

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**COLLEGE OF ARTS AND SOCIAL SCIENCES**

**FACULTY OF SOCIAL SCIENCES**

**DEPARTMENT OF ECONOMICS**

**MACROECONOMIC DETERMINANTS OF THE GHANA STOCK EXCHANGE**

**MARKET PERFORMANCE**

**BY**

**THOMAS OSEI BONSU DANKWAH**

**A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS, KWAME  
NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI, IN  
PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF  
MASTER OF SCIENCE DEGREE IN ECONOMICS**

**JUNE, 2016**



## **DEDICATION**

This thesis is dedicated to the Almighty God who gave me the strength, knowledge and wisdom to successfully complete this work.

I also dedicate this work to my parents, siblings and all those who contributed in various ways to make this exercise a success.

## **ACKNOWLEDGEMENT**

My first gratitude goes to the Almighty God for guiding and protecting me throughout my course of study.

My greatest thanks also go to Mr. Emmanuel Buabeng, my thesis supervisor, for his guidance, direction, and for devoting his precious time for all the corrections and constructive suggestions.

I also express my sincere thanks to Solomon Azunga and all students of the Economics department who contributed in no small ways.

Finally, special thanks go to my parents Hon. Jacob Kofi Dankwah and Mrs. Janet Dankwah and my siblings for their enormous efforts towards the completion of my first and second degrees.

God richly bless you all

## **ABSTRACT**

This research looks at the profound impact of certain macroeconomic variables on the performance of the Ghana Stock Exchange All share index, and therefore use the outcome to predict how the GSE performance would behave if there is a slight or greater change in the macroeconomic variables. The popular co- integration method was employed for the methodology and an annual data for both the GSE All share index and the five macroeconomic variables namely, interest rate, inflation, money supply, real GDP, exchange rate from 1990 to 2012 to ascertain how changes in the variables affect the GSE performance. The research finally attains a level where there is a long run equilibrium relationship existing between the dependent and independent variables (GSE All share index and the five macroeconomic variables). Also it was established that the effect of the macroeconomic variables on the Ghana stock Exchange in the short run is almost imaginary. The results show that real interest rate (RIR), Exchange rate (EXCH), Inflation rate (INF) and Real GDP have a negative impact on Ghana Stock Exchange (GSE). Money supply (M2) is the only variable that has a positive impact on Ghana Stock Exchange in the Short run. Exchange rate (EXCH), Inflation rate (INF) and Real GDP are statistically significant but the rest are insignificant. It therefore worthy to recommend that prospective investors are very particular about the fluctuations in the exchange rate and of course the interest rate. This is because these two determine whether the economy is fertile to invest in or otherwise since their changes has a repining or long run effect on the GSE.

## TABLE OF CONTENTS

<b>DECLARATION.....</b>	<b>I</b>
<b>DEDICATION.....</b>	<b>II</b>
<b>ACKNOWLEDGEMENT.....</b>	<b>III</b>
<b>ABSTRACT.....</b>	<b>IV</b>
<b>TABLE OF CONTENTS .....</b>	<b>V</b>
<b>LIST OF TABLES .....</b>	<b>VIII</b>
<b>LIST OF FIGURES .....</b>	<b>IX</b>
<b>LIST OF ABBREVIATIONS .....</b>	<b>X</b>
<b>CHAPTER ONE: INTRODUCTION.....</b>	<b>1</b>
1.1 BACKGROUND TO THE STUDY.....	1
1.2 RESEARCH PROBLEM.....	5
1.3 RESEARCH OBJECTIVES.....	6
1.4 RESEARCH HYPOTHESIS .....	6
1.5 SIGNIFICANCE OF THE STUDY.....	8
1.6 SCOPE AND LIMITATIONS OF THE STUDY .....	8
1.7 OUTLINE OF THESIS REPORT .....	8

<b>CHAPTER TWO: LITERATURE REVIEW .....</b>	<b>10</b>
2.1 INTRODUCTION.....	10
2.2 THEORETICAL REVIEW.....	10
2.2.1 MCKINNON AND SHAW THEORY .....	10
2.2.2 KEYNESIAN ECONOMIC THEORY .....	11
2.2.3 THE MONETARIST THEORY .....	12
2.2.4 THE PORTFOLIO BALANCE APPROACH.....	13
2.3 EMPIRICAL EVIDENCE .....	14
2.3.1 EMPIRICAL EVIDENCE FROM ADVANCED ECONOMIES .....	16
2.3.2 EVIDENCE FROM DEVELOPING COUNTRIES .....	19
2.3.3 EVIDENCE FROM AFRICA.....	23
2.3.4 EVIDENCE FROM GHANA.....	24
<b>CHAPTER THREE: RESEARCH METHODOLOGY .....</b>	<b>25</b>
3.1 INTRODUCTION.....	25
3.2 DATA SOURCES AND TYPES .....	25
3.3 MODEL SPECIFICATION .....	25
3.4 DEFINITION OF VARIABLES AND A PRIORI EXPECTATION.....	26
3.5 METHODS OF ANALYSIS.....	30
3.5.1 ESTIMATION TECHNIQUE .....	30
<b>CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION ....</b>	<b>34</b>

4.1 INTRODUCTION.....	34
4.2 TEST FOR STATIONARITY OF THE VARIABLES .....	34
4.3 LONG RUN RELATIONSHIP AMONG THE VARIABLES. ....	37
4.4 DIAGNOSTIC TEST .....	41
4.5 CUSUM AND CUSUMQ TEST FOR STRUCTURAL STABILITY. ....	41
4.6 LONG RUN RELATIONSHIP AMONG THE VARIABLES .....	42
<b>CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS ...</b>	<b>45</b>
5.1 INTRODUCTION.....	45
5.2 SUMMARY .....	45
5.3 CONCLUSION .....	46
5.4 RECOMMENDATIONS .....	46
5.5 SUGGESTIONS FOR FURTHER STUDY .....	48
<b>REFERENCES.....</b>	<b>49</b>
<b>APPENDICES .....</b>	<b>54</b>

## LIST OF TABLES

Table 3.1: Expectations of the coefficients ( $\beta$ s).....	25
Table 4.1 Augmented Dickey Fuller Unit Root Test.....	33
Table 4.2 Phillips-Perron Unit Root Test .....	34
Table 4.3: ARDL Bound Test for Co-integration.....	35
Table 4.4: The ARDL Autoregressive Distributed Lag Estimates .....	35
Table 4.5 Diagnostic Test .....	38
Table 4.6: Long-run estimates .....	40

## LIST OF FIGURES

Figure 2.1: Graphical representation of Portfolio Balance Approach.....13

Figure 4.1: Plot of cumulative sum and cumulative sum of square recursive residuals.40

## **LIST OF ABBREVIATIONS**

<b>AD:</b>	Aggregate Demand
<b>APT:</b>	Arbitrage Pricing Theory
<b>AS:</b>	Aggregate Supply
<b>ASPI:</b>	All Share Price Index
<b>BOG:</b>	Bank of Ghana
<b>CPI:</b>	Consumer Price Index
<b>CRPS:</b>	Credit to Private Sector
<b>ECM:</b>	Error Correction Model
<b>EXR:</b>	Exchange Rate
<b>GDP:</b>	Gross Domestic Product
<b>GFCE:</b>	Government Fixed Capital Formation
<b>GNP:</b>	Gross National Product
<b>GSE:</b>	Ghana Stock Exchange
<b>INF:</b>	Inflation
<b>IR:</b>	Interest Rate
<b>KLSE:</b>	Kuala Lumpur Stock Exchange
<b>LR:</b>	Long Run
<b>M2:</b>	Money Supply
<b>OLS:</b>	Ordinary Least Squares
<b>PP:</b>	Phillips-Perron
<b>RIR:</b>	Real Interest Rate
<b>SR:</b>	Short Run
<b>STII:</b>	Straits Time Industrial Index
<b>T- Bill:</b>	Treasury Bill

<b>USD:</b>	United States Dollar
<b>US:</b>	United States
<b>VECM:</b>	Vector Error Correction Model

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Background to the study**

There are a lot of programs and policies that have been implemented by various governments in Ghana so as to achieve a more constructive macroeconomic background to help boost private investment. An example is the emergence of the Ghana Stock Exchange market which lay on the drawing board in the late 1980's. The issue of concern is the scientific proof of an association existing between the macroeconomic variables and the 'all share index' that will give investors the assurance to invest especially on the stock market.

