THE IMPACT OF MACROECONOMIC FACTORS ON THE EMERGING STOCK MARKETS PERFORMANCE: EVIDENCE FROM SELECTED COUNTRIES

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ABSTRACT

The purpose of the study is to explore the relationship between macroeconomic factors (Interest rate, Exchange rate, Inflation, GDP and Money supply) and the emerging stock market through the evidence of selected 13 emerging stock markets over the past 20 years period from 1997 to 2016. The yearly data is collected from Thomson Data Stream. Through a series of regression analysis and diagnostic tests, the fixed effect model with robust standard error is found to be the most appropriate. The findings show that interest rate, exchange rate and money supply have significant relationship with the emerging stock markets. The increase of interest rate will inversely affect the change of stock market indices. The exchange rate and money supply move in the same direction with the emerging stock market indices. Meanwhile, consumer price index (CPI) and GDP have no significant relationship with the emerging stock market indices.

Key words: macroeconomic factors, interest rate, exchange rate, inflation, GDP, money supply, emerging stock market

ABSTRAK

Tujuan kajian ini ialah untuk meneroka hubungan antara faktor makroekonomi (kadar faedah, kadar tukaran, inflasi, KDNK dan penawaran wang) dan pasaran saham menimbul melalui bukti 13 pasaran saham menimbul yang dipilih bagi tempoh 20 tahun antara 1997 hingga 2016. Data tahunan diperolehi daripada pengkalan data Thomson Data Stream. Melalui beberapa siri analisis regresi dan ujian diagnostik, *fixed effect model with robust standard error* adalah merupakan model yang paling sesuai. Dapatan menunjukkan kadar faedah, kadar tukaran dan penawaran wang mempunyai hubungan yang signifikan dengan pasaran saham menimbul. Peningkatan dalam kadar faedah akan mempengaruhi secara songsang perubahan dalam indeks pasaran saham. Kadar tukaran dan penawaran wang berubah secara langsung dengan pasaran saham menimbul. Sementara itu, indeks harga pengguna (CPI) dan KDNK tidak mempunyai hubungan yang signifikan dengan pasaran saham menimbul.

Kata kunci: faktor makroekonomi, kadar faedah, kadar tukaran, inflasi, KDNK, penawaran wang, pasaran saham menimbul

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

As the significant part of the financial market, the stock market not only functions as a capital medium for financing and resource allocation, but also functions as a "barometer" of economic development (Zhao, 2011). Stock market has always been regarded as a "microcosm" of macroeconomic conditions in various countries, therefore, it is extremely significant (Li, 2015). The stock market is an important place for financing and investment, it can promote the transformation of business operation mechanism and optimize the allocation of resources (Zhao & Xue, 2004). Stock is a kind of valuable securities, which is issued by the joint-stock companies to the capital contributors either in public or private when they raise capital. It can represent the investor's capital stock and power, which can enjoy the rights and interests according to the number of shares held by the holders.

Stock first appeared in capitalist countries. With the expansion of business scale and the lack of capital demand, enterprises need a way to get a lot of money, resulting in the emergence of joint-stock companies (Bai & Sun, 2013). The Eastern Indian Company was the earliest joint-stock company in the world, which was born in the Netherlands in 1602, and the Amsterdam Stock Exchange became the first stock market in the world. With the birth and development of joint-stock companies, the way to raise capital has

also been developed in the form of shares. Meanwhile, there had also been the demand for shares to be traded and sold. Consequently, it led to the emergence and formation of the stock market and contributed to the improvement of the stock market. It can be divided into issuance market and circulation market, therefore, the market price of stock is also divided into issuance price and circulation price. The price of a stock in the circulation market, the price at which the stock is traded in the market, is the indicator in the measurement of the stock market's development (Zhao, 2011).

Stock market index is a kind of indicator for reference made by the stock exchange or financial service institution to show the change of the stock market. It is an important basis for studying the changes in the stock market. At present, people generally think that macroeconomy affect the change of stock price (Liu, 2006). The past thirty years, scholars conducted corresponding empirical analysis. Broadly speaking, macroeconomic variables are the external factors affecting the stock market. Many previous studies identify that the change of macroeconomic factors would lead to corresponding changes in stock prices (Sudhakaran, 2016).

This study intends to examine the factors which affect the performance of emerging stock markets. Consequently, this study focuses on selected emerging countries as sample countries. Emerging markets are chosen because emerging markets are markets where the market economy system has gradually improved, the speed of economic development is high, and the potential of market development is large (Pan, 2007). In

2009, Morgan Stanley Emerging Markets Index listed 21 countries as the emerging markets (Lu, 2013). Nevertheless, this study focuses on 13 emerging markets which are China, Malaysia, Indonesia, Brazil, Mexico, Peru, Philippines, South Africa, South Korea, Czech Republic, Hungary, Colombia, Poland, because of the limited data.

1.2 An overview of the stock markets

Emerging stock markets' characteristic are as follow: (1) Immature, high growth, high returns. The low stock prices in emerging markets provide the possibility of high returns. (2) The benefits of decentralized investment. The emergence of emerging markets has broadened the range of options available, which has made it possible for portfolios to operate in a globalized and decentralized manner. (3) Anti-economy cycle characteristics. Since the fiscal and monetary policies adopted by emerging market countries are very different from those of developed countries, the economic and corporate profits of emerging market countries have a low correlation with the stock indexes of developed countries, and some are even negatively correlated. (4) The market size is generally small, for example, the market value of the entire Philippine stock market is less than the market value of Du Pond Company in the United States. (5) The investors of emerging market are generally immature. For example, in Brazil, investors conflate good companies with good stocks, regardless of price factors. From the above characteristics, the emerging stock market is still immature, which also have the characteristics of the benefits of decentralized investment, anti-economic cycle, market size is generally small, the investors of emerging market are generally immature.

The related research is illustrated by selected 13 emerging stock markets, which are China, Malaysia, Indonesia, Brazil, Mexico, Peru, Philippines, South Africa, South Korea, Czech Republic, Hungary, Colombia, Poland. The indicators of the selected countries are Shanghai Composite Index, Bovespa Index, IDX Composite Index, FTSE Bursa Malaysia KLCI Index, Mexico IPC Index, S&P/BVL Peru General Index, PSE Composite Index, FTSE/JSE Africa Index, KOSPI Index, PX-50 Index, Budapest Stock Exchange Index, COLCAP Index and Warsaw Stock Exchange General Index.

The abbreviation of Shanghai Composite Index is the SSE Composite Index. Its constituents are all the stocks listed on SSE, reflecting prices' changes listed stocks on the SSE. It officially released on 1991 July 15.

The FTSE Bursa Malaysia KLCI Index, the abbreviation is the FBM KLCI Index, it includes 30 largest companies on Bursa Malaysia. The IDX Composite (formerly: JSX Composite) is an index of all stocks listed on the IDX. This benchmark stock index is divided in nine sectoral indices.

The Bovespa Index best known as Ibovespa is the Benchmark index of about 60 stocks that are traded on the B3. Mexico IPC is designed to provide a broad, representative, yet easily replicable index covering the Mexican equities market. The constituents are weighted by modified market cap subject to diversification requirements.

The S&P/BVL Peru General Index is a modified market cap-weighted index that is designed to serve as the broad benchmark for the Peruvian stock market, which tracks the performance of the largest and most frequently traded stocks on the Lima Exchange. It is re-balanced annually in September for updates to the composition, shares outstanding, investable weight factors and constituent weights.

The PSE Composite Index includes 30 representative stocks. The FTSE/JSE Africa Index is the result of an exciting joint venture between JSE Limited and the FTSE Group. The live FTSE/JSE Indices data is provided through a live feed via the live Information Dissemination system InfoWiz.

The KOSPI includes 200 largest companies on the Korean Exchange. The PX index is the official index of the Prague Stock Exchange. The first calculation of the PX index took place on March 20, 2006, when it became the successor to the PX 50 and PX-D indices. The PX index has replaced the historical value of the earlier PX 50 index and has been continuously established.

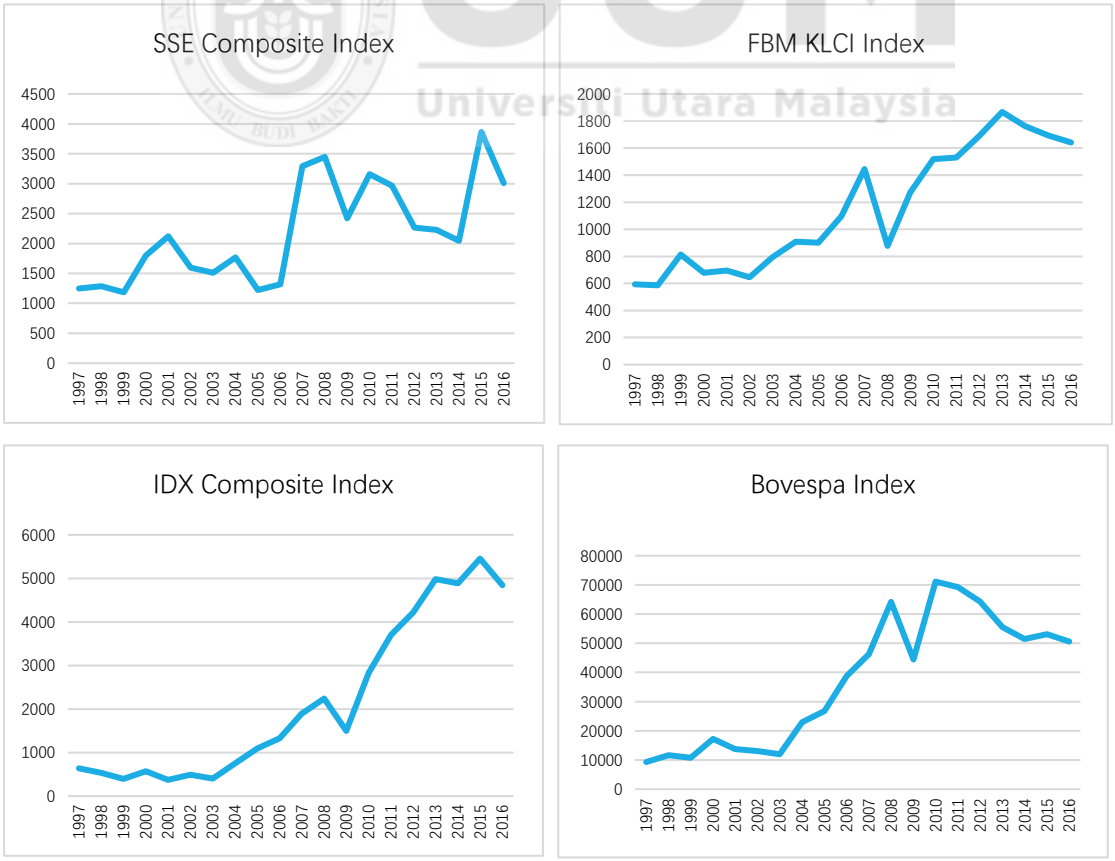
The Budapest Stock Exchange Index is a major stock market index which tracks the performance large, actively traded shares listed on the Budapest stock in Hungary. It is a free floating, capitalization-weighted, total return index. The Budapest Stock Exchange Index has a base value of 1000 as of January 2, 1991.

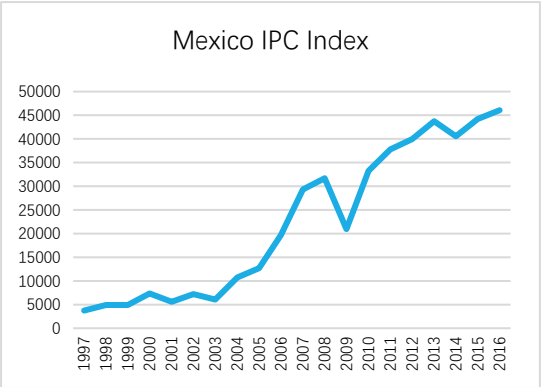
The COLCAP Index is a major stock market index which tracks the performance of the 20 most liquid stocks traded in the Colombia Stock Exchange. The adjusted Market Capitalization for each company listed on the COLCAP is reviewed periodically to determine its inclusion in the index.

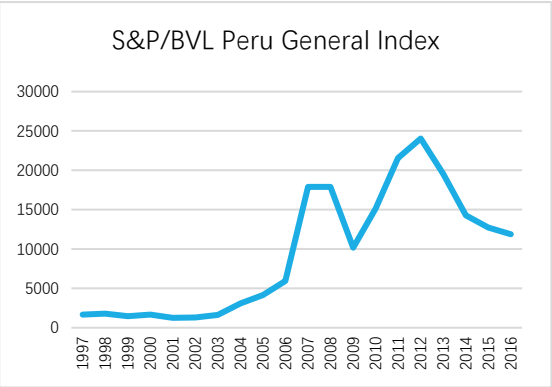
The Warsaw Stock Exchange Composite Index (WIG) is the main stock market index for all domestic companies (except investment funds) that track the listing on the main markets of the Warsaw Stock Exchange.

