz criterion	-4.510896
Log likelihood	273.1774	Hannan-Quinn criter.	-4.538637
F-statistic	772.6729	Durbin-Watson stat	1.570664
Prob(F-statistic)	0.060421		

Based on the result in Table 4.10, diagnostic checking for heteroscedasticity was carried out.

H_0 : There is no heteroscedasticity problem.
H_1 : There is heteroscedasticity problem.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(1,117) = 0.0190

Decision: Do not reject H_0 since the probability value is 0.0190 which is greater than the significance level of 0.01.

Conclusion: There is no enough evidence to conclude that there is heteroscedasticity problem at significance level of 0.01.

From the ARCH test result, conclude that the model does not have heteroscedasticity problem. So, do not reject the H_0 since the probability value is greater than 0.01, meaning that there is no heteroscedasticity problem.

4.3.2.3 Inflation

Table 4.11: Result of the ARCH test for MODEL 3

Heteroskedasticity Test: ARCH			
F-statistic	404.2339	Prob. F(1,117)	0.0321
Obs*R-squared	92.28838	Prob. Chi-Square(1)	0.0589

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/31/13 Time: 00:29
Sample (adjusted): 2001M02 2010M12
Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002576	0.001712	1.504892	0.1350
RESID^2(-1)	0.879763	0.043757	20.10557	0.0000

R-squared	0.775533	Mean dependent var	0.020806
Adjusted R-squared	0.773614	S.D. dependent var	0.033288
S.E. of regression	0.015838	Akaike info criterion	-5.436108
Sum squared resid	0.029350	Schwarz criterion	-5.389400
Log likelihood	325.4484	Hannan-Quinn criter.	-5.417142
F-statistic	404.2339	Durbin-Watson stat	1.684419
Prob(F-statistic)	0.029750		

Based on the result in Table 4.11, diagnostic checking for heteroscedasticity was carried out.

H_0 : There is no heteroscedasticity problem.
H_1 : There is heteroscedasticity problem.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(1,117) = 0.0321

Decision: Do not reject H_0 since the probability value is 0.0321 which is greater than the significance level of 0.01.

Conclusion: There is no enough evidence to conclude that there is heteroscedasticity problem at significance level of 0.01.

From the ARCH test result, conclude that the model does not have heteroscedasticity problem. So, do not reject the H_0 since the probability value is greater than 0.01, meaning that there is no heteroscedasticity problem.

4.3.2.4 Money Supply

Table 4.12: Result of the ARCH test for MODEL 4

Heteroskedasticity Test: ARCH			
F-statistic	396.9790	Prob. F(1,117)	0.0753
Obs*R-squared	91.91134	Prob. Chi-Square(1)	0.0823

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/31/13 Time: 00:37
Sample (adjusted): 2001M02 2010M12
Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001846	0.001292	1.429093	0.1556
RESID^2(-1)	0.878393	0.044086	19.92433	0.0000

R-squared	0.772364	Mean dependent var	0.014625
Adjusted R-squared	0.770419	S.D. dependent var	0.025536
S.E. of regression	0.012235	Akaike info criterion	-5.952316
Sum squared resid	0.017515	Schwarz criterion	-5.905608
Log likelihood	356.1628	Hannan-Quinn criter.	-5.933349
F-statistic	396.9790	Durbin-Watson stat	1.628451
Prob(F-statistic)	0.053020		

Based on the result in Table 4.12, diagnostic checking for heteroscedasticity was carried out.

H_0 : There is no heteroscedasticity problem.
H_1 : There is heteroscedasticity problem.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(1,117) = 0.0753

Decision: Do not reject H_0 since the probability value is 0.0753 which is greater than the significance level of 0.01.

Conclusion: There is no enough evidence to conclude that there is heteroscedasticity problem at significance level of 0.01.

From the ARCH test result, conclude that the model does not have heteroscedasticity problem. So, do not reject the H_0 since the probability value is greater than 0.01, meaning that there is no heteroscedasticity problem.

4.3.3 MODEL SPECIFICATION

In this study had carries out Ramsey Reset Test to test for the model specification in this research.

4.3.3.1 Interest rate

Table 4.13: Result of the Ramsey RESET test for MODEL 1

Ramsey RESET Test:				
F-statistic	44.19374	Prob. F(1,117)		0.0209
Log likelihood ratio	38.45197	Prob. Chi-Square(1)		0.0310
Test Equation:				
Dependent Variable: Y				
Method: Least Squares				
Date: 01/31/13 Time: 00:14				
Sample: 2001M01 2010M12				
Included observations: 120				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-269.0803	40.50415	-6.643276	0.0000
C	-4745.601	714.8577	-6.638525	0.0000
FITTED^2	107.2987	16.14038	6.647838	0.0000
R-squared	0.284980	Mean dependent var		6.842789
Adjusted R-squared	0.272757	S.D. dependent var		0.268037
S.E. of regression	0.228578	Akaike info criterion		-0.089197
Sum squared resid	6.113001	Schwarz criterion		-0.019510
Log likelihood	8.351810	Hannan-Quinn criter.		-0.060897
F-statistic	23.31588	Durbin-Watson stat		0.243891
Prob(F-statistic)	0.018210			

Based on the result in Table 4.13, diagnostic checking for model specification was carried out.

