AN INVESTIGATION ON THE IMPACT OF MACROECONOMIC VARIABLES ON STOCK MARKET PERFORMANCE OF G7 COUNTRIES

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ZHANG LONG FEI

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ABSTRAK

Kajian ini bertujuan untuk mengkaji kesan perubahan dalam kadar tukaran matawang, kadar faedah dan kadar inflasi ke atas prestasi pasaran saham negara-negara G7 yang meliputi Amerika Syarikat, UK, Kanada, Jepun, Itali, Jerman dan Perancis. Indeks yang digunakan meliputi indeks saham industri Dow Jones, indeks kesemua saham FTSE, indeks saham DAX, indeks SBF 250, indeks pasaran saham Tokyo, pasaran saham Toronto dan indeks Comit. Kajian ini menggunakan data tahunan dari tahun 2001 hingga 2005. Data diperolehi daripada pengkalan data Datastream. Bagi mencapai objektif kajian, ujian-ujian seperti model *ordinary least square,* model *fixed effect,* model *random effect* dan model *fixed effect with robust standard error* telah digunakan. Dapatan empirikal model *fixed effect with robust standard error* telah menunjukkan bahawa kadar inflasi mempunyai kesan yang signifikan dan positif ke atas indeks pasaran saham. Dapatan regresi menunjukkan bahawa bagi satu peratus peningkatan dalam kadar inflasi akan menyebabkan indeks pasaran saham meningkat sebanyak 38 peratus. Kadar tukaran matawang dan kadar faedah tidak mempunyai kesan yang signifikan ke atas indeks pasaran saham.

Kata kunci: kadar faedah, kadar inflasi, kadar tukaran, pulangan pasaran saham, negara-negara G7

ABSTRACT

This study intends to investigate the impact of exchange rate, interest rate and inflation rate on stock market performance of G7 countries which are United States, UK, Canada, Japan, Italy, Germany and France. The stock indices used in this study are Dow Jones Industrial stock index, FTSE all stock index, DAX stock index, SBF 250 index, Tokyo stock exchange index, Toronto stock exchange and Comit indices. This study employs annual data for 15 years which is from 2001 to 2015. The data is obtained from the Datastream database. An ordinary least square, fixed effect model, random effect model and fixed effect with robust standard error model are the tests used to achieve the objectives of the study. Empirical results of the fixed effect model with robust standard error show that inflation rate has a significant impact and positive relationship with the stock index movement. In particular, the regression result shows that for 1 percent increase in inflation rates the stock price would increase by 38 percent. The exchange rate and interest rate do not have any significant impact on the stock market index.

Key words: interest rate, inflation rate, exchange rate, stock market return, G7 countries

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

Discussion on stock performance are of interest to firms, investors, regulators, policy makers and researchers due to the importance of the stock market in the financial system (Barakat, Elgazzar & Hanafy, 2016). It is suggested that the stock price movement and economic performance of developed countries are affected by inflation, exchange rate and interest rate (Duca, 2007). This indicates that in countries with steady economic growth, the stock market is expected to have better performance. Talla (2013) indicates that the stock return can significantly being impacted by a change in macroeconomic variables. The significance role of the stock market can be seen in a number of circumstances. For instance, the period of the great depression in the United States of America (U.S.A) witnessed a crash in the stock market (Cecchetti, 1992; Green, 1971; Krugman, 2009.) Similarly, a rapid fall in the prices of stocks along with falls in economic growth was effected by the 2007/2008 global financial crisis (European Commission, 2009; Verick; Islam, 2010; United Nations Conference on Trade and Development(UNCTAD), 2010).

The stock market is part of the financial system which promotes savings, investment and growth (Levine 2004). A study by Flannery and Protopapadakis (2002) highlight that macroeconomic variables are the most influential factors that affect the return on the stock market. When a stock market is functioning well, companies could raise funds through equity while the secondary market would provide liquidity for investors.

Thus, the stock market provides opportunity for raising capital as well as ensuring liquidity for stocks, which contributes to market deepening (Fynn, 2012). In another study, King (1966) reveals that stock prices are subjected to the impact of macroeconomic indicators by an average of 50 percent. While Levine (2004) contends that a developed capital market would aid growth and ensure stable macro-economic variables. Stiglitz (1994) indicates that economic development and macro variables stability would enhance financial system's development.

The stock market provides opportunity for buyers and sellers of stocks to meet and conduct transactions on the purchase and sale of securities at market prices. It is also an avenue for investors to invest and make returns. The market is also a key component of the capital market and it is vital to ensure that the financial system functions smoothly. While the stock market is considered to be a vital element of the financial system of developed nations, it is gradually becoming important in emerging markets and developing nations. Literature indicates that prices in the stock market are determinants of how much could be raised by firms through new issues of equities (Mishkin, 2013). Suggesting that stock prices could influence business decisions, investment, employment and economic growth. Ngare, Nyamongo and Misati (2014) note that the stock market plays a vital role in the economy of a nation through:

i. mobilization of savings which could contribute to capital formation thereby promoting growth and development; and
ii. reduction of the risks faced by investors through opportunity in the sale of equities which is crucial in a well-developed capital market.

Therefore, the stock market performance can be regarded as a signal of the economic condition of a nation.

While the stock market performance determines the return of investors would earn and could be linked to economic growth, it can also be influenced by macroeconomic characteristics such as inflation, exchange rate and interest rates. Maysami, Howe and Hamza (2004), Moolman and Toit (2005) and Olalere (2006) suggest that a link exists between the stock market and macroeconomic variables in an economy. However, changes in macroeconomic variables can have varying effects on different sectors of the stock market. For instance, changes in interest rates could affect the industrial and service sectors differently. Despite this, the overall effect of changes in inflation, exchange rates and inflation could influence stock market performance.

Duca (2007) shows that there is an association between share prices and macroeconomic variables such as interest rate, exchange rate and inflation. He posits that if the security market is assumed to be a discounted present value of a firm's payout, and if investors expectation on the expected payout of a firm is correct, then the expectation of steady economic growth could produce better future payout. Thus, links between expected growth and a high stock price could suggest an association between macro-economic characteristics and stock market performance. Another study that investigate the association between macroeconomic variables and stock market performance is Adenuga (2010).

Similarly, Domac and Yucel (2005), Enisan and Olufisayo (2009), Hou and Cheng (2010) suggest the likelihood of links between stock market performance and macroeconomic variables of an economy such as inflation, exchange rate and inflation.

Olweny and Omondi (2011) investigate the influence of macroeconomic variables on stock return change in the NSE. Their results represent that macroeconomic variables; exchange rates, interest rates and inflation rates affect the fluctuation of the stock market returns at the NSE.

Modigliani and Cohn (1979) findings indicate that the stock market performs well under strong economic growth and low inflation. Similarly, changes in domestic exchange rates are expected to influence the stock market given that such changes affect the value of a nation's currency viz-a-viz other currencies (Barakat et al., 2016). Also, interest rate changes signal the mood of the economy and the stock market is expected to respond differently to an increase or decrease in interest rates (Toraman & Basarir, 2014). Given the vital position of the stock market in an economy, particularly in the developed economies of western nation, an investigation on the association between the stock market and macroeconomic variables is important to determine which macroeconomic variables actually influence stock market performance. The study is therefore aimed at examining the association between stock market performance and inflation rate, interest rate and exchange rates of G7 economies which are Canada, US, Japan, Germany, Italy, France, United Kingdom.

This study is summarized as follows. The first chapter talks about the introduction of the study, a brief overview of stock market behavior of the G7 countries, problem

statement, research questions, research objectives, significance of the study and scope of the study. Chapter two critically analyzes theoretical and empirical literature related to the study. Chapter three describes the methodology adopted in this study. Finally, chapter four and chapter five discuss the findings and conclude the study respectively.

1.1 An Overview of the Stock Markets

The stock markets indicators used for the G7 countries of Canada, America, Japan, Germany, Italy, France and United Kingdom are S&P/TSX Composite Index, Dow Jones Industrial share index, Tokyo stock exchange index, DAX share index, Comit indices, FR share price index and FTSE all share index respectively.

Dow Jones Industrial share index was first published on 16 February 1885. And it is the second-oldest index in US stock market. The index consists of 30 large publicly owned companies and indicate how these stocks have traded in the stock market during a standard trading session.

The FTSE all share index made up of 600 companies. The index base date is 10 April 1962. And traded on the London Stock Exchange based level of 100.

The DAX share index consists of 30 major German companies. And started date is 30 December 1987 with a base value of 1,000 of DAX share index. The index is trading on the Frankfurt Stock Exchange.

The FR share price index - SBF 250 reflects situation of all sectors of the French economy. The index consists of all the component stocks of the SBF 120 Index, and it started on 31 December 1990 with a base value of 1,000.

The Tokyo stock exchange index is the largest in East Asia and Asia, the world rank is number four. It is being traded on the stock exchange located in Tokyo, Japan.

The Toronto stock exchange composite share price index is made up of 250 companies, it takes up around 70 percent of the total stock market on the Toronto Stock Exchange.

The Comit indices are developed based on all the shares listed on the Italian electronic stock market. The base date is 31 December 1972 with a base value of 100.

1.1.1 The Stock Market Performance of G7 Countries

In an efficient stock market, the fluctuation of stock market price fully reflects all available information (Talla, 2013; Fama, 1970). Kirui, Wawire, and Onono (2014) highlight that the share price is influenced by the economic situation which depends on macroeconomic variables change, for example gross domestic product (GDP), interest rate, inflation rate, exchange rate and money supply. Figure 1.1 illustrates the share price index performance of the G7 countries from 2001 to 2015 year.