The plan of instituting a stock market in Ghana came to being about 27 years ago. This idea of establishing a stock market moved to an advanced stage in the year 1989 and virtually began smooth operation in the year 1990. The then Governor, Dr. G.K. Agama was to be the head of the ten member committee to monitor the operation of the Exchange. The committee's sole duty was to fuse the already existing works with new ones which would be brought on board towards the actualization of a stock market in Ghana. the stock Exchange started as a limited private company, and operated under the companies code 1963, but subsequently expanded in 1990 to trade freely in October 1990 in accordance with the Stock Exchange act of 1971 ( i.e Act 384). Stock business commenced on that same day, after the launch of the Exchange Market in 1990. However, the Exchange Market became a public limited company in April, 1994 (BOG working paper 2003).

The GSE is a scheme devoid of government interference; therefore no funds are solicited from the government. (Victor 2003). No shareholders belong to the Exchange except that there are two groups of participants namely, Licensed Dealing Members and Associate Members. A Licensed Dealing Members are the organizations who have the right to buy or sell a security which has been listed. On the other hand a member who is an associate is a person or an organization which has been approved membership status but is not permitted to act as stock broker. By the close of 1998 participants of the Exchange had moved from three to fifty three. Also it started business with three brokerage entities and eleven listed companies.

In defining a capital market, it can be said to include market for debt or equity in which business enterprises, including companies and governments can raise long-term funds. It is very essential for economic growth just as the money market does. The market is seen to perform crucial roles in the workings of the economy.

The Ghana stock Exchange right from its beginning has seen several processes of growth and development. In view of that, the exchange market is viewed as one of the highest accomplishing markets in the African region (BOG working paper 2003).

Currently, the GSE has 37 listed companies operating in the market featuring one depository and preference shares each. The government however is holding on to certain organization which could be allowed to be enlisted on the stock exchange. It is so surprising to say that a lot of banks are moving away from the capital market for no proper reason.

Once the government starts patronizing the market, most other companies will be motivated to invest in it which will eventually make the market a bullish one. Moreover, failure on the part of some companies which produce oil to enlarge their mode of operation and use the market as a means of raising long term capital for progress and growth in their business.

As Boateng (2004) observes, the stock market helps to mop up all savings and funds from the economy and ensure that they are put into proper investments ventures in the economy. Through mobilization of ideal resources it generates savings; the mobilized savings are made available to various segments such as agriculture, industry, manufacturing among others. This is how capital is formed by through the net addition to the existing stock of capital in the economy. This helps in increasing capital formation (Thorbecke, 1997).

Capital market helps to secure longer term financial assets for a specified time period. Thus it provides an investment avenue for people who wish to invest resources for a long period of time. It therefore gives investors deserving interest rates as return to enable them to invest. Instruments which provide investment avenues for the public include: insurance policies, bonds, equities, units of mutual funds etc.

Production and productivity in the national economy is enhanced through the use of this system (Smirlock and Yawitz, 1985). It helps in research and development. It enables production and productivity in the economy to increase through the creation of employment and improvement in infrastructure. Although capital markets helps in

mobilizing funds, it also ensures appropriate apportionment of these resources. It can have regulation over the resources so that it can direct funds in a qualitative manner.

Capital market offers various types of facilities including long-term and medium term loans to industry, consultancy services, export finance, underwriting services among others. The manufacturing sector is assisted in a large spectrum through these services.

According to Kibuthu (2005), the Capital market is a place where the investment possibility is continuously available for long term investment. It makes funds available on continuous basis, which makes it a liquid market. Capital market transactions are linked to the stock exchange market; as such both buyers and sellers can always buy and sell their securities as long they are ever available. Thus marketability in the capital market becomes easy.

In countries like Ghana, where there is lack of an advance and strong capital market, financial resources are under underutilized. Potential investors with ready cash prefer to buy hard currencies such as the dollar and even put them under their pillows. The reverse is true for the developed capital markets as they also provide access to foreign cash for indigenous industries. The capital market definitely is a major player in the development of any economy.

According to literature available from Lane (2002), Campbell and Yogo (2003), Jansen and Moreira (2004), Donaldson and Maddaloni (2005), there are other macroeconomic factors influencing the stock market performance aside from those mentioned earlier. They include; Inflation, interest rates, GDP, exchange rate, and money supply. Little research

has been done in Ghana to examine the direct effects of some of the above variables on the stock exchange performance. Interest has so far been on the dynamic effects of changes in the above mentioned variables on the general stock market performance in the case of Ghana.

## **1.2 Research Problem**

Certain macroeconomic variables have significant impact on the Ghana Stock Exchange performance. Although, certain studies already conducted some couple of years ago try to solve certain problems pertaining to low performance of stock exchange markets elsewhere. However, the problem of low performance in stock market in some African countries and for that matter Ghana still needs thorough analysis and explanations because the economic conditions prevailing in Ghana is quite different from what prevails elsewhere. This study therefore seeks to seal the gap in literature with respect to the Ghana Stock Exchange.

For example, the work of Mensah (1997) enables financial institutions and markets to understand their core reason of existence in Ghana and the way forward to development. Acheampong (2008) also looks at certain functioning questions which start from computerization to payment and clearing (Wallenius, 2009).

The work of Kibuthu (2005) suggested ways and means of solving certain functional, technical and legal cases so as to chalk a higher level of advanced market. Although the research is very important but is worthy of note that, not all stock markets closely match despite their similarity. It goes to say that one cannot consider a single solution to all

markets which are now emerging of which the study hypothesizes. Looking at previous studies, the subject of ascertaining ways of improving the stock market by coming out with the challenges confronting and dealing with them is absent in earlier research. Due to the absence of certain salient facts bringing about a gap in literature, the researcher attempts to ascertain how certain macro-economic variables affect the performance of the exchange.

### **1.3 Research Objectives**

The main objective of the study was to examine the effect of macro-economic variables on the Ghana Stock Exchange All Share Index.

The specific objectives of the study are to:

- Analyse the impact of real interest rate and inflation on the Ghana Stock Exchange market;
- Examine the effect of the real GDP on the performance of Ghana Stock Exchange market;
- Examine whether exchange rate and money supply have a significant impact on the Ghana stock Exchange;
- To investigate if there exists a long run relationship among the variables that determines the performance of Ghana stock exchange market.

### **1.4 Research Hypothesis**

To achieve the objectives of this study, we test the following hypothesis:

1. H<sub>0</sub>: Real interest rate has no negative impact on Ghana Stock Exchange market.

H<sub>1</sub>: Real interest rate has a negative impact on Ghana Stock Exchange market.

2. H<sub>0</sub>: Real GDP does not necessarily affect the performance of Ghana Stock Exchange market.

H<sub>1</sub>: Real GDP necessarily affect the performance of Ghana Stock Exchange market

3. H<sub>0</sub>: Inflation rate has no significant impact on the Ghana stock Exchange.

H<sub>1</sub>: Inflation rate has a significant impact on the Ghana stock Exchange.

4. H<sub>0</sub>: Exchange rate does not affect the performance of Ghana Stock Exchange.

H<sub>1</sub>: Exchange rate affects the performance of Ghana Stock Exchange.