H_0 : The model is correctly specified.

H_1 : The model is not correctly specified.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(1,117) = 0.0209

Decision: Do not reject H_0 since the probability value is 0.0209 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that the model is not correctly specified at significance level of 0.01.

From the output of Ramsey RESET Test, conclude that the model is correctly specified at significance level of 0.01 since do not reject the H_0, meaning that the model is correctly specified. Therefore, the researcher proceeds to carry out normality test.

4.3.3.2 Exchange Rate

Table 4.14: Result of the Ramsey RESET test for MODEL 2

Ramsey RESET Test:				
F-statistic	10.16068	Prob. F(1,117)		0.0218
Log likelihood ratio	9.993309	Prob. Chi-Square(1)		0.0226
Test Equation:				
Dependent Variable: Y				
Method: Least Squares				
Date: 01/31/13 Time: 00:22				
Sample: 2001M01 2010M12				
Included observations: 120				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER	-534.0451	167.3142	-3.191870	0.0018
C	5022.432	1572.430	3.194058	0.0018
FITTED^2	-54.11313	16.97623	-3.187582	0.0018
R-squared	0.095416	Mean dependent var		6.842789
Adjusted R-squared	0.079953	S.D. dependent var		0.268037
S.E. of regression	0.257099	Akaike info criterion		0.145967
Sum squared resid	7.733659	Schwarz criterion		0.215655
Log likelihood	-5.758043	Hannan-Quinn criter.		0.174268
F-statistic	6.170631	Durbin-Watson stat		0.054219
Prob(F-statistic)	0.012833			

Based on the result in Table 4.14, diagnostic checking for model specification was carried out.

H_0 : The model is correctly specified.
H_1 : The model is not correctly specified.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(1,117) = 0.0218

Decision: Do not reject H_0 since the probability value is 0.0218 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that the model is not correctly specified at significance level of 0.01.

From the output of Ramsey RESET Test, conclude that the model is correctly specified at significance level of 0.01 since do not reject the H_0, meaning that the model is correctly specified. Therefore, the researcher proceeds to carry out normality test.

4.3.3.3 Inflation

Table 4.15: Result of the Ramsey RESET test for MODEL 3

Ramsey RESET Test:			
F-statistic	33.00751	Prob. F(1,117)	0.0829
Log likelihood ratio	29.82137	Prob. Chi-Square(1)	0.0703

Test Equation:
Dependent Variable: Y
Method: Least Squares
Date: 01/31/13 Time: 00:32
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	80.33966	13.44307	5.976288	0.0000
C	-280.4095	47.49683	-5.903752	0.0000
FITTED^2	-1.806598	0.314453	-5.745216	0.0000

R-squared	0.773876	Mean dependent var	6.842789
Adjusted R-squared	0.770011	S.D. dependent var	0.268037
S.E. of regression	0.128543	Akaike info criterion	-1.240425
Sum squared resid	1.933225	Schwarz criterion	-1.170738
Log likelihood	77.42551	Hannan-Quinn criter.	-1.212125
F-statistic	200.2079	Durbin-Watson stat	0.146690
Prob(F-statistic)	0.070620		

Based on the result in Table 4.15, diagnostic checking for model specification was carried out.

H_0 : The model is correctly specified.
H_1 : The model is not correctly specified.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(1,117) = 0.0829

Decision: Do not reject H_0 since the probability value is 0.0829 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that the model is not correctly specified at significance level of 0.01.

From the output of Ramsey RESET Test, conclude that the model is correctly specified at significance level of 0.01 since do not reject the H_0, meaning that the model is correctly specified. Therefore, the researcher proceeds to carry out normality test.

4.3.3.4 Money Supply

Table 4.16: Result of the Ramsey RESET test for MODEL 4

Ramsey RESET Test:			
F-statistic	3.218007	Prob. F(1,117)	0.0754
Log likelihood ratio	3.255946	Prob. Chi-Square(1)	0.0712

Test Equation:
Dependent Variable: Y
Method: Least Squares
Date: 01/31/13 Time: 00:36
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MS	4.902106	2.380531	2.059249	0.0417
C	-35.20371	18.75583	-1.876948	0.0630
FITTED^2	-0.494153	0.275466	-1.793880	0.0754

R-squared	0.801235	Mean dependent var	6.842789
Adjusted R-squared	0.797837	S.D. dependent var	0.268037
S.E. of regression	0.120516	Akaike info criterion	-1.369384
Sum squared resid	1.699323	Schwarz criterion	-1.299697
Log likelihood	85.16307	Hannan-Quinn criter.	-1.341084
F-statistic	235.8175	Durbin-Watson stat	0.148910
Prob(F-statistic)	0.075688		

Based on the result in Table 4.16, diagnostic checking for model specification was carried out.

H_0 : The model is correctly specified.
H_1 : The model is not correctly specified.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of F-statistic is less than the significance level of 0.01. Otherwise, do not reject H_0.

Probability value: Prob. F(1,25) = 0.0754

Decision: Do not reject H_0 since the probability value is 0.0754 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that the model is not correctly specified at significance level of 0.01.