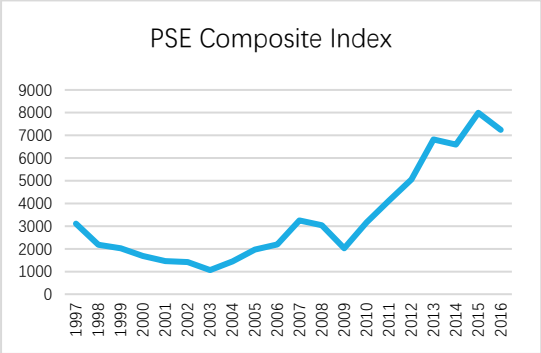
Figure 1.1

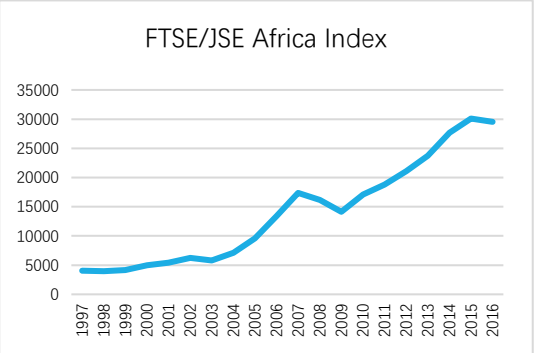
The Performance of the Emerging Stock Market Indices

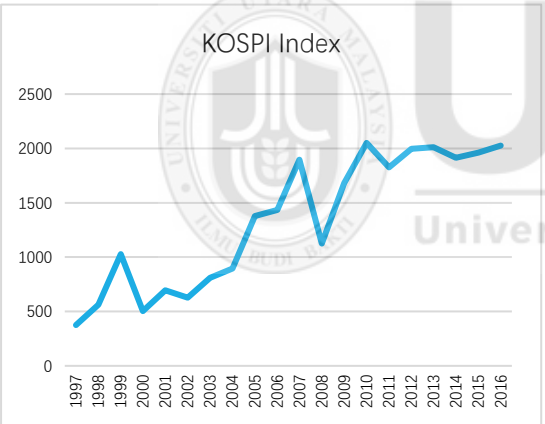


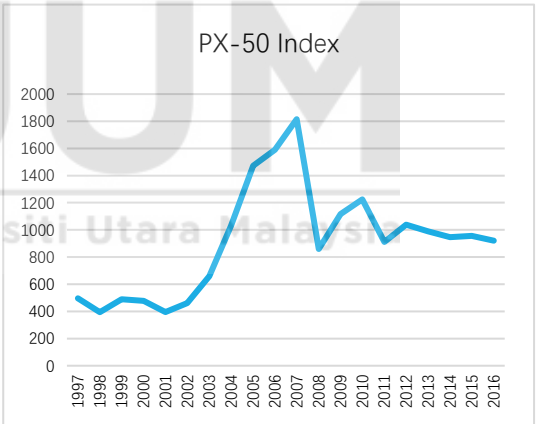


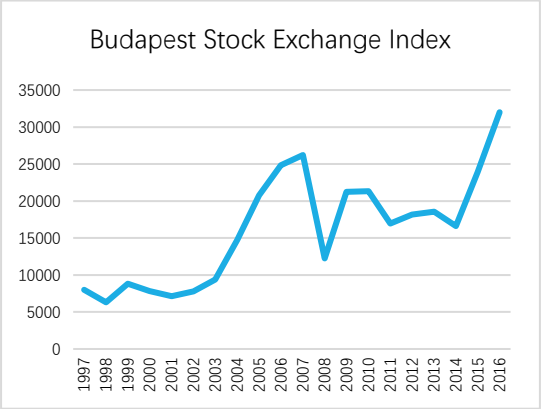


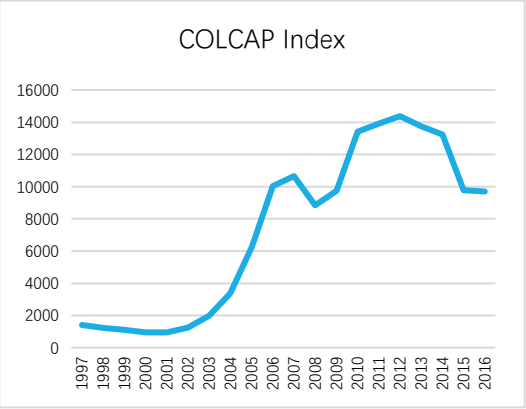


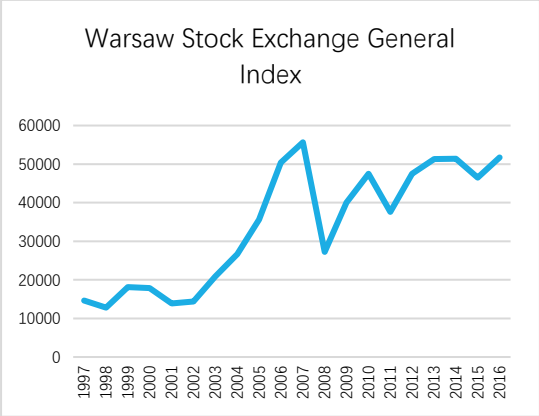












Different countries have various socio-economic backgrounds. Social and economic environment of a country's stock market has its own characteristics. Therefore, the stock market volatility in different markets has different characteristics (Bai & Sun, 2013). For example, historically, a variety of political events, which included both domestic and foreign, affected the volatility of the Malaysian stock market at a certain extent (Mitchell & Joseph, 2010). Consequently, we can identify that there are differences among the trends of change. According to Figure1.1, there has been a general upward trend and the corresponding huge volatility over the years for the stock market indices of the emerging countries. Meanwhile, the sharp decline occurred from 2007 to 2009, which were caused by the global financial crisis.

1.3 Problem statement

According to Figure 1.1, the fluctuations of the selected 13 emerging stock market indices have their own characteristics, but they also have similarities. In general, the stock prices had plummeted because of global financial crisis during the period from 2007 to 2009. Empirical studies believe financial crisis has bad impact on the prices of

stock. Fynn (2012) highlights that the stock markets undergone huge fluctuations and the overall trend declined after outbreak of the financial crisis. With acquisition of Merrill Lynch and bankruptcy of Lehman Brothers, the financial market in the United States has suffered an unprecedented economic crisis, which has brought disasters to the financial markets of various countries around the world. Since the outbreak of the global financial crisis, there have been unprecedented major sell-offs in the global stock market, especially for some large stock-market companies, and the decline was extremely serious (Li, 2009).

There are many literatures about the relationship between stock market and macroeconomy by using quantitative methods. However, due to different data, methods and starting points, the relevant studies have drawn different conclusions. Some scholars think it is no significant correlation between macroeconomy and stock market. The macroeconomy has no obvious impact on the stock market, that is, stock market does not accurately reflect the macroeconomic changes (Han and Wu, 2003; Sun and Deng, 2009; Xiao, 2012). Shiller (1980) argues that the US stock market is irrelevant with macroeconomic factors. Nevertheless, some other scholars identify that stock market is greatly influenced by some variables of the macroeconomy, and the changes of the macroeconomy is basically reflected from the stock market. Kyereboah (2008) suggests that the macroeconomy can affect the volatility of stock market, such as exchange rates, interest rates and inflation, as these factors can directly affect the state of the company in this country. Hosseini et al (2011) choose China and India as

comparative research subjects, they identify that there are four macroeconomic variables in the two countries which are correlated with the stock market. We can identify that the macroeconomy has the controversial impact on the stock market from the above related studies.

Empirical studies identify influence of interest rate of macroeconomic factors on the stock market is the most direct and most influential. Basistha and Kurov (2008) found that the stock price has also the corresponding response when there was a big difference for the real interest rates and the target interest rates under recession and monetary tightening. Rapach (2005) shows that interest rates are the most important macroeconomic indicator of stock price changes through the study of the response of stock returns in different countries. The corresponding profits of savings increase when interest rates rise, which will result in a decline in stock demand and the decline of stock prices. Nonetheless, in medium and long term, relationship between interest rates rise and share prices is not a simple negative correlation, due to stock price is not only affected by interest rates, namely cannot be determined by a single factor, which would be affected by a combination of many factors (Zhao, 2011). For instance, Chinese interest rate did not rise in 2001, however, the stock index has begun to decline. Consequently, it is meaningful to study interest rate and the performance of stock markets' relationship.

As trend of world economic integration gradually increases, the influence of financial

markets is deepened in various countries, including the stock market. Fluctuations of the one country's exchange rate will also affect the prices of their securities. Consequently, its share price will rise. If its currency devaluates, its share price would drop accordingly (Barakat et al, 2016). However, if the exchange rate rises blindly, it will also adversely affect the stock market because the exchange rate is too high will affect the export of trade, exports blocked, which is not conducive to economic development, and thus the securities market will be affected (Zhao, 2011). As a result, it is necessary to explore the relationship between exchange rate and volatility of stock market.

Empirical study suggests that the effect of inflation on stock price is very complicated because its role in the national economy is multi-layered. For Chinese stock market, if inflation can be controlled within an appropriate range, it will have a positive correlation with the fluctuation of the stock price. However, when the situation becomes extremely serious, stock price volatility shows negative correlation. According to the Fisher effect, there stock prices and inflation rate move in the same direction. However, Pereira (2010) reached the conclusion that there was a negative correlation about inflation and stock price, through monthly study of 1986-2007 on 15 emerging market countries. In addition, some scholars suggest that stock prices and inflation are not relevant (Shiller, 1980; Campbell, 1990). It can be seen from the above literature that the scholars have different conclusions.

The level of economic development is measured by GDP. Theoretically, GDP's growth means that the overall economy continues to grow, the profits of listed companies rise, dividends have also increased, business conditions are improved and reduce the corresponding risk of investment, which will send investors a positive signal, thus promoting the stock price index rise. In general, the indicators that measure economic performance include various macroeconomic factors (Pal and Mittal, 2011). Bhargava (2001) argues that stock prices generally move in the same direction as GDP under the condition of a balanced stock market and no serious distortion of its economic functions, because when the GDP increases, the stock prices also rise and when the GDP decreases, the stock price also will fall. Nevertheless, Yang (2002) thinks that the significant factors which influence the stock market are the money supply, deposit and loan, and savings, while there is no statistically significant causal relationship between GDP, industrial added value, import and export, consumer price index and other variables. In summary, there should be more investigation on the relationship between GDP and volatility of stock market, due to the different conclusions.

From the economic point of view, when the money supply is sufficient, which will increase stock price. On the contrary, the stock price will drop. Hassan (2012) uses ARDL to prove that there are four macroeconomic variables such as trade surplus, foreign exchange reserve, which have a significant impact on the stock market in Jordan. Friedman (1988) suggests that the impact of money supply on stock prices is positive through the analysis of expected effect, portfolio effect and stock intrinsic value growth

effect. However, Habibullah et al. (1996) shows that stock prices in Malaysia cannot be predicted using predictors of output and the money supply. Hence, results are inconclusive.

1.4 Research questions

It is extremely meaningful to explore the factors which affect the performance of the emerging stock markets. Based on the problem statement, the research questions of the study are as follows:

i. Is there a significant relationship between interest rate and the performance of the emerging stock markets?

ii. Is there a significant relationship between exchange rate and the performance of the emerging stock markets?

iii. Is there a significant relationship between inflation and the performance of the emerging stock markets?

iv. Is there a significant relationship between Gross Domestic Product(GDP) and the performance of the emerging stock markets?

v. Is there a significant relationship between money supply and the performance of the emerging stock markets?

1.5 Research objectives

Based on the problem statement and the corresponding research questions, the research objectives are as follows:

i. To explore the relationship between interest rate and the performance of emerging stock markets.

ii. To explore the relationship between exchange rate and the performance of emerging stock markets.

iii. To explore the relationship between inflation and the performance of emerging stock markets.

iv. To explore the relationship between GDP and the performance of emerging stock markets.

v. To explore the relationship between money supply and the performance of emerging stock markets.

1.6 Significance of the study

The volatility of stock price is the normal feature of the stock market, the appropriate volatility of stock price helps to increase market activity and increase market liquidity. Nevertheless, frequent and violent fluctuations will distort the pricing mechanism, resulting in the loss of stock market efficiency and hindering the market from optimizing the allocation of resources. The stock market is a “thumbnail” of macroeconomic development of a country. The changes of relevant macroeconomy is bound to have an important impact on the securities market. Meanwhile, due to the emerging markets are not immature, and there are various problems among them. Consequently, it is of great theoretical and practical significance to explore the macroeconomic factors which affect the fluctuation of emerging stock markets.

Through the study of the effect of macroeconomy on the volatility of the stock market, which can provide a reference for the relevant policymakers to revitalize the stock market and stimulate investment among investors. For investors, they can make rational investment based on the state of relevant macroeconomic factors. The research in this paper also supplements the research on the macroeconomic factors that affect the the stock market performance, which provide reference for the latter researchers and enrich the literature.

1.7 Scope of the study

This study analyzes the impact of macroeconomic factors on the performance of the emerging stock markets, using a panel data analysis. Selected 13 emerging countries are China, Malaysia, Indonesia, Brazil, Peru, Philippines, Mexico, South Africa, South Korea, Czech Republic, Hungary, Colombia, Poland. The indicator of the stock market of the selected countries are Shanghai Composite Index, Bovespa Index, IDX Composite Index, FTSE Bursa Malaysia KLCI Index, Mexico IPC Index, S&P/BVL Peru General Index, PSE Composite Index, FTSE/JSE Africa Index, KOSPI Index, PX-50 Index, Budapest Stock Exchange Index, COLCAP Index and Warsaw Stock Exchange General Index. The period of study is from 1997 to 2016.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Scholars have done a lot of research and have the different conclusion, due to the different methods and data. This chapter is mainly the review of the related literature, which include the related theory and the relationship between macroeconomic factors and volatility of stock market.