5. H<sub>0</sub>: Money supply does not affect the performance of Ghana Stock Exchange.

H<sub>1</sub>: Money supply affects the performance of Ghana Stock Exchange.

6. H<sub>0</sub>: Export does not affect the performance of Ghana Stock Exchange.

H<sub>1</sub>: Export affects the performance of Ghana Stock Exchange.

### **1.5 Significance of the Study**

This study report will add to existing ideas and information concerning the topic by using the GSE by focusing on achievements gained by the GSE right from the beginning. The study will attempt to fish out how certain macro-economic variables namely, exchange rate; inflation, economic growth, and monetary policy have affected the GSE. The study would also discuss the improvement need to accelerate the development process. The outcome of this research will help to make informed decisions on how to deal with certain economic variable to achieve a well performing stock exchange market.

### **1.6 Scope and Limitations of the Study**

The capital market is a broad concept which describes the purchase and sale of medium-term and long-term securities. The GSE is an organized market in that it ensues over-the-counter. By reason of this study, the GSE will be the main subject of discussion. The study holds on the principle that the growth of the Ghana stock exchange is followed by the proper behavior of certain macroeconomic variables in Ghana.

### **1.7 Outline of Thesis Report**

This report is made up of five chapters. Chapter one consist of the introduction background, research questions, research problem, and objectives of the study, significance of the study, justification of the research, research hypothesis and scope and limitations of the research. Chapter two evaluates related and relevant literature. It looks at certain macroeconomic variables that affect the performance of the stock exchange and also examine some evidence from other countries or continents. Chapter three looks at the methods used. It also includes the limitations. Data analysis and presentation are contained in chapter four.

The use of different statistical tools is also found in this chapter. Chapter five which is the final chapter provides answers to the research questions by way of suggestions that will improve the level of GSE performance following what has been uncovered in the findings.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This section highlights some basic theories that have been used to support macroeconomic determinants of the performance of stock exchange market. Such theories among others are: the McKinnon and Shaw theory, Keynesians economic theory, the monetarist theory and the portfolio balance approach. This chapter also makes available literatures which have been written by other researchers in past studies pertaining to how the stock market can improve. By considering literatures from diverse past authors, the chapter outlines the theoretical and the conceptual framework on the determinants of stock market performance in Ghana.

#### **2.2 Theoretical Review**

##### **Theories of Stock Exchange and its macroeconomic determinants**

##### **2.2.1 McKinnon and Shaw theory**

According to McKinnon and Shaw (1973), when interest rates are placed beneath the equilibrium market rate, it attracts more demand for investments, but in away does not necessarily increase the real investment. This is because the lower interest rate becomes inadequate to generate more savings in the economy. In a situation where the substitution effect is greater that the income effect, savings can be reduces.

On the other hand, the net present value of future earnings from projects can be increased since low interest rate increases the expected profitability of investment projects. This

theory explains that savings is directly proportional to real interest rate on deposits as well as real growth rate in yield. However, investment is negatively related to the real interest rate on loans and an increasing function of the growth rate. The theory posits that interest rate in nominal terms should be administratively constant. They advance that developing economies are uneven; for this reason there is the higher possibility of getting investments that are less productive. In an economy where there is persistent increase in price of goods and service, are setting of nominal interest rates too low and thus real interest rates could be negative leads to the discouragement of capital accumulation. When the supply of capital to the banking sector is limited and for this reason banks have only specialized credit activities, people will need to be financing their investment projects by themselves or would to secure loans from the informal sector where interest rates are extremely high.

### **2.2.2 Keynesian Economic Theory**

Keynes (1930), also in a dissertation on money asserted that, there is lot of importance which could be derived from the banking in an economy concerning its growth. Keynes further explained that bank credit "is the path along which production travels, and then if the bankers are aware of their duty, would serve as transport facilities to just the extent that is required in order that the productive powers of the community can be employed at their full capacity". The Keynes pays much attention to instantaneous outcomes in analyzing issues. Moreover, they regard the government as the sole strength to bring to rest an economic recession through the application of certain monetary and fiscal policies through monetary or fiscal policies, and providing aggregate demand to increase the level of economic output, facilitated through a stable financial system that can spur continued

economic stability. Keynes later in the 1930's supported an alternative structure that includes direct government control of investment and advanced that financial deepening can occur due to an increase in the government spending. This is because, higher interest rates leads lowering private investment, thus, "crowding out". Though a rise in government expenditure promotes investments and at the same time adversely affecting private investments. So when government expenditure crowds in investment, gross domestic product increases but when it crowds out investment, gross domestic product falls.

### **2.2.3 The Monetarist Theory**

In the 19<sup>th</sup> and 20<sup>th</sup> century's the classicalists developed and published a theory known as the "Quantity Theory of Money". This theory presupposes that, there exist a positive relationship between the supply of money and the general price levels of goods and services.

Irvin Fisher asserted that, the purchasing power of money looks at the relationship that exist between the total quantity of money (M) and total amount of expenditure on final goods and services (PY). Where P is the general price level and Y is the aggregate income.

According to Fisher, the equation of exchange is stated as:

$$MV = PY \tag{2.1}$$

Where M is the quantity of money supplied and is determined by the monetary authorities, V is determined by payments habits whether payments are made weekly, monthly and payment technology whether by cheques, credit and debit cards etc. Y is the output

determined by supply factors by the classical which includes capital, technology and population.

$$E_{pm} = 1 \quad (2.2)$$

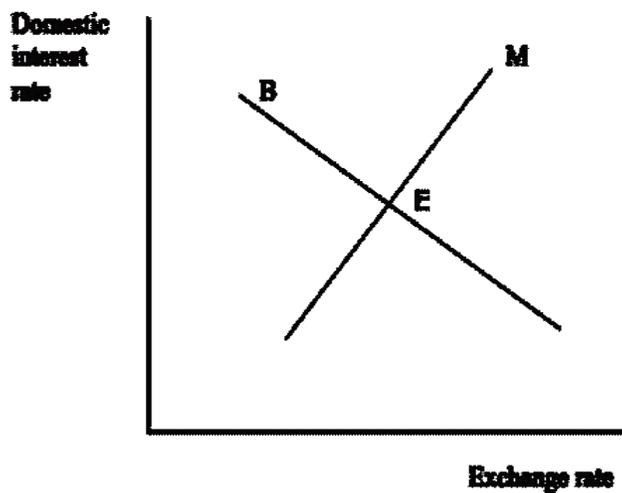
The price elasticity of money is unitary elastic. A percentage change in money supply leads to same change in the general price level. The monetarists argues that a change in the quantity of money supply affects only the price level indicating variations in money supply do not affects real output but affects the prices at which the goods and services are exchanged. Consequently, due to uncertainties in future high rates of inflation may depress investment and savings, and in a case where inflation levels increase speedily, it could lead to excess demand for goods and services as consumers start to store or hoard the goods with the concern that prices may further increase in the future.

#### **2.2.4 The Portfolio Balance Approach**

With regards to this theory in explaining exchange rate movement in Ghana it places much attention on how economic agents hold their wealth. The total wealth of an economy is the sum of all individual wealth holdings. Wealth can be held in various forms. When people with wealth hold a portfolio of various assets that they wish to hold, we say that we are in portfolio equilibrium. Since assets have been grouped into money and bonds, the portfolio of assets will be money and bond. Household must hold in the form of bond that portion of their wealth that they could not hold in the form of money. This means that households have only one decision to make on how to divide their given stock of wealth. The implication of this theory is clarified by Figure 2.1.

The 'M' curve shows equilibrium at the money market and suggest a positive relation between exchange rate and interest rate. So an increase in exchange rate makes domestic interest rate to rise making the return on stocks to rise and hence an increase in the demand of stocks at the Ghana Stock market.