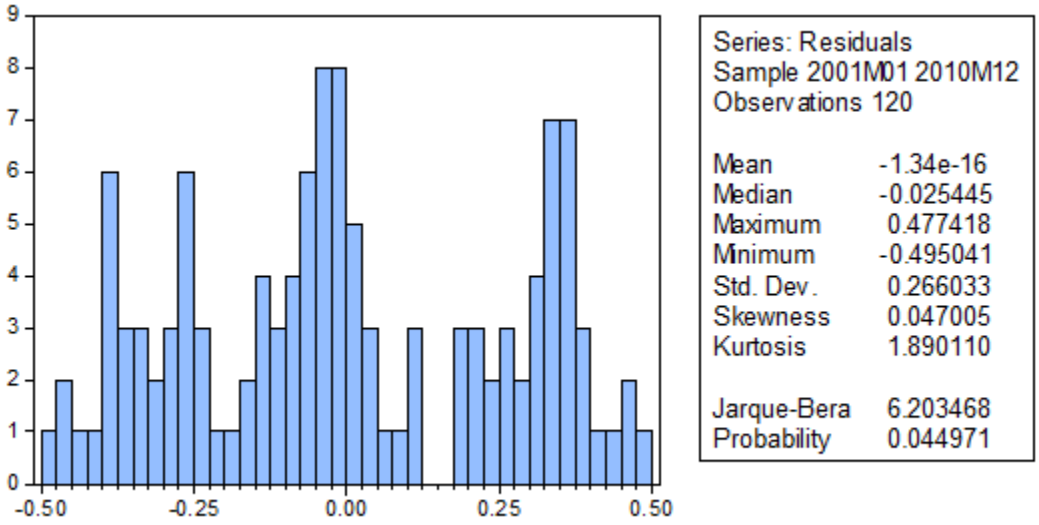
From the output of Ramsey RESET Test, conclude that the model is correctly specified at significance level of 0.01 since do not reject the H_0, meaning that the model is correctly specified. Therefore, the researcher proceeds to carry out normality test.

4.3.4 NORMALITY TEST

In this study had carries out Jarque-Bera (JB) Test to test for the normality of error terms in our model.

4.3.4.1 Interest rate

Figure 4.1: Result of the JB test for MODEL 1



Based on the result in Figure 4.1, diagnostic checking for normality was carried out.

H_0: Error terms are normally distributed.

H_1 : Error terms are not normally distributed.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of Jarque-Bera test is less than significance level of 0.01. Otherwise, do not reject H_0.

Probability value = 0.044971

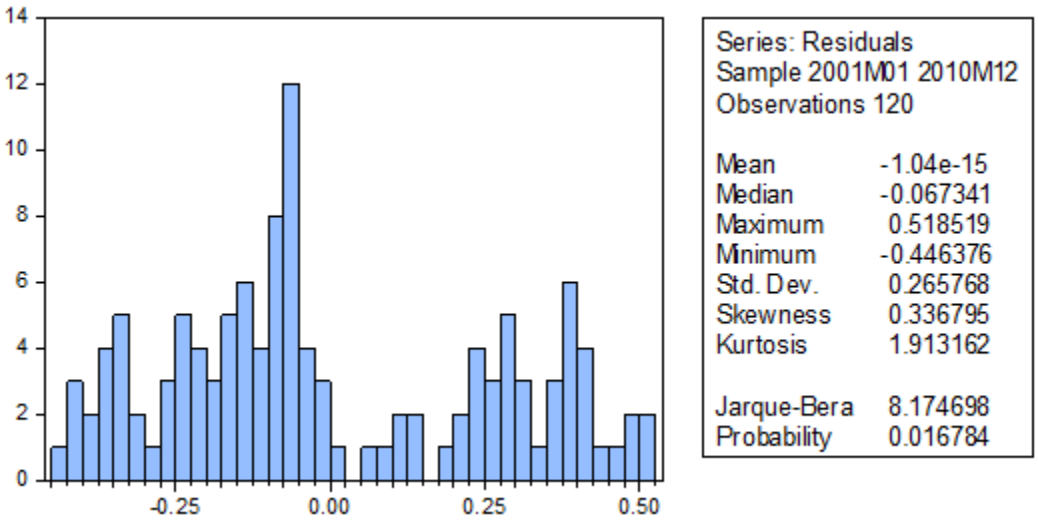
Decision: Do not reject H_0 since the probability value is 0.044971 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that the error terms are not normally distributed at significance level of 0.01.

From the Jarque-Bera Test, conclude that the error terms in the model are normally distributed at significance level of 0.01 since do not reject the H_0, meaning that the error terms are normally distributed.

4.3.4.2 Exchange rate

Figure 4.2: Result of the JB test for MODEL 2



Based on the result in Figure 4.2, diagnostic checking for normality was carried out.

H_0: Error terms are normally distributed.

H_1 : Error terms are not normally distributed.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of Jarque-Bera test is less than significance level of 0.01. Otherwise, do not reject H_0.