2.2 Theoretical literature

The relevant theoretical model has important implications for explaining the influence of macroeconomy on the stock markets performance. Granger (1981) proposed the theory of cointegration analysis to provide another method about macroeconomic variables and stock markets' correlation. FAMA (1990) used a multi-factor model to verify the significant impact of money supply and inflation in the United States on stock returns, pointing out that the stock market is affected by money supply and inflation by affecting actual economic growth. Kuttner (2004) uses the VAR method to explore the impact of unexpected monetary policy on the stock market. This section mainly introduces the APT.

2.2.1 Arbitrage Pricing Theory (APT)

It is generally believed that macroeconomic variables are important factors affecting

changes in stock prices. In recent years, scholars not only theoretically studied the impact of these variables on stock prices, but also conducted corresponding empirical analysis. APT was founded by Ross in 1976. The theory is expressed as follows:

$$\text{Expected return} = r_f + b_1 rp_1 + b_2 rp_2 + \cdots + b_n rp_n \qquad (2.1)$$

Where,

r_f= the risk-free interest rates

b = the sensitivity of the asset to the certain factor

rp = the risk premium associated with the certain factor

According to the equation, we can identify that if the stock and interest rate have a sensitive relationship, the corresponding sensitivity will have an impact on the stock's return. Chen and Ross (1986) built a VAR model under the framework of APT, who concluded that the economic variables affect the discount rate and the future dividend payout ability, so that the economic variables have a systematic impact on the stock market returns.

2.3 Empirical Literature

There are lots of factors affect the volatility of the stock market, which include internal and external factors (Sharif, Purohit & Pillai, 2015). The volatility of stock market is the indicator for macroeconomic volatility, vice versa (Liljeblom and Stenius,1997). Some related studies have shown related conclusion, such as Chen (1986), Fama (1990)

and other scholars' research results. Levine and Zervos (1998) find that macroeconomic factors fluctuations have the impact on stock markets through the research of 47 developing and developed countries. The article mainly discusses the macroeconomic factors that affect the volatility of the stock market. Nakagawa and Osawa (2000) choose the United States, the United Kingdom and Japan as their sample countries, and prove that the macroeconomic indicators of the three countries are the main causes of the stock market fluctuations. In addition, Wongbangpo and Sharma (2002) identify that the impact of macroeconomic factors on the direction and size of on the stock index are not the same, but they do not deny that the macroeconomic variables are the reason for the change of the stock index through studying the long-term and short-term correlations between the macroeconomic variables and stock indices, which take the data of the five ASEAN countries.

Nevertheless, some other scholars hold the different viewpoints. Wang and Xu (1995) think the macroeconomic situation is not the main factor affecting the volatility of stock price in China. Zhao and Zhang (2003) found that there was a weak correlation between the stock market volatility and macroeconomic volatility at the same period through using multiple regression and VAR models. Han and Wu (2003) made empirical research on the correlation between the Shanghai Composite Index and the macroeconomic indicators by using the multiple regression analysis with independent variables lag, they concluded that the Chinese stock market cannot reflect the macroeconomic changes. Ma Jin and Guan Wei (2006) analyze the relationship between

the stock market and the macroeconomy, they conclude that there is a certain long-term and stable relationship between the current stock market and the macroeconomy in China, however, the degree of mutual influence is relatively small.

2.3.1 Interest rate and stock price

Regarding relationship between interest rates and stock prices, the scholars have come to different conclusions. Bjørnland and Leitemo (2009) identify that stock prices and interest rate have the interdependent relationship. Goodfriend (2004) suggested that high inflation would raise inflation expectations of the public so that long-term interest rates would rise, while higher interest rates would reduce investors' future discount dividends and thus lower their share prices. Alam (2009) comes to the similar conclusion that there is a negatively significant relationship between interest rate and stock prices through the study of 15 developing and developed countries. Meanwhile, based on Pakistan's data analysis from 1991 to 2008, Sohail and Zakir (2010) identify that the changes in interest rates and stock prices may move in the opposite direction. There is a positive correlation between stock prices and industrial production, meanwhile, there is a negative correlation between interest rates and industrial production in US (Humpe and Macmillan, 2009).

Nonetheless, Mohi-U-Din and Mubasher (2013) find that the changes in interest rates have a positive effect on stock prices in India through OLS regression analysis. In the United States, the short-term interest rates and stock prices are positively correlated,

that is, the higher the short-term interest rate, the higher the stock price (Li, 2002). Based on the study of Greece from 1989 to 2003, the semblable result are drawn that the changes of interest rates and stock prices move in the same direction (Dritsaki, 2005). Bemanke and Kuttner (2005) used mathematical and metrological methods to quantitatively study the reaction of American stock markets to changes in interest rates. The study found that the hypothetical unforeseen fall of 0.25 basis point in the federal funds rate would result in a 1% rise in the main stock price index. The market reacted quite strongly to the unexpected changes in the federal funds rate, and the reaction of the securities market was weak for changes in the federal funds rate as predicted by investors.

2.3.2 Exchange rate and stock price

Among the macroeconomic factors, just the exchange rate and interest rate have the causality with the volatility of stock market price (Oluseyi, 2015). The exchange rate has two-way impact on the Jakarta Composite Index in Indonesia and the Composite Index is related to some Southeast Asian stock market indexes (Purnomo and Rider, 2012). However, Buyuksalvarci and Abdioglu (2010) identify that the changes of stock prices have a one-way relationship with exchange rates in Turkey through Granger non-causality test. Tsoukalas (2003) uses the method of VAR and suggests that Cypriot stock market is influenced importantly by the exchange rate through the investigation of 14-year data from 1975 to 1998. Mukherjee and Naka (1995) identify that stock prices were positively correlated with exchange rate in Japan. Solnic (1987) finds that

exchange rate and stock market move in the same direction based on the 10-year data of US. There is a positive relationship between exchange rate and the volatility of stock market in Argentina based on the study of stock market index in 1998 (Hsing, Budden & Phillips,2012). Pal and Mittal (2011) identify that the Indian stock market and exchange rate have the same direction of change through the investigation during 1995 to 2008.

Talla (2013) identify that stock prices can be affected by exchange rate and inflation, they have the change in the opposite direction. Nieh and Lee (2002) identify that there is no long-term significant relationship between changes in exchange rates and stock prices based on the research of G7 countries from 1993 to 1996. Morley and Pentecost (2000) draw the conclusion that the changes of the exchange rate may have no effect on the movement of stock price in G7 countries based on the data from 1982 to 1994. The analogical result is found that stock price and exchange rate change in the opposite direction through the BRICS' study from 1997 to 2014 (Vanita and Khushboo,2015). Yusof and AbdulMajid (2007) identify that the exchange rate is negatively related to the movement of price in the Malaysian stock market, according to the period of 1992 to 2000. Nonetheless, Pan, Fok and Liu (2007) suggest that there is a causal relationship between exchange rate and stock prices' changes in the six countries, excluding Malaysia, through the study of seven Asian countries.

2.3.3 Inflation rate and stock price

Fisher (1930) put forward the “Fisher effect” hypothesis, that is, the nominal return rate on assets equals the expected inflation rate plus the real return rate on assets, and the nominal return rate on assets and the inflation rate are synchronized. According to the Fisher effect, the relationship between stock prices and inflation rate is positive. Many scholars have conducted an empirical study of the “Fisher effect” hypothesis, which can be roughly divided into four different conclusions: There is a negative correlation between stock prices and inflation, positive correlation, irrelevance and uncertainty.

Most studies support the conclusion that stock prices are negatively correlated with inflation. Fama (1970) studies the relationship between stock price and inflation rate, who found that the stock price was negatively correlated with the expected inflation rate and the unexpected inflation rate. Chinese scholars also studied the relationship between stock price and inflation rate in China, for instance, Liu and Wang (2004), and Xiao (2012). Most scholars argue that the stock price is negatively correlated with the inflation rate in China. US stock returns and inflation were negatively correlated based on post-war data in US (Bodie, 1976; Nelson, 1976; Fama and Schwert, 1977).

The inflation rate and lending rates from banks have an adverse influence on stock market performance, based on the influence of macroeconomic variables on the Ghana Stock Exchange (GSE) (Kyereboah-Coleman and Agyire-Tettey, 2008). Balduzzi (1995) identifies that there is a negative correlation between inflation and stock return through

using covariance analysis to estimate the relationship between inflation and stock returns. Brandt and Wang (2003) explain the relationship between inflation and stock price from the perspective of the inflation risk premium. They believe that the risk premium depends on the size of the risk and the risk aversion of investors. As inflation rises, the risk of economy increases or investors become more averse to take the risk, risk premiums and discount rates will be raised, which result in lower share prices, higher stock returns, and lower stock market valuations. The related studies believe that there is no direct causal relationship between stock prices and inflation rate because inflation affects the real economy and the real economy has a correlation with the stock price. Therefore, the inflation rate will be negatively correlated with the stock price (Marshall, 1992; Balduzzi, 1995).

There are also some studies that support Fisher's conclusion that their research shows that the stock price is positively correlated with the inflation rate in some countries, especially in countries with high inflation (Firth,1979; Gultekin,1983). Still other scholars suggest that the stock price has nothing to do with inflation or uncertainty. Rapach (2005) used the approach that whether there is the long term and neutral relationship among economic variables, the study identifies that there is no negative correlation between stock prices and inflation over the long run in 16 industrialized countries. Hess and Lee (1999) argue that the relationship between stock prices and unexpected inflation is uncertain. DeFina (1991) shows that the change between the stock price and the inflation rate may be not same. Balduzzi (1995) tested the

representative variable hypothesis of Fama by using vector autoregressive, implicit moving average methods, and used covariance analysis to measure the relationship between the inflation rate and the stock return rate. He identifies that the dynamic interaction between the inflation rate and the stock return can be explained by the inflation rate itself for the most part, and the negative correlation between the stock return rate and the inflation rate can be mostly explained by the interest rate.

On the basis of the above conclusions, the related study suggests the unanticipated changes in CPI and PPI have the negative relationship with the share price (Fama and Schwert ,1979; Schwert, 1981). Chen, Roll and Ross (1986) studied the relationship of these time series under the framework of asset pricing theory and reached the same conclusion. However, McQueen (1993) think there is no significant relationship between CPI and stock prices. Flannery (2002) also shows that it is not correlated between PPI and CPI and stock prices. The interest rate factor can explain inflation, that is, inflation makes a negative reaction to the real interest rate change (Lee, 1992).

Liu and Wang (2004) find that when inflation rises, the nominal rate of return of stock market can't make the corresponding adjustment based entirely on changes in inflation through Chinese study. Ma and Guan (2006) identify that the relationship between the inflation rate and the actual rate of return of stock depends on the state of the stock market. When the stock market is in a period of significant expansion or contraction, the expected and periodic components of inflation have opposite directions to the stock

return. Meanwhile, this means that the Fisher Hypothesis and the Agency Hypothesis are established at different stages of the stock market. Han (2008) argues that if inflation is driven by supply shocks, then inflation is negatively correlated with stock market returns and positively correlated with stock market returns under the condition of demand shocks. The positive and negative correlations of the same period depend on the relative importance of supply and demand shocks. Geetha (2011) makes a conclusion that the moves of inflation and stock price are the same in China with the use of VECM, however, there is no the corresponding relationship for US and Malaysia. Tripathi and Kumar (2014) find that it is positively correlated for inflation and the volatility of stock price in India and China based on the period of 2001 to 2013. However, they find the relationship is opposite for Brazil and Russia.

It can be seen that the scholars have different opinions on the research results regard with stock prices and inflation. To explain this, scholars in different countries arrive at different results. For example, the explanation of the paradox of the relationship between the stock price and the inflation rate shows that there are three representative hypothesis theories: the agency effect (Fama,1981), the inflation hypotheses (Modigliani and Cohn, 1979) and the risk premium hypothesis (Tobin, 1958).

2.3.4 GDP and stock price

Fama (1990) and Mukherjee (1995) find that there is a long-time equilibrium between the price of securities and the growth rates of GNP, long-term and short-term interest

rates, and inflation rates. Atje and Jovanovic (1993) use different models to separately study the economic growth effects and horizontal effects of the stock markets in 40 countries. The results show that there is a clear correlation between the economic growth of the sample countries and the development of the stock market. Harris (1997) emphasizes that increased liquidity in the stock market helped to reduce transaction costs and risk, nonetheless, it also increases the level of secondary activity in the asset, attracting investors' new capital to the purchase of existing assets rather than promoting new capital formation, which turns into the great obstacles of economic growth. Albaity (2011) finds that the growth of GDP and inflation have the crucial impact on Malaysian Islamic stock market. Levine (1998) highlights that the development of stock markets is better in countries which have the higher GDP per capita than the lower ones by studying the situation outside the United States. Sudhakaran and Balasubramanian (2016) identify that there are lots of examples of short-term and long-term stock returns that can be predicted from basic macroeconomic variables, for instance, money supply and Gross Domestic Product (GDP). Khan (2014) identifies that macroeconomic factors' volatility has the impact on KSE-100 index, which include GDP growth rate, interest rate, exchange rate, inflation.

However, Li (2002) shows that the development of Chinese stock market tends to be unfavorable to economic growth through the regression analysis between the stock market and GDP. Stock index cannot be affected by GDP by using multiple regression model (Luthra and Mahajan, 2014). The change of GDP has no significant relationship

with the volatility of stock prices, through the research of 25-year monthly data in Nigeria (Oluseyi, 2015). Liang and Teng (2005) found that there was no two-way effect for the the stock market' development and the Chinese economic growth, which meant that the stock market' development did not help economic growth. The fluctuation of GDP will cause the stock price to change in the opposite direction, based on the period study of 1980-2013 in Nigeria (Nkechukwu, Onyeagba and Okoh, 2013).