**Figure 2.1: A graphical representation of the implications of the portfolio balance approach**



**Source:** Robert J, (2005)

The 'B' curve shows equilibrium at the bonds and show a negative relation between exchange rate and interest rate. So an increase in exchange rate makes domestic interest rate to fall making the return on stocks to come down and hence a fall in the demand of stocks at the Ghana Stock market.

### **2.3 Empirical Evidence**

As reported by Fama (1981), stock prices reflect macroeconomic variables such as capital expenditures, real GNP, interest rate, money supply, exchange rate and industrial

production. As a result of this assertion, Maysani and Koh (2000) and Choi *et al*(1992) in their research conducted to identify the effects of interest rate and exchange rate on the stock market performance. Their findings revealed that exchange rate and interest rate are key forces in the stock market. On the contrary, a study carried out by Tabak (2006) to examine the unstable relationship between stock performance and exchange rate in the Brazil showed that long-term relationship does not exist among these variables whiles Hardouvelis (1987) asserted that there is an indirect relationship existing between stock prices and changes of interest rate. According to him, this can be streamlined in terms of money supply surprises.

According to ( Dombush & Fisher, 1980) and(Frankel, 1993), there are two main theories that underlines the empirical studies regarding the relations between stock price and exchange rate and these are the product market approach and portfolio balance approach.. The previous observed evidences on connection between and stock return and exchange rate are at best varied. The results differed from various economies due from different degree of the trade volume, capital mobility, and economic relations among them. There could also be an omitted variable bias which accounted for the difference in these economies-for example interest rates may have an influence on stock and currency markets (Kumar, 2009).

A lot of studies have also been carried out by various scholars on a number of developed economies, less developed countries and some other African countries including Ghana.

### **2.3.1 Empirical Evidence from Advanced Economies**

Levy (1987) asserts that the volatilities in the USD exchange rate can harmfully influence the gross profit of a firm; however, the extent of such impact varies from one sector to another. His research also revealed that the fluctuations in the USD external value have an extreme impact on profits of producers of durable goods as compared to certain service industries. In contrast, Sonnen and Hennigar (1998), in their study revealed an indirect connection between changes in exchange rate in the USD and industrial stock price indices.

According to Loudun (1993) in his research during the post-float phase (Between January 1984 and December 1989) in Australia regarding the stock performance sensitivity of certain organizations with regard to the changes in the value of trade weighted index of the Australian Dollar. It was also proven that industrial resource stocks and stock respond in a different way to fluctuations in Australian Dollar. Banny and Enlaw (2000) also unearthed the relationship between the exchange rate of the Malaysian Ringgit in the area of the US dollar and stock prices in Kuala Lumpur Stock Exchange market (KLSE) by means of applying a single and multi-index models. They ended the research with a note that the KLSE stock prices and exchange rate are negatively related.

In 1976, Ang and Ghallab also attempted a study on the effect of the US dollar devaluation on fifteen United States Multinational firms. The data was used from the year August, 1971 to March, 1973 and the findings was that reported stock market is efficient and stock market performance alter rapidly to exchange rate changes which is also in line with the conclusion of Aggarwal (1981) that between the period of 1974 and 1978, the floating value of the

USD and the US stock prices are directly corrected. It therefore contradicts the conclusion by Franck and Young (1972) that there exists no definite or uniform pattern of stock prices reactions to exchange rate realignment in their study to determine the relationship between exchange rate and United State Multinational firms' stocks.

There was a study by Solnik in 1987 on the effect of certain variables which included exchange rate, interest rate and fluctuations in inflation prospects and stock returns. The research adopted broader dataset from advanced countries such as the Netherlands, Canada, Switzerland, France, Belgium, the US, the UK, Japan, and Germany. The aftermath of the study was that a fall in the exchange rate directly impacted on the US stock market in relation to changes in inflation expectations.

In examining the impact of macroeconomic variables on the Straits Times Industrial Index (STII), Ying Wu (2001) classified the macroeconomic indicators into two categories namely money supply and interest rates. He came out with the result that does not play any role in altering the STII. However, it is the interest rate that plays profound role in forming the STII on the monthly investment perspective. Upon the use of time series data from January, 1982 to December, 2002 on some selected macroeconomic variables certain key stock indexes from the USA and Singapore to check the long-run equilibrium connections that exist among these two countries, Wing et al. (2005) used a co-integration test to prove that Singapore's stock prices generally present a long-run equilibrium relationship with interest rate and money supply however related relationship does not exist in the United States stock market.

In a trial to find the proof of stock market sensitivity to inflation and interest rates in the United Kingdom, Nicholas (2003), analyzed the behavior of nominal and real interest rates and monthly total return of 35 industry indices and 10 sector indices as well as four financial times indices by applying linear regressions and their results showed that interest rate changes play a major role in the determination of equity return variability and all the industries other than forestry and paper, sectors and market portfolios are indirectly related to interest rate changes. Moreover it also indicated that utilities have the uppermost sensitivity to movements in nominal interest rates because of their greater exposure to inflation. There are significant differences between interest rate and inflation sensitivities across all economic sectors per the statistical output.

Elton and Gruber (1988) used the arbitrage pricing theory (APT) on Japanese Stock returns and some macroeconomic variables such as money supply, industrial production crude oil price, short term interest rates to examine the relationship between stock prices and short-term interest rate. The research findings exposed that there is a direct relationship between stock prices and short-term interest rates. Chen et al. (1989) scrutinized the impact of discount rate changes on the volatility of stock prices and on trading volume. The authors revealed that higher, though short-lived, volatility and trading volume as a result of changes in the unanticipated discount rate.

Smirlock and Yawitz (1985) unearthed that changes in interest rate can influence equity prices in two ways i.e. by affecting the rate at which the firm's expected future cash flows will be capitalized, and by varying expectations about future cash flows. IT established

that, when interest rates increases, stock prices fall and vice versa. This notwithstanding, both interest rates and expectations on any future cash flows are impacted by interest rates which also affect equity prices.

### **2.3.2 Evidence from Developing Countries**

Kumar (2009) observe show the relationship between the 'All share index' and exchange keeps on changing. A daily dataset from India was used to carry out the research. He also adopted the unit root and co-integration tests to test for the long run relationship between the two variables. Again, in order to examine the dynamic relationship between the two variables, the study adopted the linear and nonlinear granger causality tests to remove the volatility dependence from the series. In conclusion, the study revealed that there are no long-run relation between the All share index and exchange rate. However, there is bidirectional linear and nonlinear granger causality between stock index and exchange rates.

Muhammad and Rasheed (2002) employed co-integration, vector error correction model technique and standard Granger causality tests to examine the long-run and short-run association between stock prices and exchange for four countries namely India, Pakistan, Bangladesh and Sri- Lanka for the period January 1994 to December 2000 on monthly data collected. The study discovered that no short-run alliance exists between the variables and the above stated countries. Again, in the case of Pakistan and India, there is no long-run relationship between stock prices and exchange rates as well. However, for Bangladesh

and Sri Lanka there appear to be a bi-directional causality between these two financial variables.

Bhattacharya and Mukherjee (2003) also conducted an empirical study to find out whether there exist an empirical relationship between the prices of stock and certain macroeconomic variables which took place in India. Econometrics techniques such as unit-root tests, co-integration and the long-run Granger non-causality test recently proposed by Toda and Yamamoto (1995), to test the causal relationships between the Bombay Stock Exchange Sensitive Index and the three macroeconomic variables; exchange rate, foreign exchange reserves and value of trade balance using monthly data for the period 1990-91 to 2000-01. They conclude that there is not any causal relation linking stock returns and the variables.