Probability value = 0.016784

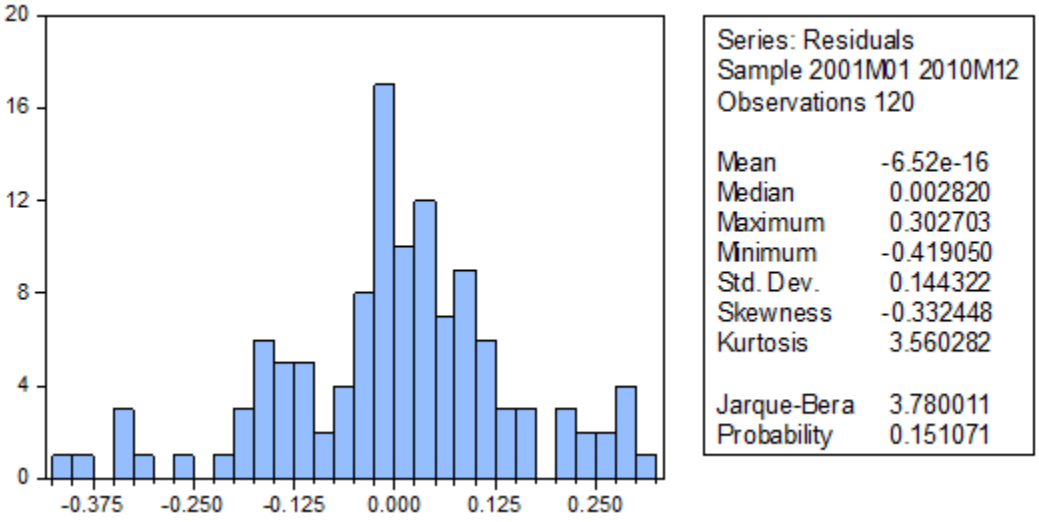
Decision: Do not reject H_0 since the probability value is 0.016784 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that the error terms are not normally distributed at significance level of 0.01.

From the Jarque-Bera Test, conclude that the error terms in the model are normally distributed at significance level of 0.01 since do not reject the H_0, meaning that the error terms are normally distributed.

4.3.4.3 Inflation

Figure 4.3: Result of the JB test for MODEL 3



Based on the result in Figure 4.3, diagnostic checking for normality was carried out.

H_0: Error terms are normally distributed.

H_1 : Error terms are not normally distributed.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of Jarque-Bera test is less than significance level of 0.01. Otherwise, do not reject H_0.

Probability value = 0.151071

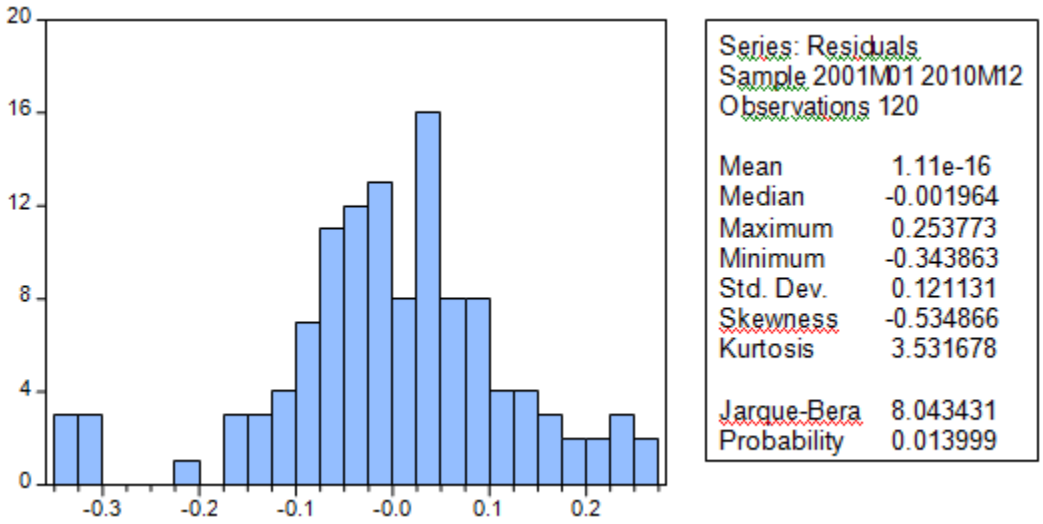
Decision: Do not reject H_0 since the probability value is 0.151071 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that the error terms are not normally distributed at significance level of 0.01.

From the Jarque-Bera Test, conclude that the error terms in the model are normally distributed at significance level of 0.01 since do not reject the H_0, meaning that the error terms are normally distributed.

4.3.4.4 Money Supply

Figure 4.4: Result of the JB test for MODEL 4



Based on the result in Figure 4.4, diagnostic checking for normality was carried out.

H_0: Error terms are normally distributed.
H_1 : Error terms are not normally distributed.

Significance level, $\alpha = 0.01$

Decision rule: Reject H_0 if the probability value of Jarque-Bera test is less than significance level of 0.01. Otherwise, do not reject H_0.

Probability value = 0.013999

Decision: Do not reject H_0 since the probability value is 0.013999 which is greater than the significance level of 0.01.

Conclusion: There is not enough evidence to conclude that the error terms are not normally distributed at significance level of 0.01.

From the Jarque-Bera Test, conclude that the error terms in the model are normally distributed at significance level of 0.01 since do not reject the H_0, meaning that the error terms are normally distributed.