2.3.5 Money supply and stock price

Basistha and Kurov (2008) found that the stock price responded more in the case of recession and monetary tightening. Zhang and Gong (2009) show that monetary policy is very relevant to stock returns, and if the money supply enhance, the stock price will rise. Yi (2002) pointed out that monetary policy must pay attention to the stock market at the same time because the simultaneous changes in commodity prices and stock prices are more common, due to the expansion of short-term money. Li and Chen (2009) have shown that both the money supply and the one-year deposit rate have the positive impact on the stock index, while the reserve ratio has the negative impact on the stock index. Wang (2010) explores the asymmetric influence of currency shock on the stock price volatility with the smooth transition vector autoregressive model. Farka (2009) points out that the change of the return on the stock index is influenced by the types of monetary policy and the behavior of the policy through studying the effect of the monetary policy of Fed on the stock price with the GARCH model.

There is a long-term equilibrium relationship between stock market and macroeconomics in India, which include silver price, inflation, oil price, money supply and so on (Patel, 2012). In general, the measures of monetary policy have the critical impact on European and American stock index (Singh, Sedgh and Hussain, 2010). Monetary and fiscal policies have impact on the stock market through indirect and direct ways and play the critical roles in the development of stock market (Chatziantoniou et al. ,2013). Maysami et al. (2005) suggests that the macroeconomic variables have the significant relationship with selected stock indexes, which include interest rate, exchange rate, inflation, money supply, industrial production. The volatility of money supply will cause the stock price to change in the same direction, they have the positive correlation, based on the period study of 1980-2013 in Nigeria (Nkechukwu,Onyeagba and Okoh, 2013). Homa and Jaffee (1971) identify that stock market can be influenced by money supply systematically based on the 15-year data in America. For the volatility of the stock prices, the money supply plays the role of predictive function through the analysis of 19-year data in US (Brunie, Hamburger and Kochin, 1972). However, D'Amico and Farka (2003) identify that there is the negative relationship between monetary policy and stock returns.

2.4 Summary

In general, although the relevant studies have explored the impact of macroeconomic variables on the stock markets, the results are inconclusive. Meanwhile, emerging stock markets are still immature. Therefore, further study is needed to explore the impact of

macroeconomic variables on emerging stock markets.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter mainly introduces the research methodology used by the study. Panel data analysis is used, namely pooled OLS regression models, fixed effects models and random effects models. In addition, sample and data, theoretical framework, variables and research hypothesis are also covered.

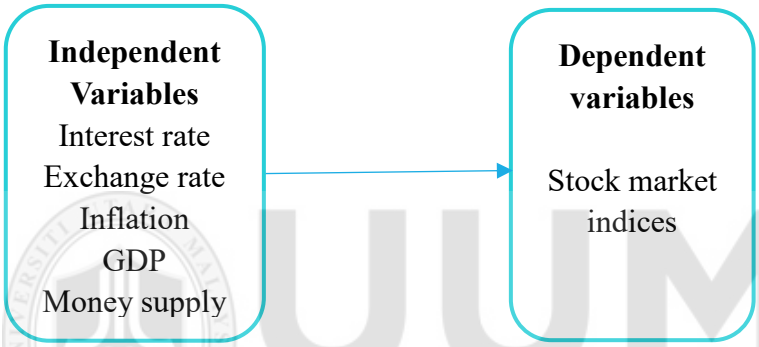
3.2 Sample and Data

The intent of the study is to check macroeconomic factors (Interest rate, Exchange rate, Inflation rate, GDP and Money supply) and stock market's relationship through the evidence of the selected 13 emerging stock markets over the past 20-year period from 1997 to 2016. The data is composed of interest rate, inflation, exchange rate, GDP, money supply and stock market index, which is yearly. The interest rate is based on the one-year fixed deposit interest rate, the inflation rate is replaced by the consumer price index (CPI, 2010=100), the exchange rate adopts the currency of each country against U.S. dollar respectively, the constant 2010 USD is used for the GDP, M2 is used as the money supply, that is, broad money supply. Regarding the stock market index, Shanghai Composite Index, Bovespa Index, IDX Composite Index, FTSE Bursa Malaysia KLCI Index, Mexico IPC Index, S&P/BVL Peru General Index, PSE Composite Index, FTSE/JSE Africa Index, KOSPI Index, PX-50 Index, Budapest Stock Exchange Index,

COLCAP Index and Warsaw Stock Exchange General Index represents the China, Malaysia, Indonesia, Brazil, Mexico, Peru, Philippines, South Africa, South Korea, Czech Republic, Hungary, Colombia, Poland stock market respectively.

3.3 Theoretical Framework

Figure 3.1 lists the relevant independent variables and dependent variables:



3.1 Theoretical Framework

3.3.1 Dependent Variable

The stock index of the selected 13 emerging stock markets are taken as the dependent variable, which is the indicator of the performance of the emerging stock markets. The yearly data is collected from the Thomson Data Stream.

3.3.2 Independent Variables

In this study, interest rate, inflation, exchange rate, GDP and money supply are as the independent variables. The yearly data are obtained from Thomson Data Stream.

3.4 Research Hypothesis

In order to solve the research questions, the research hypothesis is put forward based on the problem statement and related literature.

1. H0: There is no significant relationship between interest rate and the emerging stock market indices.

   H1: There is a significant relationship between interest rate and the emerging stock market indices.

2. H0: There is no significant relationship between inflation and the emerging stock market indices.

   H1: There is a significant relationship between inflation and the emerging stock market indices.

3. H0: There is no significant relationship between exchange rate and the emerging stock market indices.

   H1: There is a significant relationship between exchange rate and the emerging stock market indices.

4. H0: There is no significant relationship between GDP and the emerging stock market indices.

   H1: There is a significant relationship between GDP and the emerging stock market indices.

5. H0: There is no significant relationship between money supply and the emerging stock market indices.

   H1: There is a significant relationship between money supply and the emerging stock

market indices.

3.5 Model

The relationship between independent variables and dependent variables in many economic phenomena in multiple linear regression models is often not linear, so the study attempts to use the existing data as a basis to establish a regression model for the stock market index and each factor. Taking the logarithm of the index, GDP and money supply to make the result smoother, and combining various factors, establish a model:

$$\mathrm{LNINDEX_{it}} = \alpha + \beta_1 \mathrm{INR_{it}} + \beta_2 \mathrm{EXR_{it}} + \beta_3 \mathrm{INFR_{it}} + \beta_4 \mathrm{LNGDP_{it}} + \beta_5 \mathrm{LNMS_{it}} + \mathrm{u_{it}} \quad (3.1)$$

Where,

$\mathrm{LNINDEX}_{it}$= Stock market index in country i at period t.

INR_{it} = Interest rate in country i at period t.

EXR_{it} = Exchange rate in country i at period t.

INFR_{it} = Inflation rate in country i at period t.

LNGDP_{it}= GDP in country i at period t.

LNMS_{it}= Money supply in country i at period t.

u_{it} = Error term

β =Regression coefficient

3.6 Methods of Estimation

In this section, three methods for panel data analysis are discussed, that are, pooled OLS regression model, fixed effect models, and random effect models. The formula for the panel data model is expressed as follows：

$$Y_{it} \equiv \alpha + \beta_1 X_{it} + \varepsilon_{it}, \ \ i=1, 2, 3\ldots, N; \ \ t=1, 2, 3\ldots, T. \qquad (3.2)$$

Where,

Y represents the dependent variable.

X represents the independent variable.

i represents ith cross-sectional unit.

t represents tth period.

α represents the constant variable.

β represents the regression coefficients.

ε_{it} represents the random error term: E (ε_{it}) ~ N (0, δ^2).

From the above formula, we can see that the formula is mainly evaluated though constant variable, the product of corresponding coefficient and variable, and the standard error terms. Pooled OLS regression model, fixed effect model and random effect model will be discussed separately below.

3.6.1 Pooled OLS Regression Model

The pooled OLS regression model is descripted through general OLS regression. The formula for the model is expressed as follows:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + u_{it},\ i=1, 2\ldots13;\ t=1,2\ldots n. \qquad (3.3)$$

Where

Y represents the dependent variable.

X represents the independent variable.

i represents ith cross-sectional unit.

t represents tth period.

α represents the constant variable.

β represents the regression coefficients.

u represents the random disturbance term.

The model essentially postulates that the slope and intercept are the same across the time and units. Nonetheless, the assumption may be restrictive. Consequently, the model neglects the cross section and time series nature of data, which may result in heterogeneity or individuality bias. Based on the research of this study, the pooled OLS for this model can be expressed as follows:

$$LNINDEX_{it} = \alpha + \beta_1 INR_{it} + \beta_2 EXR_{it} + \beta_3 INFR_{it} + \beta_4 LNGDP_{it} + \beta_5 LNMS_{it} + u_{it}$$

（3.4）

3.6.2 Random Effect Model

If some of the coefficients in the model are random and others are fixed, they are generally called pooled OLS models. With the continuous updating of methodologies and the understanding of heterogeneity, methodologists have begun to question the FEM of the "ideal" state for understanding and analyzing the internal structure of evidence. Subsequently, REM was gradually used and replaced part of the FEM. Random effects have the function of shrinkage and can reduce the degree of freedom (df) of the model. The equation of the random effect model can be expressed as follows:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \omega_i \qquad (3.5)$$

Where,

$$\omega_i = u_{it} + \varepsilon_{it} \qquad (3.6)$$

The error term of the random effects model is represented by ω_i, and which comprises of u_{it} and ε_{it}. u_{it} is regarding with error component which integrates cross-sectional and time series. Meanwhile, ε_{it} signifies the individual-specific error term. According to the scope of this study, the equation for this model can be expressed as follows:

$$LNINDEX_{it} = \alpha + \beta_1 INR_{it} + \beta_2 EXR_{it} + \beta_3 INFR_{it} + \beta_4 LNGDP_{it} + \beta_5 LNMS_{it} + \omega_i$$

(3.7)

3.6.3 Fixed Effect Model

Fixed effects model, namely the fixed effect regression model, abbreviated FEM, is a panel data analysis method. As early as 1976, the first meta-analysis used FEM to merge data. Based on its statistical simplicity and cognition of heterogeneity, FEM was widely used. Until 2006, there were still three quarters of meta-analysis articles in use. The fixed-effect model has n different intercepts, one of which corresponds to one individual. A series of binary variables can be used to represent these intercepts. The equation of the fixed effect model can be expressed as follows:

$$Y_{it} \equiv \alpha_i + \beta_2 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \cdots + u_{it},\ i=1, 2\ldots, N;\ t=1, 2\ldots, T. \quad (3.8)$$

In the equation, i on interception term identify that cross-sections' interception may be different. Based on the scope of this study, the equation for this model can be expressed as follows:

$$\mathrm{LNINDEX}_{it} = \alpha_i + \beta_1 \mathrm{INR}_{it} + \beta_2 \mathrm{EXR}_{it} + \beta_3 \mathrm{INFR}_{it} + \beta_4 \mathrm{LNGDP}_{it} + \beta_5 \mathrm{LNMS}_{it} + u_{it} \quad (3.9)$$

3.7 Breusch and Pagan Lagrangian Multiplier Test

There are three models for the panel data analysis as mentioned earlier in the chapter, namely pooled OLS regression model, fixed effect model and random effect model. In order to identify which model is appropriate, the related test need to be done. In this

section, Breusch and Pagan LM is used to explore whether pooled OLS regression model or random effect model is more appropriate. According to the result, we can focus on Prob>chi2, if the result is below 0.05, it means the null hypothesis should be rejected, random effect model is appropriate. Meanwhile, if the result is above 0.05, it means the null hypothesis cannot be rejected, the pooled OLS regression model is more appropriate.

3.8 Hausman Test

Hausman test is applied to determine which model is more appropriate either the fixed effect model or the random effect model. Based on the result, we can focus on Prob>chi2, if the result is below 0.05, it means null hypothesis should be rejected, fixed effect model is appropriate. Meanwhile, if the result is above 0.05, it means null hypothesis cannot be rejected, the random effect model is more appropriate.

3.9 Fixed Effect Model with Robust Standard Error

If there are the issue of heteroskedasticity and serial correlation, the fixed effect model with robust standard error can solve the problem. The heteroscedasticity is relative to the homoscedasticity. The so-called homoscedasticity is to ensure that the regression parameter estimator has good statistical properties. An important assumption of the classical linear regression model is that the random error terms in the global regression function satisfy homoskedasticity, that is, they all have the same variance. If this assumption is not satisfied, that is, random error terms have different variances, the

linear regression model is said to have heteroskedasticity. The problem of heteroskedasticity exists which can result in the bias of standard error. Autocorrelation in econometrics mainly refers to the correlation between the disturbances of different observations in the regression model. Autocorrelation problems are usually related to time series data, so autocorrelation is also called serial correlation. According to the proof process of Gauss-Markov's theory, it can be seen that the OLS estimation has the least variance only under the conditions of homoscedasticity and non-autocorrelation. When the model has autocorrelation, the OLS estimation is still an unbiased estimate, but it is no longer valid. This is the same as when heteroscedasticity is present, indicating that there are other parameter estimation methods with an estimation error smaller than that of the OLS estimation.