Abdalla and Murinde (1997), conducted a research for four Asian countries namely; India, Pakistan, Korea and the Philippines using monthly data covering the period 1985 and 1994, examined the relation between stock prices and exchange rates. The study adopted an econometric method of integration, to find that there are no long-run relations between the two financial assets for Pakistan and Korea but in the case of Korea and India, the study found that there is a long-run relationship among the variables. The research findings also revealed that, there was a unit-directional causality from exchange rate to stock prices in Pakistan and Korea. Since there was the existence of long-run relations for India and the Philippines, the study used an error correction model to examine the causality for the two

countries. The causal relation for India was from exchange rate to stock prices but the reverse was true for the Philippines; in each case the relation was unidirectional.

On the other hand, Bahmani and Payesteh (1993) empirically proved that, in the short run there exists bidirectional causality between stock prices and exchange rate, although the cointegration analysis does not depict any long-term relationship between these variables. However, in a study conducted by Qiao (1997), he reports that there is a bi-directional relationship that was in existence in the stock prices and exchange rate of the Tokyo stock market.

Findings from other research expressly indicate that the interest rate and exchange rate changes have an effect on the stock market in the long run, however such evidence is not the case in the short run since the influence is insignificant. According to Amaresh das (2005) on his study on the interrelations between the stock prices which is indicated by market ratio and interest rates which is also measured by three month Treasury bills for monthly observation from 1985 to 2003 for three Asian countries involving Bangladesh, Pakistan and India, the codependence among variables shows that the relationship between stock prices and interest rate is not significant for Bangladesh and Pakistan. The paper in addition documents that the time series data for Bangladesh and Pakistan reflects robustly common cycles.

In a related study, Officer (1973) explained the drop in stock market volatility in the 1960s with a reduced variability in industrial production. Schwert (1989) and Hamilton and Lin

(1996) revealed that at times in recession periods the stock market volatility increases and Glosten et al.(1993) discover interest rates as a vital factor that explain stock market volatility.

In the research works of Hasan and Samarakoon (2000), interest rates were measured by Treasury bill rates of three maturities. Thus 3, 6 and 12 months respectively. This was done on the performance of the Sri Lankan stock market returns for the period 1990 to 1997 on monthly, quarterly and annual bases. The stock return is measured by the continuously compounded monthly returns on the All Share Price Index (ASPI) and Sensitive price index. The 12 month maturity was seen as the most powerful tool to tracking both monthly and quarterly returns on all three maturities. This was done using the Ordinary Least Square method.

In a study conducted by Lobo (2002) to examine the impact of unforeseen changes in the federal funds target on stock prices from 1988 to 2001; Measures of interest rate surprises are constructed from survey data and changes in the 3-month T-bill yield. It was discovered that surprises associated with decreases in the target caused stock prices to rise significantly.

In Mishra (2004), it was identified that there is no Granger's causality between the exchange rate and stock return.

### **2.3.3 Evidence from Africa**

Ocran (2010) conducted a research on the pragmatic correlation that exists between the stock prices of South Africa and the US and the rand and the USD exchange rate. The study adopted the Johansen cointegration technique, the Granger causality test, generalized impulse response function and forecasting error variance decompositions for the analysis. In the estimations of the results, the study used a monthly dataset of all the variables covering from January 1986 to November 2005. However, the Johansen cointegration test could not identify any long-run relationship between the variables of interest.

Adjasi and Biekpe (2005) investigated the relationship between stock market returns and exchange rate movements in seven African countries. From the cointegration tests conducted it revealed that exchange rate depreciation causes an increase in stock market prices in the long-run of some of the countries whereas in the short-run exchange rate depreciations cause a reduction in the stock market returns.

Subair, K. and Salihu, O.M. (2010) looked at the annual stock market capitalization, GDP, inflation rate, IR and EXR fluctuations from a dataset for the period between 1981 to 2007. Using ECM, the research ascertained the effects of EXR volatility on the Nigeria stock markets. The EXR volatility mostly exerts a stronger negative impact on the Nigeria Stock markets.

#### **2.3.4 Evidence from Ghana**

Adjasiet al (2008) analysed the effect of exchange rate volatility on stock market in Ghana in addition to the effect of other macroeconomic variables on stock market volatility. The authors tried to find the nature of volatility in both the stock market and the exchange rate from 1995 to 2005. The findings indicated that there is an indirect linkage between exchange rate volatility and stock market returns. The study also revealed the presence of volatility shocks of the exchange rate on stock returns on the Ghana Stock Exchange, and thus indicating that variations in the tradeoff between risk and return is knowable and in the process serving as a valuable tool for risk management.

Adam and Twenenboah (2008) investigated the role of macroeconomic variables on stock price movement in Ghana by means of Databank Stock Index, Treasury Bill Rate, Consumer Price Index and Exchange Rate as macroeconomic variables. He used the Johansen's multivariate cointegration test and Innovation accounting techniques for the analysis and the conclusion was that there is cointegration between macroeconomic variables acknowledged and stock prices in Ghana signifying a long run relationship.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

The main objective intended to be achieved in this chapter is to find out the macroeconomic determinants of the Ghana Stock Exchange performance. This chapter presents the methodology used in the study. The chapter consists of two core sections. The first section focuses on the theoretical framework for the study. Section two, on the other hand, contains the estimation procedure for the study.

#### **3.2 Data Sources and Types**

The research employed only secondary data. The data for all the variables employed start from 1990 to 2012. Data on real GDP per capita (GDP), Government fixed capital formation (GFCF), Money supply (M2), Inflation rate (INF) were obtained from World Bank World Development Indicator. Data on Credit to private sector (CRPS), Interest Rate (IR), Exchange Rate (ER) and real gross domestic product were obtained from Ghana data set. The main reason for the sample period was mainly due to availability of data

#### **3.3 Model Specification**

Based on theoretical and empirical findings, the macroeconomic variables found to determine the performance of the Ghana Stock Exchange are; money supply, inflation rate, real GDP, Exchange Rate and interest rate. However, Gross Fixed capital Formation and credit to private sector would be added as control variables. Hence the baseline model is expressed as:

$$GSE = f (CRDT, GFCF, IR, INF, M2, EXCH, GDP) \quad (3.1)$$

The deterministic model is can be expressed as below:

$$GSE = \beta_0 + \beta_1 CRDT + \beta_2 GFCF + \beta_3 IR + \beta_4 INF + \beta_5 M2 + \beta_6 EXCH + \beta_7 GDP + et \quad (3.2)$$

Taking natural log of the above model yields:

$$\ln GSE = \beta_0 + \beta_1 \ln CRDT + \beta_2 \ln GFCF + \beta_3 \ln IR + \beta_4 \ln INF + \beta_5 \ln M2 + \beta_6 \ln EXCH + \beta_7 \ln GDP + \varepsilon_t \quad (3.3)$$

Where: GSE represents Ghana stock exchange; CRDT denotes credit to private sector; GFCF stands for gross fixed capital formation; IR represents interest rate; INF represents inflation rate; M2 represents money supply; EXCH represents exchange rate; GDP represents Gross domestic product; and  $\varepsilon_t$  is the error term.

### 3.4 Definition of Variables and a Priori Expectation

The study further defines each variable and explains the economic intuition of its expected impact on the performance of Ghana's stock exchange. Table 3.1 gives a summary of the expected signs and the respective discussions are further presented.