4.4 Inferential Analysis

4.4.1 Unit Root Test

Augmented Dickey Fuller (ADF) and Philip-Perron (PP) test are using to test the stationary of time series data. The lag length for the ADF Unit Root Test is based on Schwarz Information Criterion (SIC) for all variables. The bandwidth for the PP Unit Root Test is based on the Newey-West estimator for all variables.

In the Unit Root Test, there are two important model which are model with trend and model without trend. These two models are to capture the trend effect on time series data. Based on the table of level 4.17 and 4.19, it shows the insignificant of all variables in 10% significant level. Thus, all of the variables in this level form are non-stationary.

First difference test will be carrying out after the test of level. Based on the table of first difference 4.18 and 4.20, all of the variables are significant at 1%, 5% and 10% significant level. Therefore, all of the variables in the first difference form are dynamic stationary.

Table 4.17: Result of Unit Root Test (Augmented Dickey-Fuller -Level)

Level	without trend	with trend
Kuala Lumpur Composite Index	-0.333151(0)	-2.206580(0)
Consumer Price Index	-0.021409(1)	-2.895154(1)
Interest Rate	-2.181818(0)	-2.175213(0)
Money Supply	0.417154(0)	-2.051839(0)
Exchange Rate	-1.303205(0)	-1.125182(0)

Note: *, **, *** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels. Number in parentheses is the number of lags. Lag lengths for the ADF unit root are based on Schwarz information criterion. The bandwidth for the PP unit root is based on the Newey-West estimator using the Default (Barlett kernel).
The unit root tests include a constant and a linear time trend. The null hypothesis under ADF and PP tests are the presence of a unit root.

Table 4.18: Result of Unit Root Test (Augmented Dickey-Fuller -first difference)

First difference	model with trend	model without trend
Kuala Lumpur Composite Index	-8.708740(0) ***	-8.719033(0) ***
Consumer Price Index	-7.807412(0) ***	-7.814506(0) ***
Interest Rate	-13.17655(0) ***	-13.23323(0) ***
Money Supply	-8.807729(0) ***	-8.832792(0) ***
Exchange Rate	-9.324540(0) ***	-9.270480(0) ***

Note: *, **, *** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels. Number in parentheses is the number of lags. Lag lengths for the ADF unit root are based on Schwarz information criterion. The bandwidth for the PP unit root is based on the Newey-West estimator using the Default (Barlett kernel).

The unit root tests include a constant and a linear time trend. The null hypothesis under ADF and PP tests are the presence of a unit root.

Table 4.19: Result of Unit Root Test (Phillips-perron -Level)

Level	intercept	trend and intercept
Kuala Lumpur Composite index	-0.636581(4)	-2.749463(5)
Consumer Price Index	0.084440(2)	-2.630514(3)
Interest Rate	-2.125488(3)	-2.118363(3)
Money Supply	0.251039(4)	-2.217461(4)
Exchange Rate	-1.481920(4)	-1.291556(4)

Note: *, **, *** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels. Number in parentheses is the number of lags. Lag lengths for the ADF unit root are based on Schwarz information criterion. The bandwidth for the PP unit root is based on the Newey-West estimator using the Default (Barlett kernel).
The unit root tests include a constant and a linear time trend. The null hypothesis under ADF and PP tests are the presence of a unit root.

Table 4.20: Result of Unit Root Test (Phillips-perron -First Difference)

First difference	model with trend	model without trend
Kuala Lumpur Composite Index	-8.6891769)2 ***	-8.707736(1) ***
Consumer Price Index	-7.807412(0) ***	-7.814506(0) ***
Interest Rate	-13.04805(3) ***	-13.101389(3) ***
Money Supply	-8.770230(1) ***	-8.794286(1) ***
Exchange Rate	-9.289193(2) ***	-9.223155(3) ***

Note: *, **, *** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels. Number in parentheses is the number of lags. Lag lengths for the ADF unit root are based on Schwarz information criterion. The bandwidth for the PP unit root is based on the Newey-West estimator using the Default (Barlett kernel).

The unit root tests include a constant and a linear time trend. The null hypothesis under ADF and PP tests are the presence of a unit root.

4.4.2 Vector Error Correction Method (VECM)

Table 4.21 Vector Error Correction Method

	α	β	AIC
Consumer Price Index	5.271706	-1.737279***	-11.41038
Interest Rate	4.260435	-1.043144***	10.21640
Money Supply	1.739167	0.644951***	-9.362655
Exchange Rate	4.892856	1.502903*	-8.929346

Note: *, **, *** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels.

Based on the result in table 4.21, the Vector Error Correction Method (VECM) result is statistically significant and the stock market movement is statistically shown. A negative relationship has shown between stock market and consumer price index. When 1% of consumer price index increases, stock market will decrease 173.72%. This result is consistent with the previous research done by Fama and Schwert (1977).

There is a negative relationship between stock market and interest rate. An increase in interest rate by 1%, it will bring down stock market by 104.31%. This result is consistent with the past research done by Kadir, Selamat, Masuga and Taudi (2011), Adam and George (2008), Ozbay (2009).

A positive relationship has shown between stock market and money supply. When 1% increases in money supply, stock market will raise 64.49%. This result is constant with the previous research done by Hoseeini, Ahmad & Lai (2011), Fazel and Alatiqi (2008), Brahmasrene and Jiranyakul (2007).