3.10 Diagnostic Test

To determine the validity and reliability of the model, diagnostic test is further conducted. The diagnostic test is used to check the existence of multicollinearity, heteroskedasticity and serial correlation. If there exists a strong relationship between any two independent variables, the problem of multicollinearity arises. Multicollinearity problem increases the standard error, which will make the significant variable insignificant. Because of the increase in standard error, the t-value will be smaller. Abdullah (2016) suggests that there is no problem of multicollinearity where the value of variance inflating factor (VIF) is below 10. Breusch-Pagan / Cook-Weisberg test is applied to determine whether heteroskedasticity exists. Based on the

result, we can focus on Prob>chi2, if the result is below 0.05, it means the null hypothesis should be rejected, heteroskedasticity exists. Meanwhile, if the result is above 0.05, it means the null hypothesis cannot be rejected, homoskedasticity exists. Wooldridge test is used to detect serial correlation in the panel data. The null hypothesis is no first-order autocorrelation. Regarding with Prob>chi2, if the result is below 0.05, it means null hypothesis should be rejected, serial correlation exists. Meanwhile, if the result is above 0.05, it means the null hypothesis cannot be rejected, there is no serial correlation.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.1 Introduction

This chapter is mainly about the analysis and discussion of the results. As mentioned in the previous section, panel data analysis is applied to explore the relationship between macroeconomic variables and the emerging stock markets, which include pooled OLS, fixed effect model and random effect model. The corresponding findings and discussion are as below.

4.2 Descriptive Statistic

Descriptive statistics is used to describe or summarize the basic condition of observations. It summarizes the entire data, including the 20-year data of selected thirteen countries, which is from 1997 to 2016.

Table 4.1

Descriptive Statistic

Variable	Mean	SD	Min	Max	Obs
LNINDEX	8.455929	1.434204	5.920648	11.17235	260
INR	0.0668927	0.0568022	0.0037	0.3258	260
EXR	0.142931	0.1656406	0.000076	0.94554	260
CPI	88.11306	21.95883	22.2392	150.4782	260
LNGDP	26.78496	1.084253	25.13384	29.88276	260
LNMS	14.2759	3.380537	8.239408	22.3337	260

Table 4.1 presents the descriptive statistics for all the dependent and independent

variables studied in this paper, which includes logarithm of index, interest rate, exchange rate, CPI, logarithm of GDP, logarithm of money supply. Based on the table, it can be seen that the mean value of ln index is 8.455929, its maximum and minimum values are 11.17235 and 5.920648 respectively. The mean value is an indicator which reflects an indicator of the central trend of the data. As a result, the central trend of the logarithm of the index is 8.455929. For the interest rate, the values of mean value, minimum and maximum are 0.0668927, 0.0037 and 0.3258 respectively. The central trend of 1-year deposit interest rate is 0.0668927. Regarding with the value of minimum and maximum, we can identify that there is a big gap between them, the maximum value is approximately 90 times the minimum value.

About the exchange rate, the values of mean value, minimum and maximum are 0.142931, 0.000076 and 0.94554 respectively. We can find that the mean value is not high, and there is a very wide distance between the values of minimum and maximum, because there are several countries whose currencies have a low exchange rate against the U.S. dollar, such as Indonesia, Mexico, Philippines, South Korea, Czech Republic, Hungary and Colombia. The mean, minimum and maximum values of the consumer price index(CPI) are 88.11306, 22.2392 and 150.4782 respectively. There is a relatively big gap between the minimum and maximum values. Regarding with logarithm of GDP, the values of mean value, minimum and maximum are 26.78496, 25.13384 and 29.88276. The result indicates that the central trend of logarithm of GDP is 26.78496. About the logarithm of money supply, the values of mean value, minimum and

maximum are 14.2759, 8.239408 and 22.3337. This means that there are large differences in the money supply of the countries.

4.3 Correlation Matrices

The correlation coefficient is the statistical indicator originally designed by the statistician Carl Pearson and is the amount of linear correlation between research variables. The Pearson correlation test is used to explore the independent variables' relationship, the result is presented in the table as below.

Table 4.2

Correlation Matrices

	INR	EXR	CPI	LNGDP	LNMS
INR	1.0000				
EXR	0.2271	1.0000			
CPI	-0.5992	0.0117	1.0000		
LNGDP	-0.0140	0.1824	0.2155	1.0000	
LNMS	-0.0556	-0.3157	0.1408	0.3907	1.0000

The correlation matrices are not only used to measure the correlation between the variables, but also used to determine whether there are multiple collinearity problems. From this result, it can be seen that the correlation of the variables is relatively not high, the range is from -0.5992 to 0.3907. Ratner (2009) believes that the correlation coefficient is weak from -0.3 to 0.3, the correlation coefficient's absolute value is moderate from 0.3 to 0.7, and the correlation coefficient's absolute value is strong correlation from 0.7 to 1.0. Table 4.2 shows the correlation coefficient between the

variables, according to the result, we can find there is a moderate negative correlation between CPI and interest rate. Moderate negative correlation also exists between logarithm of money supply and exchange rate, it means more money supply will devalue the currencies of these countries against the U.S. dollar. Meanwhile, there is a moderate positive correlation between logarithm of GDP and logarithm of money supply. The finding is consistent with Zhu and Sun (2011). This indicates that the higher the GDP is, the greater the demand for money is, the money supply will be greater. Drury (2008) suggests that there is no multicollinearity problem when the correlation between two independent variables is less than 0.7. To further determine whether the multicollinearity exists, the variance inflating factor (VIF) test is done later.

Table 4.3

The correlation coefficient's absolute value

Between 0 and 0.3	Weak correlation
Between 0.3 and 0.7	Moderate correlation
Between 0.7 and 1.0	Strong correlation

Source: Ratner (2009)

4.4 Regression Analysis

Panel data analysis is used to explore the relationship between macroeconomic variables and emerging stock market indices. In this section, the analysis results of the models are presented in the form of table.

4.4.1 Pooled OLS

The pooled OLS estimation is presented in the Table 4.4. For panel data analysis, pooled OLS is the basic regression technique.

Table 4.4

Pooled OLS Model

	Coefficient	t-statistic	Prob
Constant	1.047113	0.57	0.571
INR	7.087645	4.37***	0.000
EXR	1.296913	2.62***	0.009
CPI	0.03563991	8.54***	0.000
LNGDP	0.2223233	2.94***	0.004
LNMS	-0.164328	-6.58***	0.000
Obs	260		
R-square	0.4005		

*Note: The significant level at 1% respectively is marked by ****

Table 4.4 shows that all independent variables (interest rate, exchange rate, CPI, GDP and money supply) have significant relationship with the dependent variable (stock market index) at confidence level of one percent. It can be seen that interest rate, exchange rate, CPI and GDP have positive significant relationship with stock market index. Meanwhile, money supply and stock market index move in the opposite direction. The R-square is 0.4005 which manifests that the independent variables jointly account for 40.05 percent variation of the emerging stock market indices.

4.4.2 Random Effect Model

Random effect model assumes that the individual unit' intercept is random. The analysis

result is described in the Table 4.5.

Table 4.5

Random Effect Model

	Coefficient	t-statistic	Prob
Constant	-3.330949	-0.82	0.413
INR	-2.807579	-3.44***	0.001
EXR	1.503684	3.12***	0.002
CPI	0.0193159	8.08***	0.000
LNGDP	0.3447484	1.94*	0.052
LNMS	0.0576988	0.73	0.464
Obs	260		
R-square	0.7394		

*Note: The significant level at 1% and 10% are marked by *** and *.*

Based on the results, we can identify there is a negatively significant relationship between interest rates and stock market index, it means the increase of interest rate will reduce the stock market index. Exchange rate, CPI and GDP have positively significant relationship with stock market index respectively. It means that the improvement of the three explanatory variables will affect the performance of the stock market index in the same direction. Money supply and stock market index have no significant relationship. The R^2 is 0.7394 which means the 73.94% of explainable variables can account for the stock market index.

4.4.3 Fixed Effect Model

Regarding the FEM, although the intercept may differ for the related countries, intercept does not change over time, which is time invariant. The result is summarized

in the Table 4.6

Table 4.6

Fixed Effect Model

	Coefficient	t-statistic	Prob
Constant	19.10709	3.27	0.001
INR	-2.253583	-3.00***	0.003
EXR	1.170525	2.57**	0.011
CPI	0.0035992	1.14	0.254
LNGDP	-.9835753	-3.38***	0.001
LNMS	1.075952	6.23***	0.000
Obs	260		
R-square	0.7732		

*Note: The significant level at 1% and 5% are marked by *** and **.*

Based on the findings, interest rate, exchange rate, GDP and money supply have significant relationship with stock market index. The interest rate and GDP have negative relationship with stock market index respectively. This means that the increase in interest rates and GDP will adversely affect the stock market index. There is no correlation between CPI and stock market index, this indicates that the change of CPI will not have an impact on the volatility of stock market index. Exchange rate and money supply move in same direction with stock market index, which the increase of exchange rate and money supply will enhance the stock market index.

4.4.4 Breusch and Pagan LM Test and Hausman Test

Breusch and Pagan lagrangian multiplier test is applied to determine which one is more appropriate, the pooled OLS regression model or REM. To choose the random effect

model or FEM, Hausman test is taken in the paper. The findings of the test are presented in Table 4.7.

Table 4.7

Breusch and Pagan LM Test and Hausman Test

	Prob>chi2
Breusch and Pagan LM Test	0.0000
Hausman Test	0.0000

About Breusch and Pagan LM Test, the prob>chi2 is below 0.01, which suggests the null hypothesis should not be accepted, the alternative hypothesis is appropriate, namely random effect model is appropriate for the study. Regarding with Hausman test, the prob>chi2 is also less than 0.01, which means fixed effect model is appropriate. Consequently, FEM is an appropriate model.

4.4.5 Diagnostic Test

In order to investigate whether exists the issues of multicollinearity, heteroskedasticity, and serial correlation, diagnostic test is applied in the section. The findings are integrated in Table 4.8.

Table 4.8

Diagnostic Test

	Range	Mean	Prob>chi2
Variance inflating factor (VIF)	1.38-1.74	1.54	
Heteroskedasticity			0.0755
Serial correlation			0.0002

The purpose of variance inflation factor (VIF) test is to check whether there is the issue of multicollinearity. Abdullah (2016) suggests that there is no problem of multicollinearity under the condition of the value of variance inflating factor (VIF) which is below 10. The range of the VIF value is from 1.38 to 1.74, the mean value is 1.54, which is less than 10, no multicollinearity issue exists in the study. In addition, Breusch-Pagan / Cook-Weisberg test is to check whether exists problem of heteroskedasticity or not. The result shows that the prob>chi2 is 0.0755, which is more than 0.05, it suggests that there is no heteroskedasticity problem. Lastly, Wooldridge test is used to investigate serial correlation or not among the variables. The prob>chi2 is below 0.01 which suggests that serial correlation exists in the model.

4.4.6 Fixed effect with Robust Standard Error

Through the previous analysis which compare with the pooled OLS and random effect model, the fixed effect model is appropriate. Nonetheless, there is the issue of serial correlation in the model. As a result, the fixed effect model with robust standard error is applied to achieve more reliable results. The corresponding results are shown in Table 4.9.

Table 4.9

Fixed Effect Model with Robust Standard Error

	Coefficient	t-statistic	Prob
Constant	19.10709	1.20	0.255
INR	-2.253583	-2.55**	0.025
EXR	1.170525	3.22***	0.007
CPI	0.0035992	0.44	0.667
LNGDP	-0.9835753	-1.23	0.243
LNMS	1.075952	2.22**	0.046
Obs	260		
R-square	0.7732		

*Note: The significant level at 1% and 5% are marked by *** and ** Respectively*

Overall, the findings show that interest rate, money supply and exchange rate have correlation with the stock market index, consumer price index (CPI) and GDP have no significant relationship with index of stock market. We can identify there is a negatively significant relationship between interest rates and stock market index, which indicates the stock market index will decrease 2.2536 percentage if the interest rate increase 1 units. The finding is consistent with Alam (2009), who identify that interest rates and stock prices have negative correlation through the study of 15 developing and developed countries. Some other scholars also hold the viewpoint that exchange rates move towards the opposite trend, such as Sohail and Zakir (2010), Humpe and Macmillan (2009), etc. Higher interest rates would reduce investors' future discount dividends and thus lower their share prices (Goodfriend, 2004). Zhao (2011) suggests that the corresponding profits of savings increase when interest rates rise, which will capital flow from the stock market to bank, resulting in stock demand's decline and the decline of stock prices.

There is a positively significant relationship between exchange rate and stock market index, which signifies that they move in the same direction and stock market index will enhance 1.1705 percentage if the exchange rate drops 1 unit. The result is similar with Solnic (1987), and Hsing, Budden and Phillips (2012). Pal and Mittal (2011) identify that the stock market and exchange rate have the same direction of change.

Furthermore, consumer price index and GDP have no significant relationship with stock market index respectively. Some scholars suggest that stock prices and inflation have no significant relationship (McQueen and Roley, 1993; Flannery and Protopapadakis, 2002; Lee, 1992). Yang (2002) thinks that the significant factors which influence the stock market are the money supply, deposit and loan, and savings, while there is no statistically significant causal relationship between GDP, industrial added value, import and export, consumer price index and other variables. The change of GDP and inflation have no significant relationship with performance of stock prices, through the research of 25-year monthly data in Nigeria (Oluseyi, 2015).