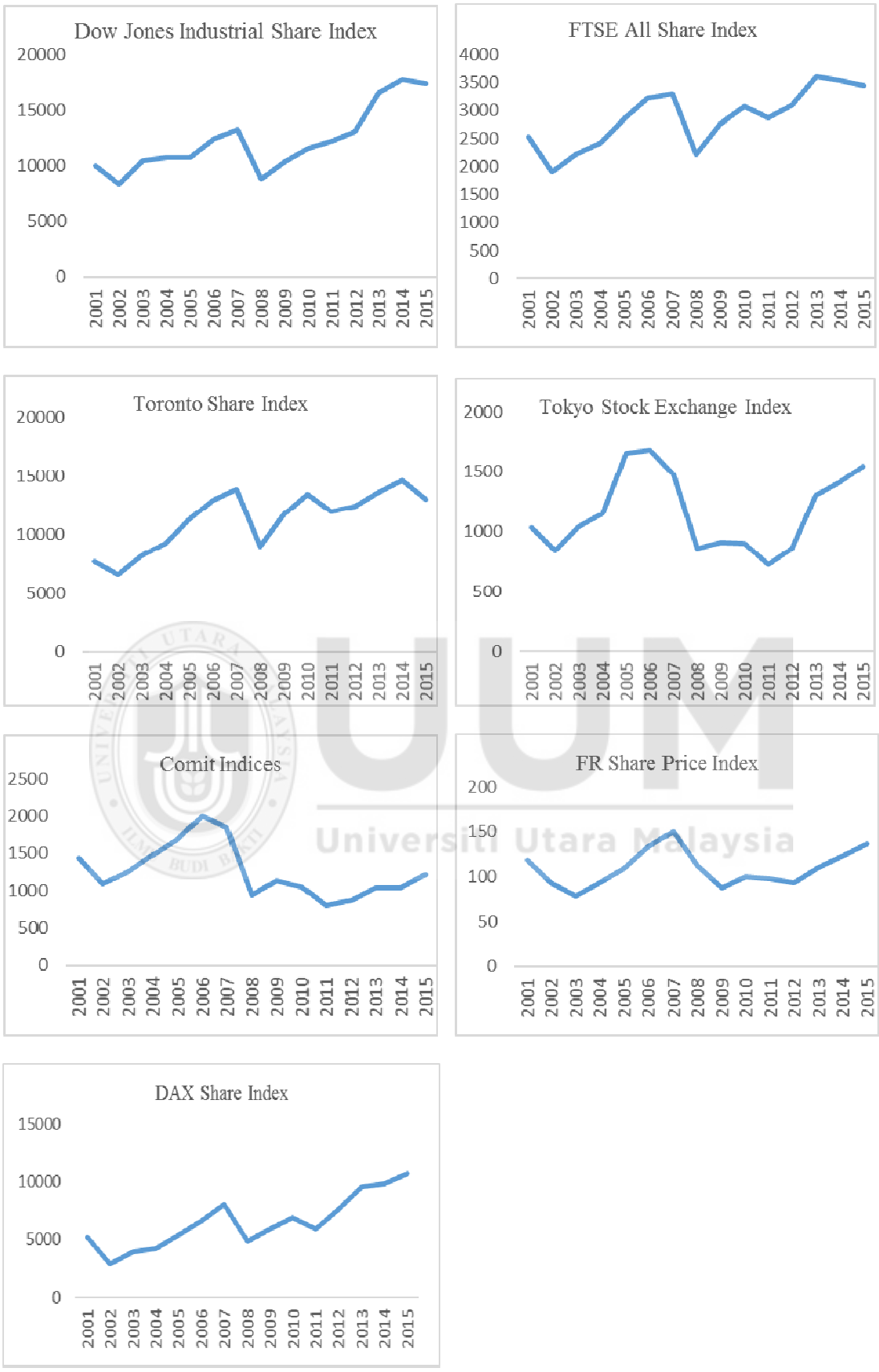

Figure 1.1: Stock Market Index of the G7 Countries

Based on Figure 1.1, the graphs for all share index show a declining trend from 2007 to 2008. The reason for the declining performance is because of the global financial crisis which began in 2007 and ended in 2008. The figure shows that most of the index had a declining trend up to 2009, except for France where the declining trend ended up in 2010.

1.2 Problem Statement

The impact of macroeconomic factors on the stock market performance has been widely researched and recorded in developed capital markets such as America, Japan, UK, Canada and European countries. Empirical studies suggest that financial crises have a negative influence on the fluctuation of stock price. For instance, concerns over the volatility of stock markets globally and in particularly developed countries increased after the massive losses suffered by stock markets in the wake of the global financial crisis in 2007-2008 (Fynn, 2012). Schwert (1989a) indicates that the volatility of stock markets increases due to the financial crises. Polasek and Ren (2001) point out wave propagation for US, Germany and Japan stock markets from 1996 to 1998 which happened during the 1997 Asian financial crisis. They observe that different fluctuation occurred in the US, Germany and Japan stock market before and after the Asian crisis. As for the global crisis of 2008, Murtagh (2012) describes that daily returns of G7 countries stock indexes had decreased by more than 0.35 percent.

A report suggests that the Chinese economy would contribute far less than usual to global economic growth in 2016 and it could have further negative effects on stock performance in the industrial countries. In the UK, the economy is expected to grow

faster in 2016 than other G7 members, but at a low rate of 2.2%, which further shows the trend in weak growth in the advanced economies. The weakness has already been reflected in stock performance with about $8 trillion wiped off from the global stock market value at the beginning of 2016 (Her Majesty Treasury (HMT), 2016). The foregoing shows that stock markets in the developed nations are undergoing stress while economic growth and macro-economic variables such as inflation, exchange rate and inflation remain unimpressive. Hence the need arises to determine which factors contribute to the losses being experienced in the stock markets and to determine if macroeconomic factors such as inflation, exchange rate and interest rate are contributing to the decline.

Sharif, Purohit and Pillai (2015) attribute changes in stock market performance to both internal and external factors in firms. The internal factors are endogenous and subject to company control while the external factors are exogenous and beyond organizational control. Among the external factors are the macroeconomic characteristics of a country's economy. Khan (2014) reveals that volatility in the macroeconomic factors for example exchange rate, interest rate, inflation and GDP growth rate influence share prices of KSE-100 index.

Interest rates represent the cost of funds and it is applied to discount future cash flows in the financial markets. When interest rate rises, investment in stocks is expected to fall given that funds are moved to other assets with higher returns such as fixed deposits, treasury bills and savings certificates (Lobo, 2000; Toraman & Basarir, 2014). Interest rates could also be used to control inflation, which could hinder

investment in stocks. Thus, Fama (1981) suggests a negative relationship between inflation and stock market performance.

Other studies indicate that inflation could have a dual effect on stock market performance (Patel, 2012). First, inflation that arises from increase in money supply could cause lower stock prices as investors move away from stocks. On the other hand, it could also lead to rising stock price if expected dividends due to increased cash flow to firms (Barakat et al., 2016). Thus, the ambiguous nature of this bidirectional causal relationship demands more investigation.

Similarly, Barakat et al. (2016) note that the relationship between exchange rate and stock prices remains unsettled. If a currency depreciates, which makes local products to be more competitive compared to foreign goods, hence enhance exports and most probably, boost the stock of firms in that industry. However, depreciation could also lead to rise in the cost of imports which has a negative impact on import dependent firms and their stocks. Thus, the exact impact of exchange rate change remains unclear and may need further clarification.

1.3 Research Questions

Due to the importance of a stock market, especially as an economic indicator, it is important to analyze the factors that could have influenced the variability of the stock market. This leads to the following research questions:

i. What is the relationship between inflation and stock market performance in G7 countries of Canada, America, Japan, Germany, Italy, France and United Kingdom?

ii. What is the relationship between exchange rate and stock market performance in G7 countries of Canada, America, Japan, Germany, Italy, France and United Kingdom?

iii. What is the relationship between interest rate and stock market performance in G7 countries of Canada, America, Japan, Germany, Italy, France and United Kingdom?

1.4 Research Objectives

The objectives of the study are:

i. To investigate the relationship between inflation rate and stock market performance in G7 countries of Canada, America, Japan, Germany, Italy, France and United Kingdom.

ii. To investigate the relationship between exchange rate and stock market performance in G7 countries of Canada, America, Japan, Germany, Italy, France and United Kingdom.

iii. To investigate the relationship between interest rate and stock market performance in G7 countries of Canada, America, Japan, Germany, Italy, France and United Kingdom.

1.5 Significance of the Study

This study is significant in the following ways:

1. A knowledge of the factors influencing stock market performance would enable policy makers to determine the right policies that could boost the stock market and promote investment.
2. Understanding the influence of macroeconomic variables on stock performance would assist economic planners to determine which of the variables to focus on influence stock market performance.
3. The study will contribute to the theoretical debates on the association between macroeconomic variables and stock market performance and provide more insight into the relationship.
4. It will provide a source of knowledge for future researchers who intend to conduct more investigation on the stock market performance and macroeconomic variables.

1.6 Scope of the Study

This study covers seven developed G7 countries which include USA, UK, Canada, Germany, France, Italy and Japan. The period of study is from 2001 to 2015.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

There are a number of studies considering the effect of macroeconomic variables on the stock market performance. Talla (2013) highlights a few macroeconomic factors that have an impact on the stock market, which at the end would influence the return for investors. He advocates that the stock price return can be significantly impacted by changes in macroeconomic variables. Vena (2012) reveals that a raise up the inflation rate would adversely influence the price of share and consequently, the rate of returns. In addition, the higher inflation would also significantly influence the interest rates, which then leading to reduction in investments.