**Table 3.1: Expectations of the coefficients ( $\beta$ s)**

VARIABLES	EXPECTED SIGNS
CRDT	-
GFCF	+/-
RIR	+
INF	-

M2	-
EXCH	+/-
GDP	+

Real interest rate refers to the growth rate of purchasing power resulting from an investment. It is an interest rate an investor expects to receive after allowing for inflation. According to McKinnon and Shaw (1973), if real interest rates are held beneath the market equilibrium, it could lead to a rise in the demand for investment but not the actual investment. Low interest rates are insufficient to generate savings; it can even reduce savings especially if substitution effects dominate the income effect for households. So a fall in real interest rate reduces investors' confidence to invest in stocks and equity at the stock market in Ghana. It is expected to have a direct relationship between real interest rate and demand of stocks and equities at the stock market in Ghana. That is  $B_3 > 0$

Inflation refers to the persistent rise in the general price levels of commodities and services in an economy. When the price level rises, each unit of currency buys fewer goods and services which reflects a reduction in the purchasing power per unit of money. Inflation has diverse effects on an economy. It could be negative or positive. However, the negative effects intend decrease the real value of money which will also affect other monetary variables with time. Uncertainty regarding future inflation hikes may discourage investors. A rise in inflation levels in an economy may cause shortages of investment funds and this could cause consumers to resort to hoarding their funds with the hope that, prices will rise in the future. Since most investors are risk adverse and they are not certain of what happens in the future, their demand for equity and share at the stock exchange market decreases

since future increase in the general price level erodes the return on their shares at the stock market. So it is expected to have a negative relation between inflation and investment in shares and equity at the stock market. That is  $B_4 < 0$ .

Money supply refers to the total amount of money in circulation plus demand deposits. There are several standard measures of the money supply, including the monetary base (M1, and M2). The change in money supply causes variations in interest rate and inflation rate as well. An increase in money supply causes interest rate to fall which boosts up investment leading to a shift in the aggregate demand curve to the right and hence a rise in the general price as the cost of production on the part of labor increases. The increase in the AD curve increases the level of employment which causes shortage of labor and following law of demand, the price of labor (wages) goes up making the firms cost of production to rise and therefore a shift of AS curve to the left leading increase in the general price level. This means that, increase in money supply causes interest rate to fall and general price level to rise. This makes the return on equity and shares to fall and hence investors would be less inclined to demand equity and shares at the stock market. So it is expected to have a negative relationship between money supply and demand of shares and equity at the stock market. That is  $B_5 < 0$ .

Exchange rate is the value of one currency for the purpose of conversion to another. Exchange rates movements affect the market return for stock and the volatility due to its information content to the investors. When there are high fluctuations in the exchange rates, the exchange rates movement, there would be high movements of market return volatility. Following this, some researchers have concluded that there exist a strong relationship

between exchange rate movement and stock market returns volatility. Specifically, the information content of exchange rate movement would be carried to the securities business. Exchange rate fluctuations cause decision of foreign investor who invests in domestic asset to change. The inclusion of foreign stock markets boosts the domestic demand for shares. Since foreign investment is usually associated with exchange rate fluctuations, an appreciation of the cedi means that the return on domestic asset at the stock market is favorable. So a fall in exchange rate which causes appreciation of the cedi increases foreign investors' demand of domestic asset at the stock market in Ghana. So it is expected that, a fall in the exchange rate causes a rise in the demand of domestic shares and equity by foreign investor. That is  $B_6 > 0$ . But a rise in exchange rate which means depreciation of the cedi causes foreign investors demand for shares at the stock market to fall as the return on domestic asset falls. So when there is a rise in exchange rate, it is expected to have a negative relationship. That is  $B_6 < 0$ .

Real Gross Domestic Product (real GDP) is a macroeconomic measure of the value of economic output adjusted for price changes (i.e., inflation or deflation). This adjustment transforms the money-value measure, nominal GDP, into an index for quantity of total output.

The bond between economic growth and real GDP impact strongly on the stock market growth. When real GDP rates are high, investors will have the confidence to invest in shares. A rise in per capita income increases an individual's ability to save or invest holding other factors constant. Because, the increase in per capita income should be considered with caution, for individuals will only invest after satisfying their basic needs.

That is, the higher the per capita GDP and the greater the wealth per capita, the more investment there will be in stock markets, and the more liquid that market will be. Greater liquidity will induce more companies to list their shares because of the increase in price per share. So it is expected to have a positive relation between real GDP and investment in shares and equity at the stock market. That is  $B_7 < 0$ .

### **3.5 Methods of Analysis**

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were conducted to test for the stationarity of the variables. To find out the long run relationship among the variables, cointegration analysis method would be employed; also error correction model would be used in this chapter.

#### **3.5.1 Estimation Technique**

##### **3.5.1.1 Unit Root Test**

Estimation of unit root in the variables is crucial at this point for the study so as to find out whether the variables employed are stationary or not. Conducting this test is necessary to ensure that the variables are integrated of order  $I(0)$  or  $I(1)$ . The Augmented Dickey-Fuller (ADF) test for unit root was carried out to test each variable for the presence of unit root. In the estimations, the null hypothesis of the presence of a unit root (non-stationery) against the alternative hypothesis of no unit-root (stationery) was tested for stationery of the variables. In rejecting or failing to reject the null hypothesis, the Mackinnon critical values were used to make the conclusion as in whether to accept or reject the null hypothesis.

The Augmented Dickey- fuller equation is given below:

$$\Delta V_t = \sigma_o + \sigma_1(t) + \psi V_{t-1} + \sum_{b=1}^p \lambda_b \Delta V_{t-b} + \ell_t \quad (3.4)$$

For b= 1,2,3,4.....p

Where  $V_t$  represents time series variable to be tested for its stationary, the general direction in which the variable tends to move in time is defined by t and  $e_t$  is a residual term.

### **3.5.1.2 Co-integration Estimation**

The bounds testing approach is used to test for the presence of long run relationship among the variables employed in the study which employs Autoregressive Distributed Lag models (ARDL). More importantly evidence of cointegration among the variables rule out the possibility of the estimated relationship being spurious. The reason for using the ARDL Model is that, since the sample size for the study is not too large, it is more efficient to use ARDL instead of Johansen cointegration technique. Also, the ARDL model enables the cointegration to be estimated by the ordinary least squares (OLS) method once the lag of the model is identified. This makes the ARDL procedure very simple, as one can also estimate the long-run and short-run components of the model simultaneously, thus, removing the problems associated with omitted variables and autocorrelations. Finally, the ARDL procedure generates consistent estimates of long-run coefficients that are asymptotically normal regardless of whether the regressors in the model are purely I(0), purely I(1) or mutually cointegrated (Pesaran et al., 2001). The technique provides unbiased

estimates of the long- run model and valid t-statistics even in situations when the variables are endogenous.

The bounds test approach to cointegration under the ARDL model involves three stages. The first stage is to establish the existence of a long-run relationship between GSE and the regressors. Once the existence of a long-run relationship has been established, the conditional ARDL (p, q1, ...qn) is estimated in the second stage to capture the long-run equilibrium relationship between the variables. The ARDL approach necessitates foremost estimating the conditional long run relationship among the variables which is specified by the equation below:

$$\Delta Y_t = \theta_o + \sum_{b=1}^p \theta_b \Delta Y_{t-b} + \sum_{d=1}^p \theta_d \Delta X_{t-d} \quad (3.5)$$

The above model can be formulated as below:

$$\begin{aligned} \Delta GSE\_IC = & \varphi_o + \phi_1 \Delta GSE\_IC_{t-1} + \phi_2 \Delta GSE\_IC_{t-2} + \dots + \phi_v \Delta GSE\_IC_{t-v} + \varphi_1 \Delta RIR_{t-1} + \varphi_2 \Delta RIR_{t-2} \\ & + \dots + \varphi_v \Delta RIR_{t-v} + \delta_1 \Delta INF_{t-1} + \delta_2 \Delta INF_{t-2} + \dots + \delta_v \Delta INF_{t-v} + \rho_1 \Delta GDP_{t-1} + \rho_2 \Delta GDP_{t-2} + \dots + \rho_v \Delta GDP_{t-v} \\ & + \omega_1 \Delta EXCH_{t-1} + \omega_2 \Delta EXCH_{t-2} + \dots + \omega_v \Delta EXCH_{t-v} + \eta_1 \Delta M2_{t-1} + \eta_2 \Delta M2_{t-2} + \dots + \eta_v \Delta M2_{t-v} \end{aligned} \quad (3.6)$$

$$\Delta Y_t = \phi_o + \sum_{m=1}^g \phi_{1m} \Delta Y_{t-m} + \sum_{m=1}^g \phi_{2m} \Delta X_{t-m} + \mu_1 Y_{t-1} + \mu_m X_{t-1} + \varepsilon_t \quad (3.7)$$

$$\Delta Y_t = \lambda_o + \sum_{m=1}^g \phi_{2m} \Delta Y_{t-m} + \sum_{m=1}^g \phi_{1m} \Delta X_{t-m} + \mu_2 Y_{t-1} + \mu_m X_{t-1} + \varepsilon_t \quad (3.8)$$

Where the regressand is defined by  $Y_t$  and  $X_t$  stand in for the variables that explain the regressand and is the vector of observations of included explanatory variables and  $\varepsilon_t$  is the error term.