Finally, money supply and stock market index have positively significant relationship, which means stock market index increases 1.0760 percentage under the condition which money supply increase 1 percentage. From the economic point of view, when the money supply is sufficient, stock's demand will increase and stock price will rise. On the contrary, the stock price will drop. Hassan (2012) uses ARDL to prove that there are four macroeconomic variables, namely trade surplus, foreign exchange reserve, oil

price and money supply, which have an impact on the stock market in Jordan. Friedman (1988) finds impact of money supply on stock prices is positive through expected effect's analysis, portfolio effect and stock intrinsic value growth effect. Zhang and Gong (1974) shows that monetary policy is closely related to stock returns, and when money supply enhances, the stock price will rise. Li and Chen (2009) have shown that both the money supply and the one-year deposit rate have the positive impact on the stock index. The volatility of money supply will cause the stock price to change in the same direction, they have the positive correlation, based on the period study of 1980-2013 in Nigeria (Nkechukwu,Onyeagba and Okoh, 2013).

4.4.7 Results of Panel Data Analysis

The results of the previous models are integrated and presented in Table 4.10.

Table 4.10

Results of Panel Data Analysis

	Pooled OLS	Random Effect Model	Fixed Effect Model	Fixed Effect Model with Robust
Constant	1.05	-3.33	19.11	19.11
	(0.57)	(-0.82)	(3.27)	(1.20)
INR	7.09	-2.81	-2.25	-2.25
	(4.37) ***	(-3.44) ***	(-3.00) ***	(-2.55) **
EXR	1.30	1.50	1.17	1.17
	(2.62) ***	(3.12) ***	(2.57) **	(3.22) ***
CPI	0.04	0.02	0.0036	0.0036
	(8.54) ***	(8.08) ***	(1.14)	(0.44)
LNGDP	0.22	0.34	-0.98	-0.98
	(2.94) ***	(1.94) *	(-3.38) ***	(-1.23)
LNMS	-0.16	0.06	1.08	1.08
	(-6.58) ***	(0.73)	(6.23) ***	(2.22) **
Obs	260	260	260	260
R-square	0.4005	0.7394	0.7732	0.7732
Breusch and Pagan LM Test		1509.22 (0.0000) ***		
Hausman test			53.24 (0.0000) ***	
Variance inflating factor (VIF)			1.54	
Heteroskedasticity			3.16 (0.0755)	
Serial correlation			26.906 (0.0002) ***	

*Note: The significant level at 1% and 5% are marked by *** and **.*

According to the table, it shows that all the independent variables have correlation with emerging stock market index through using pooled OLS model. For the random effect model, the independent variables have significant relationship with the emerging stock

market index except money supply. Nevertheless, Fixed effect model shows that exchange rate, interest rate, GDP and money supply have correlation with emerging stock market index, CPI and the emerging stock market index are insignificant relationship, which indicates CPI's change will not affect performance of the emerging stock market index. Nonetheless, the fixed effect model with robust standard error is appropriate and the corresponding findings are as the final result by the diagnostic tests, which shows the interest rate, money supply and exchange rate have correlation with the emerging stock market index, CPI and GDP have no significant relationship with emerging stock market index.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

The summary of the study is presented in this chapter. In addition, this chapter also explains the limitations of the study and corresponding recommendation.

5.2 Summary

The stock market not only serves as a capital medium for financing and allocation of resource, but also serves as a "barometer" of economic development. Emerging markets are still immature which have various problems. Therefore, it makes sense to explore the macroeconomic factors that affect the stock market. This paper examines the impact of macroeconomy on emerging stock markets. The sample comprises of the 13 selected countries, which are China, Malaysia, Indonesia, Brazil, Mexico, Peru, Philippines, South Africa, South Korea, Czech Republic, Hungary, Colombia and Poland. The period of study is 20 years from 1997 to 2016. The yearly data is used and collected from the Thomson Data Stream.

In order to understand the impact of the macroeconomic variables on the stock market, previous related research and theories have been presented. There is an issue of serial correlation which was shown by the Wooldridge test. Consequently, fixed effect model with robust standard error is most appropriate. The findings show that interest rate,

money supply and exchange rate have correlation with emerging stock market index. The increase of interest rate will inversely affect the change of stock market index. It can be explained that the related profits of savings increase when interest rates rise and will attract the capital flow from the stock market to bank, which result in stock demand's decline and the decline of stock prices. The money supply and exchange rate move towards the same direction with the emerging stock market. Regarding the exchange rate on the emerging stock markets' relationship, when the currency appreciates, it would attract inflows of foreign capital and its economic situation will develop steadily, which will increase its share price. The rise in the money supply will increase capital inflows in the stock market, which will increase the stock price. Meanwhile, CPI and GDP have no correlation with the emerging stock markets, which indicates that there is no impact of volatility of CPI and GDP on the emerging stock markets.

5.3 Limitations of the study

The purpose of this study is to explore the macroeconomic variables and emerging stock markets' relationship. The selected 13 emerging stock markets are used to achieve the purpose of this study, which do not include all the related markets. Meanwhile, the period is from 1997 to 2016, yearly data is adopted. Consequently, the time range is also not large enough. The limited sample will inevitably have some limitations, the results of the study may also present some deviations.

5.4 Recommendation

Based on the findings, the interest rate, money supply and exchange rate and have correlation with emerging stock market. In order to achieve the purpose of revitalizing stock market and stimulating investment, relevant policymakers could focus on the macroeconomic factors. According to the relevant policies, such as the volume of the money supply and interest rates' change, investors can make corresponding judgments on the trend of stock prices to make rational investment decisions. Scholars who study the field in the future may include other macroeconomic factors such as industrial added value and unemployment. If possible, they can increase the sample size as much as possible to reduce the error to some extent.

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APPENDICES

Appendix A

Raw Data

COUNTRY	TIME	INDEX	INR	EXR	CPI	GDP	MS
CHINA	1997	1246.03	5.67%	0.1201	82.6024	1.78E+12	90995.3
CHINA	1998	1286.08	3.78%	0.1208	81.9007	1.92E+12	104498.5
CHINA	1999	1184.4	2.25%	0.1208	80.788	2.06E+12	119897.9
CHINA	2000	1801.003	2.25%	0.1208	80.9953	2.24E+12	134610.3
CHINA	2001	2123.052	2.25%	0.120814	81.5783	2.42E+12	158301.9
CHINA	2002	1594.508	1.98%	0.120667	80.9528	2.64E+12	185007
CHINA	2003	1511.729	1.98%	0.120671	81.8955	2.91E+12	221222.8
CHINA	2004	1768.645	2.25%	0.120736	85.0803	3.2E+12	254107
CHINA	2005	1223.566	2.25%	0.120748	86.6236	3.57E+12	298755.7
CHINA	2006	1319.471	2.52%	0.124634	87.8936	4.02E+12	345577.9
CHINA	2007	3291.299	4.14%	0.129313	92.0837	4.6E+12	403442.2
CHINA	2008	3446.244	2.25%	0.142465	97.4641	5.04E+12	475166.6
CHINA	2009	2419.778	2.25%	0.146289	96.7813	5.51E+12	610224.5
CHINA	2010	3157.957	2.75%	0.14651	100	6.1E+12	725851.8
CHINA	2011	2967.41	3.5%	0.15272	105.4109	6.68E+12	851590.9
CHINA	2012	2262.788	3%	0.15878	108.197	7.21E+12	974148.8
CHINA	2013	2225.295	3%	0.16126	111.0405	7.77E+12	1106525
CHINA	2014	2043.702	2.75%	0.16101	113.2617	8.33E+12	1228375
CHINA	2015	3863.929	1.5%	0.16146	114.8893	8.91E+12	1392278
CHINA	2016	3009.53	1.5%	0.15435	117.1871	9.5E+12	1550067
BRAZIL	1997	9302	24.35%	0.94554	45.3606	1.47E+12	239777
BRAZIL	1998	11634	28%	0.8787	46.8115	1.47E+12	254965
BRAZIL	1999	10696	26.02%	0.57973	49.0856	1.48E+12	274770
BRAZIL	2000	17245	17.2%	0.57405	52.5436	1.54E+12	283785
BRAZIL	2001	13736	17.86%	0.45946	56.1364	1.56E+12	321612
BRAZIL	2002	13084	19.14%	0.43188	60.88	1.61E+12	397503
BRAZIL	2003	12006	21.97%	0.30656	69.8387	1.63E+12	412895
BRAZIL	2004	22948	15.42%	0.34554	74.4475	1.72E+12	493497
BRAZIL	2005	26773	17.63%	0.37611	79.56	1.77E+12	582464
BRAZIL	2006	38717	13.93%	0.46723	82.8886	1.85E+12	661500
BRAZIL	2007	46288	10.58%	0.49104	85.9033	1.96E+12	781280
BRAZIL	2008	64175	11.66%	0.581666	90.7681	2.06E+12	1072986
BRAZIL	2009	44390	9.28%	0.4527	95.2034	2.05E+12	1164855
BRAZIL	2010	71136	8.87%	0.56657	100	2.21E+12	1362389
BRAZIL	2011	69268.25	10.99%	0.61446	106.6362	2.3E+12	1617480
BRAZIL	2012	64284.26	7.91%	0.54782	112.3966	2.34E+12	1764611
BRAZIL	2013	55562.74	7.81%	0.49395	119.3674	2.41E+12	1956838

BRAZIL	2014	51408.21	10.02%	0.43873	126.9258	2.42E+12	2150684
BRAZIL	2015	53123.02	12.62%	0.32041	138.3842	2.33E+12	2285721
BRAZIL	2016	50561.52	12.45%	0.28139	150.4782	2.25E+12	2371655
INDONESIA	1997	641.621	16.28%	0.000416	22.2392	4.94E+11	3.56E+08
INDONESIA	1998	533.3	22.09%	0.000114	35.224	4.29E+11	5.77E+08
INDONESIA	1999	394.433	27.5%	0.000116	42.4411	4.32E+11	6.46E+08
INDONESIA	2000	570.901	15.07%	0.00013	44.02	4.53E+11	7.47E+08
INDONESIA	2001	372.653	13.96%	9.58E-05	49.0832	4.7E+11	8.44E+08
INDONESIA	2002	488.157	15.96%	0.000102	54.9136	4.91E+11	8.84E+08
INDONESIA	2003	400.757	12.78%	0.000112	58.5301	5.15E+11	9.56E+08
INDONESIA	2004	750.652	7.95%	0.000117	62.1844	5.4E+11	1.03E+09
INDONESIA	2005	1095.066	8.06%	0.000106	68.6839	5.71E+11	1.2E+09
INDONESIA	2006	1329.313	12.1%	0.000111	77.688	6.03E+11	1.38E+09
INDONESIA	2007	1894.576	9.49%	0.00011	82.6658	6.41E+11	1.65E+09
INDONESIA	2008	2237.971	8.59%	0.000109	90.7477	6.79E+11	1.9E+09
INDONESIA	2009	1500.361	10.93%	8.72E-05	95.1159	7.11E+11	2.14E+09
INDONESIA	2010	2829.996	8.04%	0.00011	100	7.55E+11	2.47E+09
INDONESIA	2011	3707.487	7.07%	0.000115	105.3553	8.02E+11	2.88E+09
INDONESIA	2012	4215.441	6.41%	0.00011	109.864	8.5E+11	3.31E+09
INDONESIA	2013	4981.465	6.13%	0.000103	116.91	8.97E+11	3.73E+09
INDONESIA	2014	4891.316	8.14%	8.83E-05	124.3863	9.42E+11	4.17E+09
INDONESIA	2015	5456.398	8.7%	7.69E-05	132.3012	9.88E+11	4.55E+09
INDONESIA	2016	4843.188	7.83%	7.6E-05	136.9659	1.04E+12	5E+09
MALAYSIA	1997	594.44	7.2%	0.403	73.2669	1.52E+11	292217
MALAYSIA	1998	586.13	9.6%	0.2658	77.1283	1.41E+11	296472
MALAYSIA	1999	812.33	5%	0.2632	79.2451	1.49E+11	337138
MALAYSIA	2000	679.64	4%	0.2632	80.4614	1.63E+11	354702
MALAYSIA	2001	696.09	4.25%	0.26319	81.6013	1.63E+11	362512
MALAYSIA	2002	646.32	4%	0.26319	83.0766	1.72E+11	383542
MALAYSIA	2003	793.94	4%	0.26316	83.9014	1.82E+11	426061
MALAYSIA	2004	907.43	4%	0.26281	85.1754	1.94E+11	534163
MALAYSIA	2005	899.79	3.7%	0.26316	87.6974	2.05E+11	616178
MALAYSIA	2006	1096.24	3.7%	0.27163	90.8626	2.16E+11	718216
MALAYSIA	2007	1445.03	3.7%	0.28906	92.7047	2.37E+11	796926
MALAYSIA	2008	876.75	3.7%	0.3137	97.7485	2.45E+11	903222
MALAYSIA	2009	1272.78	2.5	0.27739	98.3187	2.38E+11	989343
MALAYSIA	2010	1518.91	2.75%	0.30788	100	2.55E+11	1060154
MALAYSIA	2011	1530.73	2.5%	0.33043	103.2	2.69E+11	1214857
MALAYSIA	2012	1688.95	2.7%	0.32739	104.9	2.83E+11	1333388
MALAYSIA	2013	1866.96	2.7%	0.32384	107.1	2.97E+11	1444851
MALAYSIA	2014	1761.25	2.7%	0.30581	110.5	3.14E+11	1544657
MALAYSIA	2015	1692.51	2.9%	0.27244	112.8	3.3E+11	1588528
MALAYSIA	2016	1641.73	2.9%	0.25694	115.2	3.44E+11	1637733