Similarly, Alam and Uddin (2009) also explain the effect of interest rates. If a bank increases interest rate, cash holders will switch their investments from capital market to the bank. This would decrease the demand for share investment, hence causing a decrease in the share price. On the other hand, a raise up in the interest rate represents an increase in the lending rate. This would cause a decrease in the borrowing and reduce investment scales, lead to share price decrease and vice versa. With respect to exchange rates, Talla (2013) describes that an increase in the exchange rate, a depreciation in the local currency leads to a decrease in the stock prices because of expected inflation.

2.1 Theoretical Literature

Macroeconomic indicators influence the stock price directly and indirectly. Based on the following arbitrage pricing theory, the stock return can be affected by the macroeconomic indicators directly. While the Fisher Effect Theory shows that the inflation rate influence the stock price indirectly. Based on the following theory show that exchange rate influence the stock price through indirectly. The stock pricing theory shows that interest rate impact stock price directly.

Past studies indicate that there is an association between stock market and macroeconomic factors such as exchange rate, interest rate and inflation rate. Solnik (1987) examines the influence of macroeconomic factors (exchange rates, interest rates, and inflation rates) on share prices. His results show that exchange rates have a insignificant effect and positive relationship on the U.S. stock market compared to changes in inflation rates and interest rates.

2.1.1 Arbitrage Pricing Theory (APT)

APT model express that the rate of returns on any stock should be linearly related to a set of indices as shown in the following equation:

$$R_i = \lambda_0 + b_{i1}\lambda_1 + b_{i2}\lambda_2 + ... + b_{iN}\lambda_N \quad (2.1)$$

Where

λ_0 = the expected rate of return on a stock with zero systematic risk.

b_{iN} = the value of the Nth factor that impacts the return on stock i.

λ_N = the sensitivity of stock i 's return to the Nth factor.

The arbitrage pricing theory has gained recognition in the literature as an important theory for the explanation of the relationship between macro-economic variables and changes in the prices of stocks. The theory was described by Nkechukwu, Onyeagba and Okoh (2013). The sensitivity of an asset to an economic variable is a determinant of the impact of such asset (Talla, 2013). Thus, if stock is sensitive to inflation for instance, the degree of sensitivity will determine the impact of inflation on stock prices.

2.1.2 Fisher Effect Theory

The Fisher effect is an economic theory that provides the link between inflation rate and both real and nominal interest rates. The Fisher effect explained that the expected real inflation rate equals to the nominal interest rate minus the real interest rate. Hence, the real interest rate is affected directly by inflation rate. The real interest rate could fix in a situation that nominal interest rate and inflation rate movement into same direction.

$$1 + i_{\$} = (1 + \rho_{\$}) \times \mathrm{E}(1 + \pi_{\$}) \tag{2.2}$$

Whereby

$\rho_{\$}$ is the equilibrium expected real interest rate

$\pi_{\$}$ is the expected inflation rate.

$i_{\$}$ is the equilibrium expected nominal interest rate.

Equation (2.2) shows a relationship between an inflation rate and an interest rate.

2.1.3 Present Value of Stock Theory

According to the present value of stock theory, stock price dependent on expected rate of return on stock and interest rate factors. The stock price equals the present value of future expected dividend and the selling price of the stock as indicated by equation 2.3.

$$P = \sum_{t=1}^{n} \frac{D_t}{(1+i)^t} + \frac{M}{(1+i)^{(n+1)}} \qquad (2.3)$$

Where

P is stock price.

D is expected dividend.

i is the rate of return on the stock.

M is selling price of the stock.

Equation 2.3 shows an association between the share price and an interest rate. Stock price affected by interest rates through the following ways: first, the change of interest rate will cause change in the income structure of different investment tools. For instance, when raise up interest rates, earning of bond relative to the share will

increase, so that the investors who hold shares would sell their stocks meanwhile turn to invest in bonds. Second, the company profit changed by the change of interest rate. When interest rates increase, lending rate increased also. Therefor higher interest rate raise borrowing cost of companies up, this will influence the production and operation of companies, the higher production cost would be reducing profit. Hence, stockholder get less return, which then may cause a decrease in the stock price. Finally, for investors, if interest rate increases, the discount rate of the stock would increase, hence causing the present value of the stock to decrease. Then, the stock price will be decrease correspondingly.

2.2 Empirical Literature

There are vast literature examining the relationship between stock market and macroeconomic variables.

Table 2.1 summarizes past empirical literature related to the study.

Author	Country of Study	Period of Study	Technique Employed	Result
Talla (2013)	Sweden	1993-2012	OLS	Inflation and exchange rate have a significant effect and negative relationship on stock prices.
Vena (2012)	Kenya	1998-2013	EGARCH	Inflation is positive and insignificant on stock market.
Alam (2009)	Fifteen developed & developing countries.	1988 - 2003	REM	Interest rate has significant negative relationship with share price
Solnik (1987)	USA	1973-1983	GLS	Exchange rates have a positive relation with the stock market
Nkechukwu, Onyeagba & Okoh	Nigeria	1980-2013	OLS	GDP has significant long-run negative effect on stock prices Money supply has significant long-run positive effect on stock prices
Homa & Jaffe	USA	1954-1969	Cochrane and Orcut	Money supply has significant and systematic impact on stock market

Hamburger & Kochin (1972)	USA	1952-1970	Standard error of regression	Money supply have predicted effect on stock price.
Hernández (1999)	Mexico	1992-1996	GARCH	10 percent of warrant has significant negative effect on stock return volatility
Solnik (1983)	Developed countries	1971-1980	ARIMA	Inflation has significant and negative relationship with stock price
Katrakilidis & Lake (2005)	Greece	1985-2002	ARDL	Inflation rate has a positive relationship with stock market return
Rapach. (2002)	OECD countries	1990-2000	VAR	Positive association between the long-run share price movement and inflation
Geyser & Lowies (2001)	Namibian Johannesburg	1990-2000	Regression	Positive relationship between stock price and inflation.
Bekaert & Engstrom (2010)	USA	1968-2007	VAR	Inflation and stock are moving in the same direction
Geetha, Mohidin, Chandran & Chong (2011)	China Malaysia US	2000-2009	VECM	Positive co-movement between stock price and expected inflation for China but no such relationship exists for the US and Malaysia
Chidothi &Sheefeni (2013)	Zambia	1999–2011	VAR	A negative association between inflation and stock price movement
Tripathi &Kumar (2014)	BRICS countries	2001-2013	ADF	A positive and significant association between stock price movement and inflation for China and India. they find a negative but significant result for Russia and Brazil.
Yeh & Chi (2009)	OECD countries	1957-2003	VAR	There is a negative correlation and significant effect between inflation and stock price movement
Gregoriou &Kontonika (2010)	OECD countries	1970-2006	ADF	Positive relationship exists between the movement of prices in the goods and stock markets.
Arjoon, Botes, Chesung & Gupta (2012)	South African	1980-2010	VAR	Stock price keep constant against relative to change in inflation rate in the long-run.
Marx & Struweg (2015)	Johannesburg	1969-2013	MRC	In times of stagflation, there is weak but insignificant association between stock price movement
Bai (2014)	China	2000-2012	VAR	Inflation did not induce increase in the price of stock
Olufisayo (2013)	Nigeria	1986-2010	VECM	Positive short and long-run relationship between inflation and stock price movement

Barakat, Elgazzar & Hanafy (2016)	Tunisia & Egypt	1998-2014	ADF	Exchange rate moves in the same direction as the changes in the price of stock
Hsing, Budden & Phillips (2012)	Argentina	1998	GARCH	Argentine stock market index has positive relationship with exchange rate
Pal & Mittal (2011)	Indian	1995 - 2008	ECM	Positive association exists between exchange rate and stock price movement
Tsoukalas (2003)	Cypriot	1975 - 1998	VAR	Exchange rate has significant effect on Cypriot stock market
Nieh & Lee (2002)	G7 countries	1993-1996	VECM	No long-run significant association between exchange rate and stock price movements.
Yusof & Majid (2007)	Malaysia	1992-2000	GARCH	Opposing movements in the stock market prices and changes in the exchange rates
Kirui,Wawire & Onono (2014)	Kenya	2000 - 2012	TGARCH	A significant and negative relationship between the variables
Vanita & Khushboo (2015)	BRICS countries	1997-2014	Johansen co integration	Exchange rate with stock prices has negative and significant relationship.
Buyuksalvarci & Abdioglu (2010)	Turkey	2001-2010.	Granger non-causality test	Unidirectional association from stock price movement to exchange rate
Morley & Pentecost (2000)	G7 countries	1982-1994	Common cycle tests	Exchange rate movement in the G7 countries may not likely have an influence on stock price performance
Liang, Lin & Hsu (2013)	ASEAN-5 countries	2008-2011	DOLS	A causality flows from exchange rate to stock price
Pan, Fok & Liu (2007)	Seven Asia countries	1988-1998	VAR	Exchange rates with stock prices has causal relation for all countries except Malaysia
Zeren & Koc (2016)	Japan, Turkey & England	1990-2013	VAR	Exchange rate with stock market index has Strengthen causality relationship as two-way causality
Dritsaki (2005)	Greece	1989-2003	Granger causality result	Interest rate has a positive and significant relationship with stock price movement.
Humpe & Macmillan (2009)	US & Japanese	1965-2005	VAR	Stock prices is reported to be positively related to industrial production in the US, interest rate and industrial production show a negative association. In the case of Japan,
Pilinkus (2010)	Latvia, Estonia & Lithuania	2000-2008	VAR cointegration	A short and long-run relationship exist between stock price movement and the selected macroeconomic

				factors which include interest rate.
Sohail & Zakir (2010)	Pakistan	1991-2008	Cointegration	Interest rate and stock price changes could be moving in opposite directions.
Mohi-U-Din & Mubasher (2013)	India	2008 - 2012	OLS	A positive association is found between stock price movement and changes in interest rate,
Li (2002)	USA	1953-2001	Regression	A significant effect and positive correlation between interest rate and share price returns for the US. stock prices move together with higher levels of short-term interest rate.