## **CHAPTER FOUR**

### **DATA PRESENTATION, ANALYSIS AND DISCUSSION**

#### **4.1 Introduction**

The econometric estimations and discussion of results of the study is presented in this chapter. Annual data for the periods 1990-2012 was used for the empirical analysis. The chapter is made up of four sections. Examination of the time series properties of the data is carried out in section one which presents the results of the unit root tests carried to examine the stationary properties of the variables. The bounds test approach to cointegration results in examining the presence of a long-run relationship between the variables is carried out in section two. The results of the estimated long-run relationship between the variables using the ARDL approach and the results of the Error Correction Model for short run dynamics is highlighted in section three and four respectively.

#### **4.2 Test for Stationarity of the variables**

The stationarity of the variables was carried out by finding out the presence of unit roots in all the variables used. It is necessary at this point to carry out this test to ensure that the variables are integrated of zero i.e  $I(0)$  or order one i.e  $I(1)$  but not otherwise. The ADF test results for the variables are presented and discussed in Table 4.1.

**Table 4.1 Augmented Dickey Fuller Unit Root Test**

VARIABLE	LEVEL		FIRST DIFFERENCE	
	CONSTANT	CONSTANT AND TREND	CONSTANT	CONSTANT AND TREND
LnCRDT	-1.169668	-1.706472	-6.309336***	-6.777611***
LnGFCF	-1.144032	-1.629894	-4.053241***	-3.934712**
RIR	-3.160918**	-3.373500*		
LnINF	-2.624172	-3.244961	-5.344164***	-5.242802***
LnM2	-1.568031	-1.529096	-4.005028***	-4.640997***
LnEXCH	-2.220919	-0.827526	-3.102743**	-3.744531**
LnGDP	4.849436***	-3.881594***		
LnGSE	-1.713473	-0.545269	-4.457816***	-5.241827***

\*significant at 1%, \*\*significant at 5%, \*\*\* significant at 10%

**Source:** Author

The Augmented Dickey-Fuller (ADF) test shows that only real interest rate (RIR) and real GDP are stationary at the level but the rest of the variables are stationary at first difference.

This means that, some of the variables are stationary at I(0) and others I(1). So the Phillips-

Peron (PP) unit root test is carried to confirm the results from the ADF test as shown in Table 5.2 below:

**Table 4.2 Phillips-Perron Unit Root Test**

VARIABLE	LEVEL		FIRST DIFFERENCE	
	CONSTANT	CONSTANT AND TREND	CONSTANT	CONSTANT AND TREND
LnCRDT	-1.116791	-1.635488	-6.309336***	-6.877257***
LnGFCF	-1.191631	-1.846474	-4.046513***	-3.928269**
RIR	-3.160918**	-3.373500*		
LnINF	-2.690844*	-3.244961	-5.477316***	-5.828764***
LnM2	-1.597101	-1.529096	-4.027240***	-4.632960***
LnEXCH	-2.174214	-0.880769	-3.083513**	-3.722701**
LnGDP	8.428727***	7.579500***		
LnGSE	-1.713473	-0.545269	-4.457645***	-5.241827***

\*, \*\*, \*\*\* means Significant at 10%, 5% and 1% respectively

**Source: Author**

The Phillip- Peron unit root also confirms real interest rate (RIR) and real GDP (GDP) are stationary at the level and the other variables being stationary at first difference.

The general conclusion from the unit root results is that some of the variables are stationary at the levels and some at the first difference.

#### 4.3 Long run relationship among the variables.

To show a long-run relationship among the variables, the ARDL bound test is used as proved by Table 4 .3.

**Table 4.3: ARDL Bound Test for Co-integration**

F-STATISTICS (34.3234)	BOUND TEST AT 95%		BOUND TEST AT 90%	
	UPPER	LOWER	UPPER	LOWER
	4.6371	5.2776	3.1235	4.4069

From the bound test of co-integration among the variables as presented in Table 4.3, since both the F-Statistics are above their various bound value at 95% and 90%, the null hypothesis of no long run relationship among the variables is rejected implying there exist a long run relationship between the variables employed in the study.

**Table 4.4: The ARDL Autoregressive Distributed Lag Estimates**

Dependent variable is LNGSE\_CI

22 observations used for estimation from 1990 to 2012

Regressor	Coefficient	Standard Error	T-Ratio
RIR	-.0089841	.015409	-.58303
LNINF	-1.3209**	.51901	2.5451

LNGDP	-17.9696***	2.1989	-8.1720
LNEXCH	-1.3857**	.49617	-2.7928
LN2	1.1887	1.1064	1.0744
LN2(-1)	1.8936**	1.0072	1.8800
C	104.9768***	11.5157	9.1159
R <sup>2</sup> = .96413			
F- STATISTIC = 67.1991			
D-W = 2.6692			

**Source:** Author

Since the F-Statistics is significant, it explains that the variables that determines stock market performance jointly explains stock market in Ghana. The R<sup>2</sup> value shows that about approximately 99% variation in Ghana Stock Exchange market is explained by the pre-determined variables.

From the results presented by Table 4.4, it can be seen that there exist negative relationship between and real interest rate (RIR) and Ghana Stock Exchange (GSE). An increase in Real interest rate causes the demand of stocks at Ghana stock market to fall by -0.0089841 but it's not statistically significant. The aprior expectation was not met. The reason for having a negative relation between real interest rate and stocks at the Ghana stock market is that returns on stocks fluctuate over time. This is because the price of stocks keep changing so it happen investors in stocks gets capital loss at the end of the maturity period and since most investors are risk adverse, demand for stocks fall when real interest rate rises.

It can be found from Table 4.4 that there exist a negative relationship between inflation rate and demand for stocks at the Ghana Stock Exchange market performance making the prior expectation to be satisfied. A percentage increase in inflation causes demand of stocks at the Ghana stock market to fall by 1.3209 and is statistically significant at 5% error level. The reason for the negative relationship are however most pronounced and comprise a decrease in the real value of money as well as other monetary variables over time. As a result, uncertainty over future inflation rates may discourage investment and savings and demand for stocks at the stock market falls.

There exist a negative relationship between real gross domestic product and demand of stocks at the Ghana stock market. A percentage increase in real GDP causes the demand for stocks to fall by 17.9696 and is statistically significant at 1% error level making the prior expectation of a positive relation not satisfied. The economic reason is that, a rise in per capita income increases an individual's ability to save or invest but not holding other factors constant, the individual has to spend the income on his basic needs than buying stocks. Because, the increase in per capita income should be considered with caution, for individuals will only invest after satisfying their basic needs. Here in Ghana, individuals satisfy their basic needs than buying stocks even most people has to borrow before they can satisfy their basic needs. So a rise in income leads to a fall in demand of stocks in Ghana even though they feel richer because most Ghanaians think of satisfying their basic needs rather than investing in stocks.