MEXICO	1997	3741.3	7.57%	0.1257	42.7838	7.78E+11	1290063
MEXICO	1998	4927.91	6.38%	0.1172	49.5984	8.15E+11	1663220
MEXICO	1999	4930.37	5.85%	0.105	57.8246	8.37E+11	2030685
MEXICO	2000	7378.82	4.86%	0.1076	63.315	8.81E+11	2331055
MEXICO	2001	5575.05	3.26%	0.107177	67.3435	8.76E+11	2768943
MEXICO	2002	7191.94	2%	0.110465	70.7316	8.77E+11	3056567
MEXICO	2003	6034.74	1.72%	0.093445	73.9485	8.89E+11	3458401
MEXICO	2004	10713.54	1.42%	0.08955	77.4155	9.27E+11	3800700
MEXICO	2005	12714.19	0.93%	0.089485	80.5028	9.55E+11	4366056
MEXICO	2006	19634.21	0.93%	0.092164	83.4246	1E+12	4972338
MEXICO	2007	29348.09	1.11%	0.091088	86.734	1.03E+12	5384859
MEXICO	2008	31689.61	1.12%	0.094665	91.1791	1.05E+12	6269942
MEXICO	2009	20933.78	1.12%	0.073752	96.0092	1E+12	6672271
MEXICO	2010	33266.43	1.02%	0.08118	100	1.05E+12	7207837
MEXICO	2011	37775.07	0.66%	0.08448	103.4074	1.09E+12	8065740
MEXICO	2012	39924.93	1.55%	0.07817	107.659	1.14E+12	8740162
MEXICO	2013	43717.57	2.29%	0.08101	111.7569	1.15E+12	9507302
MEXICO	2014	40563.06	2.02%	0.07624	116.248	1.18E+12	10539707
MEXICO	2015	44202.94	1.78%	0.06752	119.4107	1.21E+12	11301899
MEXICO	2016	46062.92	2.64%	0.0577	122.7801	1.24E+12	12500796
PERU	1997	1664.9	10.55%	0.3788	68.7536	8.26E+10	12915
PERU	1998	1774.5	10.05%	0.3574	73.7368	8.23E+10	12604
PERU	1999	1470.28	13.55%	0.3	76.2952	8.35E+10	14069
PERU	2000	1654.62	10.07%	0.2877	79.1619	8.58E+10	14418
PERU	2001	1258.62	8.25%	0.2837	80.727	8.63E+10	16171
PERU	2002	1307.13	3.5%	0.2902	80.8829	9.1E+10	17907
PERU	2003	1611.33	3.33%	0.2882	82.7103	9.48E+10	19812
PERU	2004	3074.23	2.38%	0.2893	85.7396	9.95E+10	25437
PERU	2005	4135.06	2.56%	0.306824	87.1254	1.06E+11	30434
PERU	2006	5933.53	3.21%	0.298245	88.8699	1.14E+11	35918
PERU	2007	17911.83	3.09%	0.314317	90.4517	1.23E+11	48644
PERU	2008	17885.91	2.51%	0.365631	95.6851	1.35E+11	60207
PERU	2009	10163.44	3.79%	0.319356	98.4947	1.36E+11	66561
PERU	2010	15129	1.32%	0.35185	100	1.48E+11	89052
PERU	2011	21562.53	2.01%	0.3565	103.3707	1.57E+11	101248
PERU	2012	24035.61	2.39%	0.37505	107.1476	1.66E+11	126199
PERU	2013	19549.08	2.3%	0.38685	110.1654	1.76E+11	135555
PERU	2014	14282.55	2.23%	0.3555	113.7194	1.8E+11	145503
PERU	2015	12717.95	2.18%	0.32335	117.7625	1.86E+11	148399
PERU	2016	11890.43	2.648%	0.299	121.997	1.93E+11	165424
PHILIPPINES	1997	3104.77	10.194%	0.03793	52.8997	1.17E+11	1053949
PHILIPPINES	1998	2173.55	12.106%	0.02556	57.7849	1.16E+11	1138438
PHILIPPINES	1999	2028.21	8.167%	0.02578	61.2168	1.2E+11	1357905

PHILIPPINES	2000	1688.32	8.305%	0.02428	63.6515	1.25E+11	1423191
PHILIPPINES	2001	1452.26	8.744%	0.020141	67.0539	1.29E+11	1706926
PHILIPPINES	2002	1419.72	4.608%	0.01955	68.8797	1.34E+11	1879654
PHILIPPINES	2003	1062.49	5.221%	0.018748	70.4564	1.4E+11	1939503
PHILIPPINES	2004	1450.91	6.178%	0.017753	73.8589	1.5E+11	2011474
PHILIPPINES	2005	1966.29	5.556%	0.018255	78.6722	1.57E+11	2341867
PHILIPPINES	2006	2189.77	5.294%	0.019577	82.9876	1.65E+11	2865908
PHILIPPINES	2007	3248	3.696%	0.020771	85.3942	1.76E+11	3314032
PHILIPPINES	2008	3034.81	4.49%	0.024114	92.4481	1.83E+11	3539715
PHILIPPINES	2009	2028.59	2.741%	0.020942	96.3485	1.85E+11	3880968
PHILIPPINES	2010	3161.8	3.22%	0.02226	100	2E+11	4283922
PHILIPPINES	2011	4129.539	3.388%	0.02309	104.6473	2.07E+11	4582417
PHILIPPINES	2012	5056.477	3.156%	0.02342	107.9668	2.21E+11	5013336
PHILIPPINES	2013	6815.297	1.662%	0.02443	111.2033	2.36E+11	6693572
PHILIPPINES	2014	6587.078	1.229%	0.0222	115.7676	2.51E+11	7396350
PHILIPPINES	2015	7993.09	1.592%	0.02256	117.4274	2.66E+11	8067273
PHILIPPINES	2016	7245.129	1.596%	0.02169	119.5021	2.84E+11	9140446
SOUTH AFRICA	1997	4042.9	15.38%	0.2264	47.2354	2.49E+11	350700
SOUTH AFRICA	1998	3964.5	16.5%	0.1984	50.4854	2.5E+11	393806
SOUTH AFRICA	1999	4128.7	12.24%	0.1622	53.1013	2.56E+11	446935
SOUTH AFRICA	2000	4986	9.2%	0.1525	55.9364	2.67E+11	474848
SOUTH AFRICA	2001	5406.1	9.37%	0.122794	59.1258	2.74E+11	544056
SOUTH AFRICA	2002	6235.2	10.77%	0.089726	64.5442	2.84E+11	632621
SOUTH AFRICA	2003	5790.1	9.76%	0.125644	68.3258	2.93E+11	733453
SOUTH AFRICA	2004	7092	6.55%	0.15626	69.2724	3.06E+11	818740
SOUTH AFRICA	2005	9597.3	6.04%	0.161028	71.6271	3.22E+11	963515
SOUTH AFRICA	2006	13396.1	7.14%	0.163647	74.9518	3.4E+11	1156842
SOUTH AFRICA	2007	17384.8	9.15%	0.139273	80.2722	3.58E+11	1396325
SOUTH AFRICA	2008	16171.1	11.61%	0.128485	89.5328	3.7E+11	1562427
SOUTH AFRICA	2009	14126.6	8.54%	0.110406	95.9164	3.64E+11	1589340
SOUTH AFRICA	2010	17106.1	6.47%	0.138001	100	3.75E+11	1678417
SOUTH AFRICA	2011	18808.1	5.67%	0.149303	105.0005	3.88E+11	1798932
SOUTH AFRICA	2012	21082.6	5.44%	0.129157	110.9368	3.96E+11	1869050
SOUTH AFRICA	2013	23744.5	5.15%	0.108372	117.3173	4.06E+11	2049694
SOUTH AFRICA	2014	27691.9	5.8%	0.093976	124.4352	4.13E+11	2226544
SOUTH AFRICA	2015	30096.5	6.15%	0.08476	130.1446	4.18E+11	2441272
SOUTH AFRICA	2016	29532.1	7.17%	0.068064	138.3779	4.19E+11	2601201
SOUTH KOREA	1997	375.15	10.81%	0.00112	65.9641	6.2E+11	5.15E+08
SOUTH KOREA	1998	562.46	13.29%	0.00069	70.9194	5.86E+11	6.37E+08
SOUTH KOREA	1999	1028.07	7.95%	0.00082	71.4949	6.52E+11	6.7E+08
SOUTH KOREA	2000	504.62	7.94%	0.0009	73.1145	7.1E+11	7.04E+08
SOUTH KOREA	2001	693.7	5.79%	0.00074	76.0876	7.42E+11	7.64E+08
SOUTH KOREA	2002	627.55	4.95%	0.00075	78.1896	7.97E+11	8.72E+08

SOUTH KOREA	2003	810.71	4.25%	0.0008	80.9378	8.21E+11	8.96E+08
SOUTH KOREA	2004	895.92	3.87%	0.00088	83.844	8.61E+11	9.54E+08
SOUTH KOREA	2005	1379.37	3.72%	0.00099	86.1531	8.95E+11	1.02E+09
SOUTH KOREA	2006	1434.46	4.5%	0.00103	88.0845	9.41E+11	1.14E+09
SOUTH KOREA	2007	1897.13	5.17%	0.00107	90.3174	9.92E+11	1.28E+09
SOUTH KOREA	2008	1124.47	5.87%	0.00103	94.5386	1.02E+12	1.42E+09
SOUTH KOREA	2009	1682.77	3.48%	0.00075	97.1447	1.03E+12	1.56E+09
SOUTH KOREA	2010	2051	3.86%	0.00089	100	1.09E+12	1.65E+09
SOUTH KOREA	2011	1825.74	4.15%	0.00092	104.0258	1.13E+12	1.74E+09
SOUTH KOREA	2012	1997.05	3.7%	0.00089	106.3011	1.16E+12	1.83E+09
SOUTH KOREA	2013	2011.34	2.89%	0.00089	107.6845	1.19E+12	1.92E+09
SOUTH KOREA	2014	1915.59	2.54%	0.00095	109.0573	1.23E+12	2.07E+09
SOUTH KOREA	2015	1961.31	1.81%	0.00092	109.8283	1.27E+12	2.24E+09
SOUTH KOREA	2016	2026.46	1.56%	0.00087	110.8936	1.3E+12	2.4E+09
CZECH REPUBLIC	1997	495.3	7.71%	0.03472	66.2862	1.44E+11	1177800
CZECH REPUBLIC	1998	394.2	8.08%	0.0288	73.3302	1.44E+11	1241400
CZECH REPUBLIC	1999	489.7	4.48%	0.028	74.9018	1.46E+11	1337500
CZECH REPUBLIC	2000	478.5	3.42%	0.02641	77.8251	1.52E+11	1412300
CZECH REPUBLIC	2001	394.6	2.87%	0.025917	81.4874	1.56E+11	1596000
CZECH REPUBLIC	2002	460.7	2%	0.028989	82.942	1.59E+11	1651814
CZECH REPUBLIC	2003	659.1	1.33%	0.033779	83.0313	1.65E+11	1766054
CZECH REPUBLIC	2004	1032	1.28%	0.036922	85.3789	1.73E+11	1844111
CZECH REPUBLIC	2005	1473	1.17%	0.043074	86.9551	1.84E+11	1992132
CZECH REPUBLIC	2006	1588.9	1.19%	0.04264	89.1534	1.97E+11	2188657
CZECH REPUBLIC	2007	1815.1	1.32%	0.047646	91.7633	2.08E+11	2478336
CZECH REPUBLIC	2008	858.2	1.61%	0.062953	97.5912	2.13E+11	2641123
CZECH REPUBLIC	2009	1117.3	1.27%	0.050945	98.6109	2.03E+11	2753145
CZECH REPUBLIC	2010	1224.8	1.08%	0.05319	100	2.07E+11	2844952
CZECH REPUBLIC	2011	911.1	1.04%	0.05817	101.9364	2.11E+11	2994094
CZECH REPUBLIC	2012	1038.7	1.02%	0.05373	105.2993	2.09E+11	3129477
CZECH REPUBLIC	2013	989.04	0.86%	0.04969	106.8101	2.08E+11	3278655
CZECH REPUBLIC	2014	946.71	0.7%	0.05	107.1703	2.14E+11	3429895
CZECH REPUBLIC	2015	956.33	0.53%	0.03984	107.5398	2.25E+11	3667740
CZECH REPUBLIC	2016	921.61	0.37%	0.04215	108.2273	2.31E+11	3882787
HUNGARY	1997	7999.1	17.66%	0.005667	41.959	9.56E+10	3787.3
HUNGARY	1998	6307.67	15.41%	0.00469	47.9068	9.96E+10	4378.3
HUNGARY	1999	8819.45	12.65%	0.004228	52.7123	1.03E+11	5067.9
HUNGARY	2000	7849.75	9.19%	0.003708	57.8678	1.07E+11	5680.6
HUNGARY	2001	7131.13	8.98%	0.003378	63.1664	1.11E+11	6634.2
HUNGARY	2002	7798.29	7.32%	0.003618	66.4899	1.16E+11	7547
HUNGARY	2003	9379.99	7.08%	0.004374	69.5806	1.21E+11	8575.1
HUNGARY	2004	14742.57	10.5%	0.004909	74.2982	1.27E+11	9427.3