There is a positive relationship between stock market and exchange rate. When 1% increase in exchange rate, it will bring up stock market by 150.29%. This result is consistent with the previous research which done by Kandir (2008), Ahmad, Rehman and Raoof (2010), and Anlas (2012).

4.5 Conclusion

In this chapter, the results obtained from the E-views 6 software are presented in table and figure forms, and analyzed to meet the research questions and hypotheses. There are four OLS regression models with each independent variable. From the hypothesis testing, it proves that interest rate and inflation rate are negatively related to the stock market volatility. On the other hand, exchange rate and money supply are positively related to the stock market volatility. Based on the E-views results, it shows that the models are free from autocorrelation and heteroscedasticity problems. In addition, the models are correctly specified and fulfil the assumption of normality. Besides, the inferential analysis states that all of the variables are non stationary in level form but dynamic stationary in the first difference form. Thus, Vector Error Correction Model (VECM) was carried out to test the relationship between the dependent variable and independent variables. The results are consistent with the hypothesis testing. It shows that interest rate and inflation rate have negative relationship with stock market while exchange rate and money supply have positive relationship with stock market.

CHAPTER 5: DISCUSSION, IMPLICATION AND CONCLUSION

5.0 Introduction

This chapter provides the summary of entire diagnostic checking, hypothesis checking and inferential analysis in the previous chapter and discussed major finding to authorize the research objective and hypotheses. It will all about the four independent variables that are interest rate, exchange rate, inflation rate and money supply towards the dependent variable which is stock market volatility. Besides, this chapter aims to discuss the review and discussion of the results of the data analysis. It will highlight a discussion on major findings, implication of the study, limitation of research and also recommendation for future study.

5.1 Discussion on major finding

5.1.1 Diagnostic Checking

In this research, the diagnostic checking is aims to examine the four individual independent variables (interest rate, exchange rate, inflation rate, money supply) and its relationship with dependent variables (stock market volatility). The diagnostic checking are included autocorrelation, heteroscedasticity, model specification and normality test.

5.1.1.1 Autocorrelation

Autocorrelation problem exists when there is relationship between error terms in the model. In the aspect of interest rate (table 4.5), there is no autocorrelation problem in the model due to the probability value of interest rate is 0.0248 which is greater than the significance level of 0.01.

On the other hand, in the aspect of exchange rate (table 4.6), there is no autoccorelation problem in the model because the probability value of exchange rate is 0.0129 which is greater than the significance level of 0.01.

According to the table 4.7, the inflation rate is free from autocorrelation problem which have the probability value of 0.0438. There is not enough evidence to conclude that there is autocorrelation problem in the model due to the probability value is greater than the significance level of 0.01.

According to the table 4.8, the money supply is free from autocorrelation problem which have the probability value of 0.0321. There is not enough evidence to conclude that there is autocorrelation problem in the model due to the probability value is greater than the significance level of 0.01.

5.1.1.2 Heteroscedasticity

Heteroscedasticity problem exists when the variances of error terms are not constant. Based on the results in chapter four, four of the independent variables do not have heteroscedasticity problem.

By referring to the table 4.9, there is no heteroscedasticity problem in the model of interest rate due to the probability value of interest rate is 0.0351 which is greater than the significance level of 0.01.

Form the result of the table 4.10, there is no heteroscedasticity problem in the model of exchange rate because the probability value of exchange rate is 0.0190 which is greater than the significance level of 0.01.

According to the table 4.11, the inflation rate is free from heteroscedasticity problem which have the probability value of 0.0321. There is not enough evidence to conclude that there is heteroscedasticity problem in the model due to the probability value is greater than the significance level of 0.01.

Lastly, in the aspect of money supply (table 4.12), there is no heteroscedasticity problem in the model because the probability value of money supply is 0.0753 which is greater than the significance level of 0.01.

5.1.1.3 Model Specification

Model specification test aims to use to analyze the model is correctly specified and free from the specification errors. From the test conducted in previous chapter, all of the models were correctly specified due to the high probability value of each independent variable.

In the aspect of interest rate (table 4.13), the output of Ramsey Reset test shows that the model is correctly specified due to the probability value of interest rate is 0.0209 which is greater than the significant level of 0.01.

According to the table 4.14, the exchange rate model is correctly specified which have the probability value of 0.0321. There is not enough evidence to conclude that the model is not correctly specified due to the probability value is greater than the significance level of 0.01.

By referring to the table 4.15, the result of the Ramsey Reset test shows that the inflation rate model is correctly specified due to the probability value of inflation is 0.0829 which is greater than the significant value of 0.01.

Last but not least, result for the money supply (table 4.16) shows that the model is correctly specified due to the probability value of money supply is 0.0754 which is greater than the significant value of 0.01

5.1.1.4 Normality Test

Normality test aims to analyze the error term is normally distributed and free from the specification errors. From the previous chapter, the study has achieved the consistency result which is do not reject the null hypothesis since the probability value is higher than significance level of 0.01.

According to the figure 4.1, the error terms of interest rate are normally distributed due to the result of the probability value is 0.044971. There is not enough evidence to conclude that the error terms of the model are not normally distributed at significance level of 0.01.