2.2.1 Inflation and Stock Price

Inflation is a signal that an economy is facing uncertainties and it could have much impact on investment decisions. This is because investors would monitor the trend of inflation to determine whether to invest or move their funds to more favorable destinations. Rising inflation often suggest lower real income and this could lead to sale of assets by individuals to improve their purchasing power and living standard. Thus, inflation could influence changes in the price of stock. Early studies such as Homa and Jaffe (1971) pointed to a possible association between inflation and stock price movement and their position agrees with Hamburger and Kochin (1972) who had proposed that money supply have significant effect on the fluctuation in equity prices. These studies detect that an increase in equity prices tend to align with past increases in money supply. Similar view is shared by Hernández (1999) in a research conducted on the stock markets of the USA, UK, Canada, Germany, France and Japan. While no causality exists for USA, UK, Canada, Germany, France and Japan. they find in the case of Japan that stock price movement has a positive association with changes in the money supply. It suggests that expected inflation is likely to influence

stock prices thus making it possible to adopt stock as a hedge against inflation. On the other hand. Solnik (1983) examined the association between inflation and stock price movement in the USA, UK, Japan, France, Germany, Netherlands, Canada, Belgium and Switzerland from 1971-1980. The study finds that a lower expected inflation has a negative relationship with stock price.

Katrakilidis and Lake (2005) investigate the association between inflation and stock price movement in Greece with data from 1985-2002. They contend that stock could serve as an instrument to hedge against inflation. Their results support this assertion in that a positive correlation between inflation and share price movement. Similarly, Rapach (2002) in a study covering the period from 1990-2000 for sixteen developed countries finds a positive association between the long-run share price movement and inflation which supports the hedge against inflation postulated in Fisher's theory. In another study conducted by Geyser and Lowies (2001) for the periods of 1990-2000 between Namibian and Johannesburg stock markets, they find a positive relationship. They conclude that stock could serve as hedge against inflation. Also, in a study conducted by Bekaert and Engstrom (2010) they find that in the US, in times of inflation and uncertainties, there is a likelihood of investors demanding for higher premium on stocks which indicates that inflation and stock are moving in the same direction.

In another strand of the literature, Geetha, Mohidin, Chandran and Chong (2011) study the stock market of the US, China and Malaysia using 2000-2009 data. They investigate whether there is a significant association between inflation and stock price

movement. In their contrasting result, there is a positive co-movement between stock price and expected inflation for China but no such relationship exists for the US and Malaysia. However, in a study on the Zambian stock market covering 1999-2011, Chidothi and Sheefeni (2013) find a negative correlation between inflation and share price movement. Consistent with Geetha et al (2011), Tripathi and Kumar (2014) examine the nexus between stock price movement and inflation in the BRICS countries which include Brazil, Russia, India, China, and South Africa with monthly data spanning 2001-2013. They conduct a Granger causality test in addition to the regression analysis and find a positive and significant association between stock price movement and inflation for China and India. They find a negative but significant result for Russia and Brazil. The study by Yeh and Chi (2009) which cover twelve OECD countries from 1957-2003 provide inflation rate and stock price relationship what obtains in the selected nations. The outcome of their VAR model shows that there is a negative and significant association between inflation and stock price movement in the long run for seven countries which are Canada, Finland, Germany, Italy, Netherlands, New Zealand, United States. Gregoriou and Kontonikas (2010) investigate the association between the movements in the goods and stock markets and to determine if stock could hedge against expected inflation. The finding for the sixteen sampled OECD countries from 1970-2006 reveal that a long run positive relationship exists between the movement of prices in the goods and stock markets. Thus, they conclude that stocks could hedge against expected inflation.

Meanwhile, Arjoon, Botes, Chesung and Gupta (2012) provide a contrasting finding. In the research which covers 1980-2010 data conducted on the South African stock market, they find stock price keep constant against relative to change in inflation rate

in the long-run. This suggests that inflation has no influence on the movement of prices in the stock market. The study of Marx and Struweg (2015) conducted on the Johannesburg Stock Exchange (JSE) which employed 1969-2013 data investigate stagflation and stock price movement. The regression result shows that in times of stagflation, there is weak but insignificant association between stock price movement and inflation but no association found in the absence of stagflation.

In a study on the Asian stock market, Bai (2014) investigates the Chinese stock market to determine the influence on inflation of prices. Using data that spans from 2000-2012, the author reports a low effect of inflation on stock price movement. The finding shows that although there is a co-movement between inflation and stock prices, results show some relative stability even in periods of rising inflation. This suggests that inflation did not induce increase in the price of stock perhaps due to the peculiarity of government controls in China. However, a related study from a developing country by Olufisayo (2013) on the Nigerian Stock market finds a positive short and long-run relationship between inflation and stock price movement from 1986-2010. This supports the findings in developing nations which indicates that stock could be used to hedge against inflation.

In conclusion results reported using different simple countries shows that the relationship between inflation and stock price movement cannot be determined and would require further investigation.

2.2.2 Exchange Rate Changes and Stock Price

An exchange rate movement has become a major determinant of changes in the internal economies of nations around the world especially where there is exchange rate volatility. Depreciation in exchange rate could be a signal of economic recession or a tool to attract foreign investment. When an exchange rate depreciation is associated with inflation, it could lead to capital flight as investors seek for a more stable environment for their funds. This could cause the sale of stock in order to move the funds to a less volatile economy. Thus, developments in the foreign exchange market could influence movements in the prices of stock. Barakat et al (2016) examine several macro-economic variables which include exchange rate in their study of Tunisia and Egypt. The investigation covered the period from 1998-2014 and the findings indicate that the exchange rate moves in the same direction as the changes in the price of stock and would not likely move away from each other. Thus, they conclude that a relationship exists between the two variables and changes in exchange rate could likely predict changes in the price of stock.

Hsing, Budden and Phillips (2012) and Pal and Mittal (2011) examine the co-movements in the exchange rate and stock prices for the Argentina and Indian stock market respectively. In the test for a long-run relationship, they find that a positive association exists between exchange rate and share price movement in the two countries. Similar finding is reported by Tsoukalas (2003) where developments in the external market which affect exchange rates are transmitted directly to the stock market. This could be connected with the dependence of the Cypriot economy on the external sector especially off-shore banking and tourism.

In a different strand of the literature on G7 nations, Nieh and Lee (2002) identify no long-run significant association between exchange rate and share price movements. The finding for the US in particular indicate that changes in the value of the dollar could not be considered as a reliable predictor of changes in the price of stock. In the Malaysian stock market, Yusof and Majid (2007) which show opposite movements in the stock market prices and changes in the exchange rates. In Kenya also, Kirui, Wawire and Onono (2014) report a significant and negative relationship between the variables.

Also, Vanita and Khushboo (2015) who investigate the BRICS nations of Brazil, Russia, Indian, China and South Africa in the period spanning 1997-2014 find a negative relationship. They conclude that for Russia, India and South Africa, exchange rate changes and stock price movement are in opposite directions. However, there is no established trend in the finding of Morley and Pentecost (2000) for the USA, UK, Germany, Italy and Japan in their study that spanned 1982-1994. The result suggests that exchange rate movement in the G7 countries may not likely have an influence on the stock price performance.

In contrast to the above, Buyuksalvarci and Abdioglu (2010) find a long-run but unidirectional association from stock price movement to exchange rate and other macro variables such as money supply and consumer price index (CPI). This suggests that changes in exchange rate and other macro variables may not be a good predictor of changes in the price of stock. With the test of causal relationship, Liang, Lin and Hsu (2013) examine the association between exchange rate changes and stock price

returns in five Asian countries with data covering 2008-2011. They find that a causality flows from exchange rate to stock price. A similar result is found in the study by Pan, Fok and Liu (2007) for selected Asian countries. However, Zeren and Koc (2016) employing 1990-2013 monthly data for Japan, Turkey and England, find that the two variables have two-way causalities. They report that a bi-causality exist between the two variables which shows that the influence of one on the other may be difficult to determine.

2.2.3 Interest Rate and Stock Price.

Interest rate is another factor that is considered capable of influencing stock price movement. Interest rate is the opportunity cost of investing in stock. When interest rate on government bonds and treasury bills become attractive, investors could shift away from stock especially since treasury bills and bonds are considered less risky. If investors sell stock and invest the funds in government securities, the price of shares could fall. Thus, interest rate changes could influence the changes in the prices of stock.

Dritsaki (2005) examines the stock market of Greece using the quarterly data for the period of 1989-2003. The study investigates three macro variables which include interest rates, inflation and industrial production. The Granger causality result show that a positive and significant causal association exist between the three variables and stock price movement. It suggests that an interest rate has a significant effect and positive relationship with the share price volatility.