HUNGARY	2005	20784.74	6.41%	0.005216	76.9364	1.32E+11	10652.8
HUNGARY	2006	24844.32	6.03%	0.00455	79.9202	1.37E+11	11913.2
HUNGARY	2007	26235.63	7.23%	0.005436	86.2619	1.38E+11	12937
HUNGARY	2008	12241.69	8.06%	0.006137	91.4947	1.39E+11	14097
HUNGARY	2009	21227.01	8.14%	0.004534	95.3458	1.3E+11	14354.3
HUNGARY	2010	21327.07	4.93%	0.005061	100	1.31E+11	14350.8
HUNGARY	2011	16974.24	5.49%	0.005427	103.9207	1.33E+11	15368.5
HUNGARY	2012	18173.2	6.27%	0.004418	109.8106	1.31E+11	15178.8
HUNGARY	2013	18564.08	3.77%	0.004349	111.7005	1.34E+11	15844.9
HUNGARY	2014	16634	1.78%	0.004479	111.4522	1.39E+11	17264.4
HUNGARY	2015	23920.65	1.11%	0.003653	111.3739	1.44E+11	18556.9
HUNGARY	2016	32003.05	0.58%	0.00365	111.8202	1.47E+11	20389.2
COLOMBIA	1997	1415.13	24.13%	0.000941	40.5048	1.91E+11	43794.56
COLOMBIA	1998	1231.58	32.58%	0.000736	48.0696	1.92E+11	48558.07
COLOMBIA	1999	1099.44	21.33%	0.000653	53.297	1.84E+11	53670.53
COLOMBIA	2000	952.45	12.15%	0.000502	58.2116	1.92E+11	56663.65
COLOMBIA	2001	947.68	12.44%	0.000433	62.8502	1.96E+11	62158.43
COLOMBIA	2002	1249.43	8.94%	0.000442	66.8412	2.01E+11	66672.23
COLOMBIA	2003	1975.06	7.8%	0.00034	71.6078	2.08E+11	74323.38
COLOMBIA	2004	3367.3	7.8%	0.000376	75.836	2.2E+11	88342.38
COLOMBIA	2005	6231.81	7.01%	0.000424	79.6643	2.3E+11	104088.2
COLOMBIA	2006	10044.09	6.28%	0.000434	83.0869	2.45E+11	122183.5
COLOMBIA	2007	10661.35	8.01%	0.000461	87.6931	2.62E+11	144058.9
COLOMBIA	2008	8851.35	9.74%	0.00055	93.829	2.72E+11	168771.2
COLOMBIA	2009	9734.99	6.15%	0.000415	97.7725	2.76E+11	177816
COLOMBIA	2010	13418.72	3.66%	0.000522	100	2.87E+11	195878
COLOMBIA	2011	13903.92	4.26%	0.000547	103.4116	3.06E+11	232948.3
COLOMBIA	2012	14381.05	5.36%	0.000564	106.6969	3.18E+11	271354.2
COLOMBIA	2013	13760.22	4.17%	0.000549	108.8552	3.34E+11	311178.5
COLOMBIA	2014	13233.65	4.09%	0.000513	111.9878	3.48E+11	339464.7
COLOMBIA	2015	9778.4	4.58%	0.000395	117.5928	3.59E+11	381850.8
COLOMBIA	2016	9702.18	6.78%	0.000325	126.4328	3.66E+11	408241.8
POLAND	1997	14668	22.12%	0.3252	57.4305	2.85E+11	179378.1
POLAND	1998	12795.6	23.6%	0.2896	64.1643	2.98E+11	223678.1
POLAND	1999	18083.6	12.3%	0.2506	68.8322	3.12E+11	268700.5
POLAND	2000	17847.5	18%	0.2396	75.7566	3.26E+11	300424.1
POLAND	2001	13922.16	16.1%	0.249377	79.9166	3.3E+11	329469.1
POLAND	2002	14366.65	9.79%	0.244487	81.4351	3.37E+11	324346.4
POLAND	2003	20820.07	5.55%	0.245489	82.0768	3.49E+11	342860.2
POLAND	2004	26636.19	5.97%	0.256351	85.0123	3.67E+11	368714.1
POLAND	2005	35600.79	5.45%	0.312705	86.8036	3.8E+11	415163.5
POLAND	2006	50411.82	4.16%	0.307069	87.7714	4.03E+11	481210.5
POLAND	2007	55648.54	4.67%	0.348991	89.8674	4.32E+11	549344.3

POLAND	2008	27228.64	6.51%	0.452202	93.7761	4.5E+11	660239.9
POLAND	2009	39985.99	4.17%	0.30063	97.3639	4.63E+11	714757.8
POLAND	2010	47489.91	4.28%	0.3495	100	4.79E+11	774657.9
POLAND	2011	37595.44	4.52%	0.3608	104.2583	5.03E+11	863745.5
POLAND	2012	47460.59	4.85%	0.3148	107.9667	5.11E+11	900336.7
POLAND	2013	51284.25	3.27%	0.31235	109.0833	5.19E+11	960344.9
POLAND	2014	51416.08	2.95%	0.3292	109.2	5.36E+11	1044553
POLAND	2015	46467.38	1.57%	0.268	108.1175	5.56E+11	1145259
POLAND	2016	51754.03	1.6%	0.26715	107.4583	5.72E+11	1256212

Appendix B

Stata Output

```
. encode COUNTRY,gen(COUNTRY1)

. gen LNINDEX=log(INDEX)

. gen LNGDP=log(GDP)

. gen LNMS=log(MS)

. xtset COUNTRY1 TIME
      panel variable:  COUNTRY1 (strongly balanced)
       time variable:  TIME, 1997 to 2016
               delta:  1 unit
```

```
. xtsum LNINDEX INR EXR CPI LNGDP LNMS
```

Variable		Mean	Std. Dev.	Min	Max	Observations
LNINDEX	overall	8.455929	1.434204	5.920648	11.17235	N = 260
	between		1.290201	6.717017	10.31488	n = 13
	within		.717242	6.838358	9.886641	T = 20
INR	overall	.0668927	.0568022	.0037	.3258	N = 260
	between		.0392132	.021665	.151855	n = 13
	within		.0424454	-.0068623	.2940627	T = 20
EXR	overall	.142931	.1656406	.000076	.94554	N = 260
	between		.1634634	.0001202	.5076768	n = 13
	within		.0517368	-.0833558	.5807942	T = 20
CPI	overall	88.11306	21.95883	22.2392	150.4782	N = 260
	between		4.258528	80.46598	94.33131	n = 13
	within		21.57279	29.88628	151.4105	T = 20
LNGDP	overall	26.78496	1.084253	25.13384	29.88276	N = 260
	between		1.092466	25.51708	29.06354	n = 13
	within		.2639594	25.92678	27.60418	T = 20
LNMS	overall	14.2759	3.380537	8.239408	22.3337	N = 260
	between		3.440707	9.25031	21.16437	n = 13
	within		.6767733	12.80097	15.66613	T = 20

```
. sum LNINDEX INR EXR CPI LNGDP LNMS
```

Variable	Obs	Mean	Std. Dev.	Min	Max
LNINDEX	260	8.455929	1.434204	5.920648	11.17235
INR	260	.0668927	.0568022	.0037	.3258
EXR	260	.142931	.1656406	.000076	.94554
CPI	260	88.11306	21.95883	22.2392	150.4782
LNGDP	260	26.78496	1.084253	25.13384	29.88276
LNMS	260	14.2759	3.380537	8.239408	22.3337

```
. correlate INR EXR CPI LNGDP LNMS
(obs=260)
```

	INR	EXR	CPI	LNGDP	LNMS
INR	1.0000				
EXR	0.2271	1.0000			
CPI	-0.5992	0.0117	1.0000		
LNGDP	-0.0140	0.1824	0.2155	1.0000	
LNMS	-0.0556	-0.3157	0.1408	0.3907	1.0000

```
. reg LNINDEX INR EXR CPI LNGDP LNMS
```

Source	SS	df	MS	Number of obs	=	260
				F(5, 254)	=	33.93
Model	213.341041	5	42.6682082	Prob > F	=	0.0000
Residual	319.406544	254	1.25750608	R-squared	=	0.4005
				Adj R-squared	=	0.3887
Total	532.747586	259	2.05694049	Root MSE	=	1.1214

LNINDEX	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
INR	7.087645	1.620225	4.37	0.000	3.89686	10.27843
EXR	1.296913	.4948921	2.62	0.009	.3222982	2.271527
CPI	.0356399	.0041755	8.54	0.000	.0274168	.043863
LNGDP	.2223233	.0756309	2.94	0.004	.0733798	.3712669
LNMS	-.164328	.0249622	-6.58	0.000	-.2134872	-.1151688
_cons	1.047113	1.847401	0.57	0.571	-2.591061	4.685287

```
. vif
```

Variable	VIF	1/VIF
INR	1.74	0.573231
CPI	1.73	0.577522
LNMS	1.47	0.681827
LNGDP	1.38	0.722022
EXR	1.38	0.722530
Mean VIF	1.54	


```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of LNINDEX

         chi2(1)      =     3.16
         Prob > chi2  =   0.0755


. xtserial LNINDEX INR EXR CPI LNGDP LNMS

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      12) =     26.906
           Prob > F =      0.0002
```

```
. xtreg LNINDEX INR EXR CPI LNGDP LNMS, fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: COUNTRY1                        Number of groups   =        13

R-sq:                                           Obs per group:
     within  = 0.7732                                         min =        20
     between = 0.2707                                         avg =      20.0
     overall = 0.1286                                         max =        20

                                                F(5,242)           =    164.99
corr(u_i, Xb)  = -0.9473                        Prob > F           =    0.0000

------------------------------------------------------------------------------
    LNINDEX |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
        INR |  -2.253583   .7502114    -3.00   0.003    -3.73136   -.7758049
        EXR |   1.170525   .4554201     2.57   0.011     .2734316   2.067618
        CPI |   .0035992   .0031489     1.14   0.254    -.0026035   .0098019
      LNGDP |  -.9835753   .2907521    -3.38   0.001    -1.556303   -.4108475
       LNMS |   1.075952   .1726862     6.23   0.000     .7357917   1.416111
      _cons |   19.10709   5.847785     3.27   0.001     7.588039   30.62615
------------+----------------------------------------------------------------
    sigma_u |  4.1962059
    sigma_e |  .35337875
        rho |  .99295797   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(12, 242) = 192.98                   Prob > F = 0.0000

. estimate store fe

. xtreg LNINDEX INR EXR CPI LNGDP LNMS, re

Random-effects GLS regression                   Number of obs      =       260
Group variable: COUNTRY1                        Number of groups   =        13

R-sq:                                           Obs per group:
     within  = 0.7394                                         min =        20
     between = 0.0018                                         avg =      20.0
     overall = 0.0890                                         max =        20

                                                Wald chi2(5)       =    641.10
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
    LNINDEX |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+----------------------------------------------------------------
        INR |  -2.807579    .815587    -3.44   0.001      -4.4061   -1.209058
        EXR |   1.503684   .4824511     3.12   0.002     .5580977    2.449271
        CPI |   .0193159   .0023894     8.08   0.000     .0146327    .0239992
      LNGDP |   .3447484    .177737     1.94   0.052    -.0036098    .6931066
       LNMS |   .0576988   .0787754     0.73   0.464    -.0966981    .2120957
      _cons |  -3.330949   4.068159    -0.82   0.413    -11.30439    4.642496
------------+----------------------------------------------------------------
    sigma_u |  .86904482
    sigma_e |  .35337875
        rho |  .85811345   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. estimate store re

. hausman fe re
```

	Coefficients			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
INR	-2.253583	-2.807579	.5539964	.
EXR	1.170525	1.503684	-.3331595	.
CPI	.0035992	.0193159	-.0157168	.0020509
LNGDP	-.9835753	.3447484	-1.328324	.2301007
LNMS	1.075952	.0576988	1.018253	.1536716

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 53.24
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

LNINDEX[COUNTRY1,t] = Xb + u[COUNTRY1] + e[COUNTRY1,t]

Estimated results:

	Var	sd = sqrt(Var)
LNINDEX	2.05694	1.434204
e	.1248765	.3533788
u	.7552389	.8690448

Test: Var(u) = 0
chibar2(01) = 1509.22
Prob > chibar2 = 0.0000

```
. xtreg LNINDEX INR EXR CPI LNGDP LNMS, fe robust

Fixed-effects (within) regression               Number of obs      =       260
Group variable: COUNTRY1                        Number of groups   =        13

R-sq:                                           Obs per group:
     within  = 0.7732                                         min =        20
     between = 0.2707                                         avg =      20.0
     overall = 0.1286                                         max =        20

                                                F(5,12)            =     89.95
corr(u_i, Xb)  = -0.9473                        Prob > F           =    0.0000

                                    (Std. Err. adjusted for 13 clusters in COUNTRY1)
------------------------------------------------------------------------------
             |               Robust
    LNINDEX |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------------------------------------------------------------------
         INR |  -2.253583   .8835342    -2.55   0.025    -4.178638   -.3285269
         EXR |   1.170525   .3633153     3.22   0.007     .378929    1.962121
         CPI |   .0035992   .0081727     0.44   0.667    -.0142075    .0214059
       LNGDP |  -.9835753   .8015919    -1.23   0.243    -2.730094    .7629433
        LNMS |   1.075952   .4837727     2.22   0.046     .0219013    2.130002
       _cons |   19.10709   15.97602     1.20   0.255    -15.70166    53.91585
-------------+----------------------------------------------------------------
     sigma_u |  4.1962059
     sigma_e |   .35337875
         rho |   .99295797   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```