On the other hand, in the aspect of exchange rate (figure 4.2), the error terms of the exchange rate are normally distributed because the probability value of exchange rate is 0.016784 which is greater than the significance level of 0.01.

As similar to the previous independent variable, the error terms of the inflation rate are normally distributed due to the probability value is 0.151071 which greater than the significant value of 0.01. This is proved by referring to the figure 4.3.

Lastly, the result given in figure 4.4 has examined the error terms of money supply are normally distributed with the probability value 0.013999. Since the probability value of money supply is higher than the significant value 0.01, therefore do not reject the null hypothesis which can concluded that the error terms are normally distributed.

5.1.2 Hypothesis testing

5.1.2.1 Interest Rate

From the result obtained in Chapter four (Table 4.1), there is a negative relationship where the coefficient value is -0.183619 between the interest rate and the stock market volatility. A negative relationship was achieved and this was supported by a literature review done by Rosylin and M.Shabri (2007). In the literature, it stated that as most of the investors seek to maximize their profit so they are more sensitive towards the fluctuations of the interest rates. A negative relationship which emphasize on a higher interest rate will increase the motivation of the depositors to save more money. Not only that, from a researcher's point of view, Ozbay (2009) whose result was consistent to the previous researchers where reduce in interest rate is to contribute the profitability of a firm by decreasing the cost of capital which will lead to increase in the stock returns. In addition, by referring to the Table 4.1, the probability (t-statistic) value is 0.0024 which is smaller than significance level 0.01, hence there is significant relationship between interest rate and stock market volatility.

5.1.2.2 Exchange Rate

From the result of the study, there is a positive relationship between the exchange rate and the stock market volatility. Based on the result in Chapter four (Table 4.2), the coefficient value is 0.719777 which is consistent to the literature review based in Chapter two for example Maysami, Howe and Hamzah (2004). The researches had concluded

that by applying VECM, the results will be consistent and has a significant relationship whereby a stronger domestic currency will have lower imported raw material which indirectly allow the local firm to be more competitive. Besides, an increase in the exchange rate, it will decrease the business cost and lead to higher stock return and vice versa. This was supported by Ahmad, Rehman and Raoof (2010). Therefore, from the research done by previous researchers, exchange rate is playing an important criterion in affecting the stock market volatility and a positive relationship is observed in this study. Additionally, by referring to the same table (Table 4.2), the probability t-statistic value that was tested is 0.0015 which is smaller than significance level 0.01. Therefore, the independent variable- exchange rate has a significant relationship with stock market volatility.

5.1.2.3 Inflation

A negative effect was identified in the previous chapter which is Chapter Four (Table 4.3). Coefficient value of -3.111955 is carried out. It has been investigated that to test the relationship between the inflation and stock market volatility, ARCH and GARCH model is used. From the research done by Khan, Khan, Rukh (2012), increasing of inflation will perform a negative movement in the stock market. A growing inflation is considered a bad news to the investors because it shows bad economic conditions and they will feel insecure about their investment. On the other hand, if there is a decreasing in the interest rate, it gives and attracts investors to invest more in the stock market. Therefore, result of negative effect is consistent to the results which tested by various researchers. Besides, from Table 4.3, the probability t-statistic value 0.0000 which is smaller than significance level 0.01.

From the significance point of view, the independent variable-inflation rate is concluded to have a significance relationship with stock market volatility.

5.1.2.4 Money Supply

From the result of this study, a significant relationship between money supply and stock market volatility has obtained. Not only that, a positive impact has achieved as shown in the previous chapter (Table 4.4), the coefficient value is 0.632039. This result was consistent to the research done by Brahmasrene and Jiranyakul (2007) whereby a positive impact is discovered by using the cointegration test and granger causality could reflect a positive relationship. A positively impact is said to be positive money supply would have to increase the money market equilibrium and thus affect the stock market volatility. In addition, researcher Maskay (2007) has emphasized that change in money supply matter more than unanticipated changes in money supply in determining the stock prices. In addition, by looking in the same table (Table 4.4), the result in the probability t-statistic value is 0.0000 which is smaller than significance level 0.01. It is concluded that there is significance relationship between money supply and stock market volatility. Therefore, money supply plays an important role in determining the stock market volatility.

5.1.3 Inferential Analysis

Based on Vector Error Correction Model (VECM) result, it is statistically significant and the independent variables of consumer price index and interest

rate have long run negative relationship to the stock market volatility. While the independent variables of money supply and exchange rate has long run positive relationship to the stock market volatility.

A negative relationship is shown between stock market and consumer price index and when 1 % increases in consumer price index, it will bring down stock market 173.72%. This result is similar to the study of Fama and Schwert (1977) who found that stock returns are negatively related to both expected and unexpected inflation which measure in consumer price index.

The result show there is a negative relationship between stock market and interest rate. 1% increase of interest rate will decrease stock market by 104.31%. The result is consistent with the past research Ozbay (2009) who found that there a negative relationship with real long-term interest rate and stock market movement in Ghana by using VECM model.

Besides, VECM also show positive relationship between stock market and money supply. 1% increase of money supply will bring up stock market by 64.49%. This result is similar to the study of Brahmasrene and Jiranyakul (2007) who found that the money supply has a positive impact on the stock market index by using the Johansen cointegration test which is based in Thailand.