The study of Humpe and Macmillan (2009) on the US and Japanese stock prices present contrasting findings. While the movement of stock prices is reported to be positively related to industrial production in the US, interest rate and industrial production show a negative association. In the case of Japan, they find no significant impact between share price movement and interest rate. Pilinkus (2010) investigate data from 2000-2008 for Latvia, Estonia and Lithuania. They report that both a short and long-run link exist between stock price movement and the selected macroeconomic factors which include interest rate. They further conclude that investors need to take cognizance of changes in macro-economic variables as these could serve as predictors of movement in the prices of stock.

Contrary to the finding of Pilinkus (2010), Sohail and Zakir (2010) report a mix result for exchange rate, money supply, industrial production and interest rate in the Karachi Stock market. While a positive association is reported for exchange rate and industrial production, they find a negative relationship for interest rate. This suggests that interest rate and stock price changes could be moving in opposite directions. Mohi-U-Din and Mubasher (2013) investigate the indian stock market with data between 2008 and 2012. The macro variables in the study include interest rate. They report that a positive association is found between stock price movement and changes in interest rate, inflation, exchange rate, money supply and industrial production. They however suggest that further research is necessary given that other factors could still play some roles other than macro variables. However, Naik (2013) find an insignificant relationship while Zakaria and Shamsuddin (2012) find no relationship between interest rate and changes in the prices of stock.

Barakat et al. (2016) investigate the stock market of Egypt and Tunisia with 1998-2014 data. Their study find a long-run relationship which indicates that interest rate and money supply have a co-movement with stock price changes. Thus, they suggest that interest rate could influence changes in the prices of stock.

Li (2002) find a significant effect and positive association between interest rate and share price returns for the US. In the study conducted with 1953-2001 data, the author finds a correlation between stock price movement and interest rate in the time of economic boom. However, a contrary result is found for the UK. It indicates that for the US economy, stock prices move together with higher levels of short-term interest rate.

In summary, even though there are other studies analyzing the potential association between share price and macroeconomic factors of inflation rate, exchange rate and interest rate, results are still inconclusive. Hence, this indicates that there is still a need to further analyze the impact of inflation rate, exchange rate and interest rate on the stock price movement.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

In examining the impact of exchange rate, inflation rate and interest rate on the stock market performance, this study employs panel data analysis of pooled, fixed and random effects models.

3.1 Data

This study covers 15 years period from 2001 to 2015. The data are comprised of stock market indices, inflation rate, exchange rate and interest rate. The exchange rates used are the local currencies against US dollar except for the United States where for the United States, the exchange rate used is Australian dollar to US dollar. For Italy, Germany and France exchange rate, their exchange rates are based on Euro to US Dollar. Because of they are European Union countries and they started to use the euro currency in 2001. In terms of interest rate data, one year fixed deposit interest rate is used. For the inflation rate data, this study adopts the consumer price index (CPI).

3.2 Theoretical Framework

This paper intents to investigate the relationship between stock market performance and interest rate, inflation rate, and exchange rate among G7 countries. Figure 3.1 highlights the dependent and independent variables

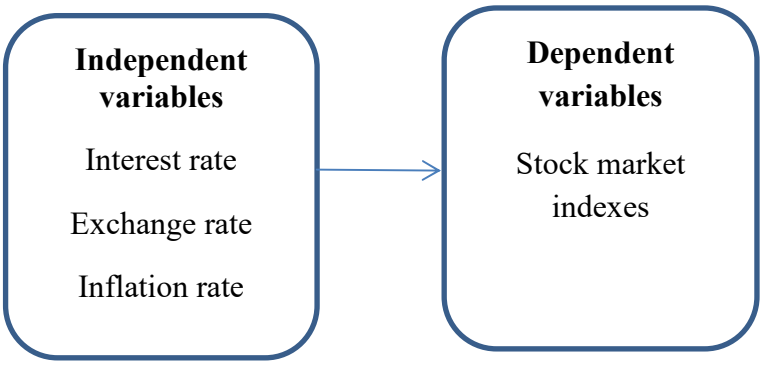

Figure 3.1 Theoretical Framework

3.2.1 Dependent Variable

In this study, stock market indices of the G7 countries are used as dependent variables that is regressed on the inflation rate, interest rate and exchange rate. All data collected are based on an annual basis.

3.2.2. Independent Variables

Independent variables used in this study are inflation rate, interest rate and exchange rate. All the data are collected from the data stream.

3.3 Hypothesis

The hypothesis of the study are as follows:

1. H_0: There is no significant relationship between inflation rate and stock market performance of G7 countries.

H_1: There is a significant relationship between inflation rate and stock market performance of G7 countries.

2. H_0: There is no significant relationship between exchange rates and stock market performance of G7 countries.

   H_1: There is a significant relationship between exchange rates and stock market performance of G7 countries.

3. H_0: There is no significant relationship between interest rates and stock market performance of G7 countries.

   H_1: There is a significant relationship between interest rates and stock market performance of G7 countries.

3.4 Model

The motivation of this paper is to examine the impact of inflation rate, exchange rate and interest rate on stock market performance as indicated by equation 3.1.

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$$(INDEX)_{it} = a + \beta_1 INFR_{it} + \beta_2 EXR_{it} + \beta_3 INR + u_{it} \quad (3.1)$$

Where;

$INDEX_{it}$ = All Share Index of countries i at period t.

$INFR_{it}$ = Inflation rate of countries i at period t.

EXR_{it} = Exchange rate of countries i at period t.

INR_{it} = Interest rate of countries i at period t.

U_{it} = stochastic error term or random disturbance term.

a and β is parameters of set up or regression coefficients.

3.5 Methods of Estimation

Based on equation 3.1 there are three techniques that will be used to estimate the regression. The techniques are pooled ordinary least square (pooled OLS) model, random effect (RE) model and fixed effect (FE) model. These three models are estimated on the parameters of intercept, the slope of coefficient and the standard error terms.

3.5.1 Pooled ordinary least square model (pooled OLS)

Pooled ordinary least square model is estimated base on the general OLS regression. the model is shown as below:

$$Y_{it} = a + \beta_1 X_{1it} + \beta_2 X_{2it} + u_{it} \tag{3.2}$$

i = 1, 2, 3, 4, 5, 6, 7.

t = 1, 2, ..., 15.

Where

Y_{it} is the dependent variable for country *i* in the period ***t.***

X_{it} are independent variables for country *i* in the period *t*

i stands for the *i* th cross sectional unit.

t for the *t* th time periods.

a and β is parameters of set up or regression coefficients.

U_{it} is stochastic error term or random disturbance term.

This model is a balanced panel data and every single cross sectional unit has the same number of time series observations. Assuming Equation (3.2) has constant coefficient contain both intercept and slopes. The error term U_{it} contains cross sections varies and over time .The pooled OLS of this study is as follow:

$$(INDEX)_{it} = a + \beta_1 INFR_{it} + \beta_2 EXR_{it} + \beta_3 INR + u_{it} \quad (3.3)$$

3.5.2 Fixed Effect Model

The fixed effect model suggests that each country should have a constant slope but intercept that differs according to each country. The intercept is cross section specific and differs between each country. It may or may not differ over time. The difference may be due to special condition of each country. Although the intercept may differ for

individual of G7 countries, each intercept of individual is fixed or time invariant, does not vary over time. The specification of the fixed effect model is as below:

$$Y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + u_{it} \quad (3.4)$$

Where, i on intercept term in above equation impose that the intercepts of the cross sections may not be the same. The fixed effect model of this study can be written as follow:

$$(INDEX)_{it} = \beta_{1i} + \beta_2 INF_{it} + \beta_3 EXR_{it} + \beta_4 INR_{it} + u_{it} \quad (3.5)$$

3.5.3 Random Effect Model

The random effects model is a special case of the fixed effects model and if the dummy variable in fact represent a lack of knowledge against the true model. The basic model for the random effect is as follows:

$$Y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + u_{it} \quad (3.6)$$

Where

β_{1i} as fixed, it is treating as a random variable with a mean value of β_1 .and the intercept value for an individual country can be expressed as

$$\beta_{1i} = \beta_i + \varepsilon_i \quad i=1,2,3,4,5,6,7 \tag{3.7}$$

Where ε_i is a random error term with a mean value of zero and variance of σ_ε^2. All the G7 countries that they have a common mean value for the intercept and the individual differences in the intercept values of each country are reflected in the error term ε_i. Combine equation (3.6) and (3.7) into one formula we can get a deviation formula as shown below:

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \omega_{it} \tag{3.8}$$

Where

$$\omega_{it} = \varepsilon_i + u_{it} \tag{3.9}$$

The recombination error term of RE model express as ω_{it}**Error! Reference source not found.** contains two components. ε_i the expression of individual specific error term, while μ_{it} is the expression of the error term of time series and cross-section.

$$INDEX_{it} = \beta_1 + \beta_2 INF_{it} + \beta_3 EXR_{it} + \beta_4 INR_{it} + \omega_{it} \tag{3.10}$$

Equation (3.10) indicates the model of random effect which would be used in this study.

3.5.4 Redundant Fixed Effect

To estimate whether a pooled OLS model or a fixed effect model is better for this study, the redundant test is applied. The pooled model does not make difference

between time series and cross section and it is mostly not appropriate for analysis. However, it is often useful to apply redundant fixed effect test and based on the results decide to whether use a fixed-effect model or a pooled model.

Null hypothesis: pooled OLS model is appropriate.

Alternative hypothesis: fixed effect model is appropriate.

3.5.5 Hausman Test

The Hausman test is applied in this study to decide either to use a fixed effect model or a random effect model.

Null hypothesis: random effect model is appropriate.

Alternative hypothesis: fixed effect model is appropriate.

3.5.6 Fixed Effect with Robust Standard Error (FE Robust)

The heteroskedasticity and serial correlation problem may arise under the fixed effect model. In that case, the fixed effect model with robust standard error is more accurate to deal with heteroskedasticity and serial correlation.

3.6 Diagnostic Tests

In order to check validity and reliability of this study, estimation results will be exposed to multicollinearity, heteroskedasticity and serial correlation tests. If there exist a strength correlation between any two random independent variables, that will

view as multicollinearity problem. Multicollinearity problem leads significant variable to insignificant by increasing its standard error, which is identified by variance inflation factor (VIF). The reference standard value is 5. If the VIF is less than 5, the study is considered to be free from the multicollinearity problem. If the variance of error term is not constant, there is heteroskedasticity problem. The standard errors are biased when heteroskedasticity is present. The Modified Wald Test is used to identify heteroskedasticity in the fixed effect regression model.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This study intends to analyze the relationship between stock price and interest rates, inflation rates and exchange rates. In achieving the objectives, this study had employed a panel data analysis of Pooled OLS, Fixed effect model and Random effect model. The existence of heteroskedasticity and serial correlation further suggests the study to adopt the fixed effect model with robust standard error.

4.1 Descriptive Statistics

Descriptive statistic describes the characteristics of the data. It measures central tendency and variability or dispersion of data set. The central tendency includes the mean, median and mode, while measure of variability include the standard deviation, minimum and maximum value of data set.

Table 4.1 shows descriptive statistics of the variables within this study. For the LINDEX, the mean, minimum and maximum values are 7.736831, 4.353241 and 9.788249 respectively. It indicates that all the stock indices' central tendency is 7.736831. And distribution from 4.353241 to 9.788249. For exchange rate the mean, minimum and maximum value is 1.007160, 0.007987 and 1.982200 respectively. The 1.007160 which meaning value of currency almost same within G7 countries at the

mean of exchange rate. And the minimum and maximum of exchange rate change less compare with mean value. It represents lower volatility also and the SD value is 0.508668. The inflation rate mean value is 1.602095 which meaning average inflation rate of whole G7 countries within 15 years, and the distribution from -1.35 to 4.48. For interest rate mean value is 2.222668, and distribution from 0.015625 to 5.8.

Table 4.1

Descriptive statistics

Variables	Mean	SD	Min	Max	Observations
LINDEX	7.736831	1.562655	4.353241	9.788249	105
EXR	1.007160	0.508668	0.007987	1.982200	105
INFR	1.602095	1.145870	-1.35	4.48	105
INR	2.222668	1.598341	0.015625	5.8	105

4.2 Correlation Matrices

Correlation matrix which is used to show how multiple variables are related with each other at the same time. It is reported as correlation coefficient between two random variables.

Table 4.2 shows the correlation among the underlying variables of LINDEX, interest rates, inflation rates, exchange rates. The LINDEX with interest rates and LINDEX with inflation rates and interest rate have a positive relationship. The result is

consistent with Caporale and Jung (1997) where they find a positive association between share price and inflation rate. Interest rate and inflation rate with LINDEX has weak correlation which is below 0.2. Exchange rate with LINDEX has a negative correlation which is -0.062288. Empirical reporting by Solnik (1987) investigated on eight industrial countries from 1973-1983 to test the correlation between stock returns an exchange rates and find a negative correlation among variables. The figure indicates that there is a weak correlation between exchange rate and Lindex also. LINDEX with exchange rate has opposite direction that meaning when LINDEX increase (decrease) exchange rate would be decrease (increase). Interest rate with exchange rate and inflation rate with exchange rate has a moderate positive relationship. Which is 0.413818 and 0.439345 respectively. That means both of them are moving in the same direction. One variable increase (decrease) another variable increase (decrease) also. Inflation rate with interest rate has a strong correlation which is 0.528234. Table 4.3 Measures the strength of correlation relationship between variables.

Table 4.2

Correlation Matrices

	LINDEX	INR	INFR	EXR
LINDEX	1.000000			
INR	0.074214	1.000000		
INFR	0.194893	0.528234	1.000000	
EXR	-0.062288	0.413818	0.439345	1.000000

Table 4.3

Strength of Correlation Relationship

Correlation < 0.20	Weak relation
Correlation ≥ 0.2 but < 0.5	Moderate relation
Correlation ≥ 0.5 up to 1	Strong relation

Source: Adapted from Ali (2014)

4.3 Results of Pooled, Fixed and Random Effects Models

Table 4.4 highlights the estimated results of Pooled OLS model, Random effect model, fixed effect model and fixed effect with robust standard errors. To determine the appropriate model within pooled, fixed effects or random, the Hausman test and Redundant Fixed Effects test were applied into this study. After run regression of Redundant Fixed Effects, the result show a significant p-value of the test is 0 which is less than 0.05. So, it suggests that the fixed effects model is more appropriate compared to the pooled OLS. And then, after running the Hausman test, the result shows a significant p-value of the is 0 which is less than 0.05 also. It recommends choosing the fixed effects model is more appropriate compared to the random effects model. The variance inflation factor (VIF) applied identify the multicollinearity problem (VIF) is 1.43 which is less than 5, and it means the multicollinearity problem does not exist. The Modified Wald test was used to test for heteroskedasticity in fixed effect regression model. Table 4.4 shows the prob>chi2 which is 0 less than 5 percent. Hence, the FE model has heteroskedasticity problem. And then Wooldridge test for autocorrelation problems the prob>chi2 which is 0.0006 less than 5 percent. That means the FE model has serial correlation problem. To rectify the indicated problems

of heteroskedasticity and serial correlation, the fixed effect model with robust standard error was further conducted.

Under the fixed effect model with robust standard error, only the inflation rate is found to be significant, while interest rate and exchange rate are not significant. Results of this study tend to support results of past empirical studies. For instance, a study by Dan (2014) indicates that there is insignificant influence between interest rate and stock price. Yousuf and Nilsson (2013) found that there is no statistically significant correlation between the exchange rates and the Swedish stock market. For inflation rate is found to be significant in affecting the stock price at 5 percent significance level. An inflation rate has a positive relationship with stock price. From Table 4.4, a 1 unit increase in inflation rates the stock price would increase by 38 percent. Mohammed and John (2001) had summarized that the inflation rate, clearly, has an impact on the stock market performance in terms of market activity and liquidity. According to Bodie (1976) it is good for the stock market to hedge against inflation, due to the fact that increase price level represents on real assets, hence, price of the stocks should not be impacted by the real change on the inflation rate. The profits of stock should be consistent with the inflation rate. The stock price hedging inflation rate implies that profit of investors is fully protected by increases in the general price level through corresponding increases in stock price and thus the stock price is unaffected. The stock price is immune by inflation pressure also.

Table 4.4

Results of Panel Data Analysis

	Pooled OLS	Fixed Effect	Random Effect	Fixed Effect Robust
Constant	7.70	7.37	7.56	7.66
	(21.97)***	(19.25)***	(11.49)***	(21.29)***
INR	0.01	0.36	-0.05	0.03
	(0.06)	(1.64)	(-2.48)**	(0.22)
INFR	0.37	0.52	-0.00	0.38
	(2.31)**	(2.56)**	(-0.09)	(2.28)**
EXR	-0.57	-1.25	0.29	-0.41
	(-1.68)	(-2.88)***	(1.74)	(-1.19)
Observations:	105	105	105	105
R^2	0.065126	0.163082	0.099986	0.060312
Redundant Fixed Effect test	388.83 (0.0000)***			
Hausman test			9.08 (0.0283)***	
Multicollinearity (VIF)	1.43			
Heteroskedasticity (X^2 -stat)	57.21 (0.0000)***			
Serial Correlation (F-stat)	42.356 (0.0006)***			

Note: **and*** indicate the significant level at 5% and 1% respectively. Figures in the parentheses are t-statistics, except for the Redundant Fixed Effects test, Hausman test, Heteroscedasticity and Serial Correlation, which are p-values.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.0 Introduction

The role of the stock market in facilitating the movement of funds is undoubted. The stock market is considered to be one of the important elements of the financial system. Nevertheless, stock prices fluctuate; they are uncertain. The fluctuation of the stock prices has been proved to be caused by a number of factors. Among the factors mostly analyzed are macroeconomic variables such as inflation, interest and exchange rate, money supply and GDP. Due to the important role of the stock market and also the variability of the macroeconomic variables, this study had been carried out with the intention to investigate the impact of inflation rate, interest rate and exchange on the stock market performances of G7 countries of Canada, United States, Japan, Italy, Germany, United Kingdom and France.

5.1 Summary of the Study

This study analyzes the relationship between macroeconomic variables and stock market indices of G7 countries. Variables considered for this study include stock exchange index, interest rate, inflation rate and exchange rate. The data used for this study are annual data for the period of 2001 to 2015.

In achieving the objectives, this study had employed a pooled OLS model, a random effect model and a fixed effect model. Further analysis indicates that the model does not satisfy heteroscedasticity and serial correlation assumptions. Hence, there is a need to regress a fixed effect with robust standard error. Besides, the Hausman test and the redundant fixed effect test justified the selection of the fixed effect model as the best model to explain the relationship between the stock market and the macroeconomic variables of inflation rate, interest rate and exchange rate compared to the pooled OLS model and the random effect model.