Based on the VECM result, a positive relationship occurs between stock market and exchange rate. 1% increase of exchange rate will increase stock market by 150.29%. This result is consistent with the study of Maysami, Howe and Hamzah (2004) who found the exchange rate and Singapore stock market has a positive relationship by applying Johansen's (1990) VECM.

5.2 Policy Implication

Based on the findings of this study, it showed that interest rate, exchange rate, inflation rate and money supply have significant relationships to the stock market volatility. It stated that interest rate and inflation rate are negatively related to stock market volatility. However, exchange rate and money supply are positively related to stock market volatility.

These macroeconomic variables volatility has significant implication on the stock market. The increases in interest rate and inflation rate reduce the stock market return. Whilst, the exchange rate appreciation and the increase in money supply raise the stock market return. In order to better control the stock market volatility, government should increase their participation in the market. Government may participate in the stock market via implementing monetary policy.

By implementing monetary policy, it influences the economic growth, inflation, exchange rate and unemployment. There are expansionary monetary policy and contractionary monetary policy. To increase the stock prices, government may employ expansionary monetary policy. This will reduce the interest rate and increase the size of money supply in the market. However, it will lead to the increase in inflation rate and decrease in exchange rate. Thus, government should be aware of the inflation rate and exchange rate movements. Coupled with this, government may have to implement contractionary monetary policy when the inflation rate is above the optimal level whereas the exchange rate is below the optimal level. Contractionary monetary policy will increase the interest rate and decrease the money supply in the market.

Monetary policy is effective in managing the macroeconomic variables. Government should implement the policy in an effective way so that can achieve the

maximum stock return in the market. Besides, government can also manage the level of reserve requirement to meet the achievement.

5.3 Limitation of Study

There are limited information sources and database can be searched through this topic. Due to limited budget, journals and articles that require payment cannot be access. There are only few local and foreign researches conducted the researches that are applicable to the researches. Therefore, this paper is lack of secondary information. Most of the journals and articles that refer are based on stock market in foreign countries. Thus, the findings of some journals and articles may not applicable to stock market in Malaysia.

At first, Value-at-Risk (VAR) method is planned to examine the relationship between dependent variable and independent variables. After running the unit root test, the result shown by the test proved that VAR method is not suitable and do not meet the research objectives. Therefore, VECM model is used to indicate the relationship between the independent variables and dependent variable. It is much more significant and meaningful to the research.

Besides, the research's is based on monthly data. The stock price index is defined as index between last index of the previous month and the last index of the next month. It is better to use weekly data as stock return is very high frequency data. Weekly data can show more clearly how the stock index fluctuates against the independent variables. Weekly data are unable to find in Datastream, so monthly data have been recorded.

5.4 Recommendation

In order to examine the stock market volatility, this research has included four determinants as our independent variables which are interest rate, exchange rate, inflation and money supply. According to Brahmasrene and Jiranyakul (2007), the model should be estimated with additional or alternative economic and financial factors. Studies have proved that various regions should be conducted when more data are available. With the more data available, it will improve the understanding of the research topic and constantly emerge some of the financial markets responses. Wagner (2012) has examined that industry and sector factors are also one of the factors that cause to influence the stock market volatility. For example, in the oil sector, the climate is one of the important factors whereby if a major weather storm in the producing area, this will cause the prices of the oil to jump up. As a result, the price of oil-related stocks will follow thereafter. In a nutshell, the increase of the volatility will affect the market prices as well as the individual stocks.

In this research, the authors have employed the VECM model to define the relationship between the dependent variable and independent variable. This is because VECM model can estimate the result and will give a much more significant and meaningful to the research. According to Foss, Myrtveit and Stensrud (2001), however, employment of multiple methods to test the model in a research is always preferred than having only one model. Therefore, this paper suggestion for further research is to employ more than one method in their research to improve the accuracy of the results. Alberga, Shalita and Yosefb (2008) have proved that by employing EGARCH models, it will improve the overall estimation for measuring the conditional variance. This is because EGARCH model might be more useful than other methods when implementing the risk management strategies for the stock index returns. Thus, it is reasonable to apply more than one method to improve the validity of the model specification and make the result to be more reasonable and secure.

5.5 Conclusion

The research has examined the relationship between macroeconomic variables volatility and stock market volatility in Malaysia. The macroeconomic variables are interest rate, exchange rate, inflation and money supply. This research was performed in two steps. Firstly involve conducting hypothesis testing of each variable. Secondly, involve estimating the short run volatility for each variable using the VECM Model.

The results of the hypothesis testing produced the following results which is all match and consistent with the literature review of other researchers. First, there are negative relationship between stock market volatility and interest rate. Second, exchange rate has a positive relationship with the stock market volatility. Third, results suggest that there are also negative relationships between stock market volatility and inflation rate. Lastly, for money supply, the relationship with the stock market volatility is positive.

By using VECM Model, the result shown is consistent with the hypothesis testing and literature review of past researchers. A negative relationship is shown between inflation rate and the stock market volatility. Besides, interest rate also shows a negative relationship with the stock market volatility. However, exchange rate and stock market volatility have a positive relationship. There is also a positive relationship occur between money supply and stock market volatility.

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