Results of the fixed effect model with robust standard error indicate that only the inflation rate is found to be significant and positive in influencing the stock market index. The interest rate and the exchange rate are not significant, although the result for interest rate indicate a positive sign and the exchange rate has a negative sign.

The positive relationship between the inflation rate and the stock market index indicates that the stock market is a good hedge against inflation. Hence, it can be considered as a good investment strategy where it can protect investors against the potential loss as a result of inflation. Both the inflation rate and the stock market index are moving in the same direction. This phenomenon can be explained by the empirical reporting that as inflation rate increases, the flow of capital would be gain among market. While demand side keep constant, thereby pushing commodity price to go up. The stock price goes up also.

5.2 Limitations of the study

This study uses a period of 15 years. Thus, the result might be relevant to analyze short term implication of the effects of the independent variables on stock returns. However, to look at the effects over a longer interval, more time series data are needed. Furthermore, this study only investigates the relationship between three independent variables, which are interest rate, inflation rate and exchange rate with stock market performance. Therefore, this study might suffer from the problem of omitted bias.

5.3 Recommendation of the Study

According to the result of this study, inflation rate is considered to have a significant influence on the stock market. Because of that, policy makers should pay particular attention on the inflation rate. Policy makers, through monetary policy, should try to maintain the inflation rate in order to stabilize the economy. As the inflation rate has a significant and positive influence on the stock market, the stock market should be considered a good avenue for investors to channel their investments which means investors can be protected against the loss because of inflation.

In studying the impact of macroeconomic variables on the G7 countries' stock market performance, a longer period of study may give better results. Also, future researchers can use other economic indicators to investigate the impact on the stock market.

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APPENDICES

DATA

YEAR	COUNTRY	INDEX	INTEREST RATE	INFLATION RATE	EXCHANG RATE
2001	USA	10021.5	4.53	2.83	0.5141
2002	USA	8341.63	2.97	1.59	0.5627
2003	USA	10453.92	1.41	2.27	0.7390
2004	USA	10783.01	1.23	2.68	0.7666
2005	USA	10717.5	3.69	3.39	0.7432
2006	USA	12463.15	5.16	3.23	0.7859
2007	USA	13264.82	5.16	2.85	0.8724
2008	USA	8776.39	2.54	3.84	0.6708
2009	USA	10428.05	2.25	-0.36	0.9026
2010	USA	11577.51	0.84	1.64	0.9929
2011	USA	12217.56	0.91	3.16	1.0118
2012	USA	13104.14	1.15	2.07	1.0473
2013	USA	16576.66	0.68	1.46	0.8984
2014	USA	17823.07	0.55	1.62	0.8255
2015	USA	17425.03	1.07	0.12	0.7248
2001	UK	2523.88	5.09	1.24	1.4193
2002	UK	1893.73	4.86	1.26	1.4267
2003	UK	2207.38	3.69	1.36	1.5636
2004	UK	2410.75	4.61	1.34	1.8473
2005	UK	2847.02	5.09	2.05	1.8992
2006	UK	3221.42	4.69	2.33	1.7469
2007	UK	3286.67	5.76	2.32	1.9673
2008	UK	2209.29	5.80	3.61	1.9822
2009	UK	2760.8	2.13	2.17	1.4433
2010	UK	3062.85	1.10	3.29	1.5070
2011	UK	2857.88	1.67	4.48	1.6387
2012	UK	3093.41	1.94	2.82	1.5808

2013	UK	3609.63	0.88	2.55	1.5239
2014	UK	3532.74	0.90	1.46	1.6495
2015	UK	3444.26	1.01	0.05	1.4922
2001	CANADA	7688.41	4.38	2.53	0.6356
2002	CANADA	6614.54	3.48	2.26	0.6342
2003	CANADA	8220.89	3.64	2.76	0.6708
2004	CANADA	9246.65	2.06	1.86	0.7532
2005	CANADA	11272.26	3.03	2.21	0.8320
2006	CANADA	12908.39	4.14	2	0.8581
2007	CANADA	13833.06	4.23	2.14	0.8639
2008	CANADA	8987.7	3.35	2.37	0.9738
2009	CANADA	11746.11	1.85	0.3	0.8083
2010	CANADA	13443.22	1.20	1.78	0.9811
2011	CANADA	11955.09	1.95	2.91	1.0238
2012	CANADA	12433.53	1.85	1.52	0.9997
2013	CANADA	13621.55	1.61	0.94	0.9780
2014	CANADA	14632.44	1.39	1.91	0.8933
2015	CANADA	13009.95	1.15	1.13	0.7940
2001	JAPAN	1032.14	0.17	-0.8	0.0082
2002	JAPAN	843.29	0.11	-1.31	0.0080
2003	JAPAN	1043.69	0.08	0.17	0.0086
2004	JAPAN	1149.63	0.02	-0.01	0.0092
2005	JAPAN	1649.76	0.08	-0.27	0.0091
2006	JAPAN	1681.07	0.33	0.24	0.0086
2007	JAPAN	1475.68	0.77	0.06	0.0085
2008	JAPAN	859.24	1.21	1.37	0.0097
2009	JAPAN	907.59	1.10	-1.35	0.0107
2010	JAPAN	898.8	0.55	-0.72	0.0114
2011	JAPAN	728.61	0.62	-0.28	0.0125
2012	JAPAN	859.8	0.53	-0.03	0.0125
2013	JAPAN	1302.29	0.45	0.36	0.0102

2014	JAPAN	1407.51	0.25	2.75	0.0094
2015	JAPAN	1547.3	0.25	0.79	0.0083
2001	ITALY	1433.36	4.30	2.79	0.8956
2002	ITALY	1091.89	3.94	2.46	0.9449
2003	ITALY	1256.64	2.55	2.68	1.1309
2004	ITALY	1475.05	2.00	2.22	1.2433
2005	ITALY	1679.13	2.34	2	1.2448
2006	ITALY	1997.16	3.11	2.07	1.2557
2007	ITALY	1841.38	4.10	1.82	1.3706
2008	ITALY	942.9	4.65	3.38	1.4706
2009	ITALY	1137.58	1.92	0.75	1.3933
2010	ITALY	1048.42	1.18	1.54	1.3268
2011	ITALY	805.85	1.86	2.74	1.3917
2012	ITALY	873.02	1.41	3.04	1.2856
2013	ITALY	1041.34	0.55	1.22	1.3281
2014	ITALY	1038.26	0.61	0.24	1.3288
2015	ITALY	1217.7	0.25	0.04	1.1096
2001	GERMANY	5160.1	4.30	1.98	0.8956
2002	GERMANY	2892.6	3.94	1.42	0.9449
2003	GERMANY	3965.2	2.55	1.03	1.1309
2004	GERMANY	4256.1	2.00	1.67	1.2433
2005	GERMANY	5408.3	2.34	1.55	1.2448
2006	GERMANY	6596.9	3.11	1.58	1.2557
2007	GERMANY	8067.3	4.10	2.3	1.3706
2008	GERMANY	4810.2	4.65	2.63	1.4706
2009	GERMANY	5957.4	1.92	0.31	1.3933
2010	GERMANY	6914.2	1.18	1.1	1.3268
2011	GERMANY	5898.4	1.86	2.08	1.3917
2012	GERMANY	7612.4	1.41	2.01	1.2856
2013	GERMANY	9552.2	0.55	1.5	1.3281
2014	GERMANY	9805.6	0.61	0.91	1.3288

2015	GERMANY	10743	0.25	0.23	1.1096
2001	FRANCE	118.77	4.30	1.63	0.8956
2002	FRANCE	92.95	3.94	1.92	0.9449
2003	FRANCE	77.73	2.55	2.11	1.1309
2004	FRANCE	92.87	2.00	2.13	1.2433
2005	FRANCE	109.34	2.34	1.74	1.2448
2006	FRANCE	132.85	3.11	1.68	1.2557
2007	FRANCE	150.31	4.10	1.49	1.3706
2008	FRANCE	112.92	4.65	2.81	1.4706
2009	FRANCE	87.36	1.92	0.09	1.3933
2010	FRANCE	100	1.18	1.53	1.3268
2011	FRANCE	98.05	1.86	2.12	1.3917
2012	FRANCE	92.67	1.41	1.96	1.2856
2013	FRANCE	109.98	0.55	0.86	1.3281
2014	FRANCE	122.34	0.61	0.51	1.3288
2015	FRANCE	137.21	0.25	0.04	1.1096

Descriptive Statistics

Date:04/04/17 Time: 16:15

Sample: 2001 2015

	LINDEX	INR	INFR	EXR
Mean	7.736831	2.222668	1.602095	1.007160
Median	7.957835	1.920000	1.680000	1.109625
Maximum	9.788249	5.800000	4.480000	1.982200
Minimum	4.353241	0.015625	-1.350000	0.007987
Std. Dev.	1.562655	1.598341	1.145870	0.508668
Skewness	-0.746335	0.503337	-0.338080	-0.670849
Kurtosis	2.617787	2.026040	2.850785	2.830051
Jarque-Bera	10.38692	8.583704	2.097629	8.002033
Probability	0.005553	0.013680	0.350353	0.018297
Sum	812.3673	233.3801	168.2200	105.7518
Sum Sq. Dev.	253.9567	265.6882	136.5539	26.90924
Observations	105	105	105	105

Correlation Matrix

	LINDEX	INR	INFR	EXR
LINDEX	1.000000	0.074214	0.194893	-0.062288
INR	0.074214	1.000000	0.528234	0.413818
INFR	0.194893	0.528234	1.000000	0.439345
EXR	-0.062288	0.413818	0.439345	1.000000

Pooled OLS Test

Dependent Variable: LINDEX
Method: Panel Least Squares
Date: 04/04/17 Time: 15:33
Sample: 2001 2015
Periods included: 15
Cross-sections included: 7
Total panel (balanced) observations: 105

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INR	0.006580	0.114063	0.057690	0.9541
INFR	0.371660	0.161235	2.305082	0.0232
EXR	-0.567744	0.338771	-1.675891	0.0969
C	7.698579	0.350369	21.97280	0.0000

R-squared	0.065126	Mean dependent var	7.736831
Adjusted R-squared	0.037357	S.D. dependent var	1.562655
S.E. of regression	1.533189	Akaike info criterion	3.729928
Sum squared resid	237.4176	Schwarz criterion	3.831031
Log likelihood	-191.8212	Hannan-Quinn criter.	3.770897
F-statistic	2.345298	Durbin-Watson stat	0.106938
Prob(F-statistic)	0.077347		

Fixed Effect Model Test

Dependent Variable: LINDEX
Method: Panel Least Squares
Date: 04/04/17 Time: 15:36
Sample: 2001 2015
Periods included: 15
Cross-sections included: 7
Total panel (balanced) observations: 105

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INR	0.358694	0.218172	1.644091	0.1038
INFR	0.519201	0.203091	2.556493	0.0123
EXR	-1.250955	0.434047	-2.882072	0.0050
C	7.367674	0.382712	19.25123	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.163082	Mean dependent var	7.736831
Adjusted R-squared	-0.000454	S.D. dependent var	1.562655
S.E. of regression	1.563010	Akaike info criterion	3.885909
Sum squared resid	212.5410	Schwarz criterion	4.340874
Log likelihood	-186.0102	Hannan-Quinn criter.	4.070270
F-statistic	0.997222	Durbin-Watson stat	0.076409
Prob(F-statistic)	0.469263		

Random Effect Model Test

Dependent Variable: LINDEX
Method: Panel EGLS (Cross-section random effects)
Date: 04/04/17 Time: 15:40
Sample: 2001 2015
Periods included: 15
Cross-sections included: 7
Total panel (balanced) observations: 105
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INR	-0.047224	0.019024	-2.482342	0.0147
INFR	-0.002556	0.028370	-0.090079	0.9284
EXR	0.287935	0.165065	1.744373	0.0841
C	7.555892	0.657638	11.48943	0.0000

Effects Specification	S.D.	Rho
Cross-section random	1.676107	0.9785
Idiosyncratic random	0.248177	0.0215

Weighted Statistics

R-squared	0.099986	Mean dependent var	0.295569
Adjusted R-squared	0.073253	S.D. dependent var	0.257854
S.E. of regression	0.248230	Sum squared resid	6.223419
F-statistic	3.740156	Durbin-Watson stat	0.761453
Prob(F-statistic)	0.013515		

Unweighted Statistics

R-squared	-0.026892	Mean dependent var	7.736831
Sum squared resid	260.7860	Durbin-Watson stat	0.018171

Husman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq.Statistic	Chi-Sq. D.f.	Prob.
Period random	9.076380	3	0.0283

** WARNING: estimated period random effects variance is zero.
Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
INR	0.358694	0.006580	0.034078	0.0565
INFR	0.519201	0.371660	0.014228	0.2161
EXR	-1.250955	-0.57744	0.069123	0.0094

Period random effects test equation:
Dependent Variable: LINDEX
Method: Panel Least Squares
Date: 04/04/17 Time: 15:44
Sample: 2001 2015
Periods included: 15
Cross-sections included: 7
Total panel (balanced) observations: 105

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.367674	0.382712	19.25123	0.0000
INR	0.358694	0.218172	1.644091	0.1038
INFR	0.519201	0.203091	2.556493	0.0123
EXR	-1.250955	0.434047	-2.882072	0.0050

Effects Specification

Period fixed (dummy variables)

R-squared	0.163082	Mean dependent var	7.736831
Adjusted R-squared	-0.000454	S.D. dependent var	1.562655
S.E. of regression	1.563010	Akaike info criterion	3.885909
Sum squared resid	212.5410	Schwarz criterion	4.340874
Log likelihood	-186.0102	Hannan-Quinn criter.	4.070270
F-statistic	0.997222	Durbin-Watson stat	0.076409
Prob(F-statistic)	0.469263		

Redundant Fixed Effect Model Test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	626.617913	(6,95)	0.0000
Cross-section Chi-square	388.833219	6	0.0000

Cross-section fixed effects test equation:
Dependent Variable: LINDEX
Method: Panel Least Squares
Date: 04/04/17 Time: 15:47
Sample: 2001 2015
Periods included: 15
Cross-sections included: 7
Total panel (balanced) observations: 105

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INR	0.006580	0.114063	0.057690	0.9541
INFR	0.371660	0.161235	2.305082	0.0232
EXR	-0.567744	0.338771	-1.675891	0.0969
C	7.698579	0.350369	21.97280	0.0000

R-squared	0.065126	Mean dependent var	7.736831
Adjusted R-squared	0.037357	S.D. dependent var	1.562655
S.E. of regression	1.533189	Akaike info criterion	3.729928
Sum squared resid	237.4176	Schwarz criterion	3.831031
Log likelihood	-191.8212	Hannan-Quinn criter.	3.770897
F-statistic	2.345298	Durbin-Watson stat	0.106938
Prob(F-statistic)	0.077347		

Multicollinearity Problem Test

```
reg lindex exr infr inr
Source    |    SS          df          MS          Number of obs = 105
----------+------------------------------          F( 3, 101) = 2.35
Model     | 16.5387625      3        5.51292083         Prob > F = 0.0774

Residual  | 237.417903     101       2.35067231        R-squared = 0.0651
----------+------------------------------       Adj R-squared = 0.0374
Total     | 253.956666     104       2.44189102         Root MSE = 1.5332
------------------------------------------------------------------------------
--
lindex    |    Coef.      Std. Err.   t      P>|t|   [95% Conf.   Interval]
----------+-------------------------------------------------------------------
--
exr       | -.5677215   .3387658   -1.68    0.097    -1.239742    .1042987
infr      | .3716581    .1612352    2.31    0.023    .0518109     .6915053
inr       | .0065789    .1140625    0.06    0.954    -.2196904    .2328482
cons      | 7.698562    .3503653    21.97   0.000    7.003531     8.393592
------------------------------------------------------------------------------


. vif
Variable |    VIF          1/VIF
---------+----------------------
infr     | 1.51          0.662168
inr      | 1.47          0.680039
exr      | 1.31          0.761165
-------- +----------------------
Mean VIF | 1.43
```

Heteroskedasticity Problem Test

```
tsset code year, yearly
panel variable: code, 1 to 7
time variable: year, 2001 to 2015
. xtreg lindex exr infr inr,fe
Fixed-effects (within) regression           Number of obs      =       105
Group variable (i): code                    Number of groups   =         7
R-sq:within  = 0.1072                       Obs per group: min =        15
between      = 0.0343                                      avg =      15.0
overall      = 0.0131                                      max =        15
                                                           F(3,9 =      3.80
corr(u_i, Xb) = -0.2016                                 Prob > F =    0.0127

Lindex       Coef.     Std.Err.   t     P>|t|     [95Conf.   Interval]

Exr        .2953234   .1664082   1.77   0.079    -.0350387   .6256854

Infr      -.0031702   .0283743   -0.11  0.911    -.0595002   .0531598

Inr       -.0471684   .0190308   -2.48  0.015    -.0849493   -.0093875

Cons       7.549313   .1779621   42.42  0.000    7.1960137   .902612

sigma_u1  .6837137

sigma_e   .2481766

Rho       .97873572 (fraction of variance due to u_i)

F test that all u_i=0: F(6, 95) = 626.62 Prob > F = 0.0000
```



```
. xttest3
Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model


H0: sigma(i)^2 = sigma^2 for all i


chi2 (7)         =  57.21
Prob>chi2        = 0.0000
```

Serial Correlation

```
tsset code year, yearly
   panel variable:  code, 1 to 7
   time variable :   year, 2001 to 2015


. xtserial lindex exr infr inr


Wooldridge test for autocorrelation in panel data


H0: no first order autocorrelation


         F( 1, 6) = 42.356
         Prob > F = 0.000
```

Fixed Effect with Robust Model Test

Dependent Variable: LINDEX
Method: Robust Least Squares
Date: 04/09/17 Time: 19:13
Sample: 2001 2015
Included observations: 105
Method: M-estimation
M settings: weight=Bisquare, tuning=4.685, scale=MAD (median centered)
Huber Type I Standard Errors & Covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
INR	0.025747	0.117114	0.219846	0.8260
INFR	0.377820	0.165548	2.282235	0.0225
EXR	-0.414656	0.347834	-1.192110	0.2332
C	7.657283	0.359741	21.28552	0.0000

Robust Statistics

R-squared	0.060312	Adjusted R-squared	0.032401
Rw-squared	0.089420	Adjust Rw-squared	0.089420
Akaike info criterion	125.8144	Schwarz criterion	136.8400
Deviance	198.4299	Scale	1.295539
Rn-squared statistic	6.925175	Prob(Rn-squared stat.)	0.074321

Non-robust Statistics

Mean dependent var	7.736831	S.D. dependent var	1.562655
S.E. of regression	1.545679	Sum squared resid	241.3014