It can be identified from table 4.4 that there exist a negative relationship between exchange rate and demand of stocks at the Ghana stock market. A percentage increase in exchange rate causes the demand of stocks at the Ghana stock exchange to fall by 1.3857 and it's statistically significant at 5% level of significant. The intuition behind this is that, a rise in exchange rate means depreciation of the cedi causes foreign investors demand for shares at the stock market to fall as the return on domestic asset falls. Though we were expecting to have both negative and positive relationship, the results satisfies a negative relationship in Ghana.

The results demonstrate a positive relationship between money supply and demand of shares at Ghana stock exchange and that a percentage increase in money supply causes demand of shares at the Ghana stock exchange to rise by 1.1887 but its impact is statistically insignificant. The economic intuition behind this is that, an increase in money supply causes the economic agents to have easy access to loan from bank which makes them to feel richer. Holding other factors constant makes the individual demand for shares at the Ghana stock exchange to rise. Though it was expected to have a negative relation, the results satisfy a positive relationship in Ghana.

It can be concluded that, five variables; Real interest rate (RIR), Inflation (INF), Real GDP, Exchange rate (EXCH) and money supply (M2) determines the performance of Ghana Stock Exchange in Ghana. Out of that, only real interest rate (RIR) and Money supply (M2) were found to be insignificant.

#### 4.4 Diagnostic Test

Table 4.5 shows the diagnostic testing of serial correlation, functional form specification and heteroscedasticity.

**Table 4.5 Diagnostic Test**

<b>Test Statistics</b>	<b>LM Version</b>	<b>P-Value</b>	<b>F Version</b>	<b>P-Value</b>
<b>A:Serial Correlation</b>	3.3080	[.069]	2.4777	[.138]
<b>B:Functional Form</b>	1.7575	[.185]	1.2155	[.289]
<b>C:Normality</b>	.46038	[.794]		
<b>D:Heteroscedasticity</b>	.0040947	[.949]	.0037232	[.952]

**Source:** Author

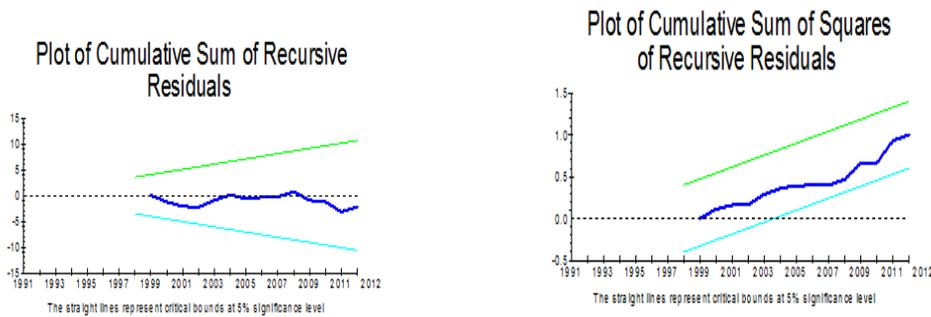
Table 4.5 shows that there is no multi-collinearity and that we can disentangle their separate effect on Stock Exchange in Ghana because its p-value is insignificant therefore accepting the null hypothesis is rejected for serial correlation. More so, there is no incorrect functional specification and no heteroskedasticity since their respective p-value is insignificant making their respective alternate hypothesis to be accepted.

#### 4.5 CUSUM and CUSUMQ Test for Structural Stability.

The study employs plots of the CUSUM and CUSUMQ are used to test the structural stability of the model. Figure 4.1 and Figure 4.2 depicts plots of the CUSUM and CUSUMQ respectively. Figure 4.1 shows the systematic variation in the parameter

estimates which suggests that fluctuations in the parameter estimates are within 5% level of significant. Both plots indicate that the parameter estimates are stable and that the model is stable for the study since the test line lies within the 5% critical lines.

**Figure 4.1: Plot of cumulative sum and cumulative sum of squares recursive residuals**



#### 4.6 Long run relationship among the variables

The study further investigates the long-run relationship among the variables included in the estimable model. The results are presented in Table 4.6.

**Table 4.6: Long run Estimates.**

Regressor	Coefficient	Standard Error	T-Ratio
RIR	-.0089841	.015409	-.58303
LNEXCH	-1.3857**	.49617	-2.7928
LN2M2	3.0823***	.47522	6.4860
LNINF	-9.3880***	2.4629	-3.8158
LNGDP	-17.9696***	2.1989	-8.1720
C	104.9768***	11.5157	9.1159

\*, \*\*, \*\*\* means significant at 10%, 5% and 1%

Source: Author

The long run results show that all the variables except real interest rate (RIR) are significant. It can be seen that real interest rate (RIR), exchange rate (EXCH), Inflation rate (INF) and Real GDP has a negative impact of Ghana stock exchange. Only money supply (M2) has a positive impact on Ghana Stock Exchange (GSE) in the long run.

The reason of carrying out this result is to find out whether the explanatory variables have a long run relationship on Ghana Stock Exchange (GSE) and therefore a movement in these variables cause change in Ghana Stock Exchange.

#### 4.5.2 Short run movement among the variables.

<b>Regressor</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>T-Ratio</b>
<b>dRIR</b>	-0.0089841	.015409	-.58303
<b>dLNEXCH</b>	-1.3857**	.49617	-2.7928
<b>dLNM2</b>	1.1887	1.1064	1.0744
<b>dLNINF</b>	-1.3209**	0.51901	-2.5451
<b>dLNGDP</b>	-17.9696***	2.1989	-8.1720
<b>dC</b>	104.9768***	11.5157	9.1159
<b>ecm(-1)</b>	-0.13660	0.78089	-1.9762

\*, \*\*, \*\*\* means significant at 10%, 5% and 1%

**Source:** Author

The results show that real interest rate (RIR), Exchange rate (EXCH), Inflation rate (INF) and Real GDP have a negative impact on Ghana Stock Exchange (GSE). Money supply (M2) is the only variable that has a positive impact on Ghana Stock Exchange in the Short run. Exchange rate (EXCH), Inflation rate (INF) and Real GDP are statistically significant but the rest are insignificant.

The coefficient of the “ecm”, which is -0.13660 shows a correct sign with a high speed of adjustment in long run from lagged period error shock and has significant t-value.

The conclusion drawn from the short run regression on the study objectives is that, since the error correction model has a correct sign, whenever there are shocks it would be restored to its long run equilibrium path.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter is made up of three sections. These are: summary of findings, recommendations and the conclusion of the research. The specific objective of the research meant to find out if long run relationship exists between Ghana Stock Exchange market and its determinants which were employed in this study. Among those variables are real interest rate, exchange rate, inflation rate, money supply and real GDP. Annual data covering twenty three years were analyzed using autoregressive distributed lag model (ARDL) model.

#### **5.2 Summary**

The result of the unit root is that some of the variables are stationary at the levels and some at the first difference. In addition; the bound testing result evidenced a long run relationship between Ghana Stock Exchange market and its determinants in Ghana.

The error correction model (ecm) showed a statistically significant with a correct sign. What this means is that economic factors are put in place to restore Ghana Stock Exchange market and its determinants to its long run path following short run shocks.

From the autoregressive distributed lag estimates, five predetermined variables namely Real Interest Rate (RIR), Inflation rate (INF), Real GDP, Exchange Rate (EXCH) and Money Supply (M2). Out of these variables Inflation rate, Real GDP and Exchange rate are statistically significant.

### **5.3 Conclusion**

The study sought to analyse the macroeconomic determinants of the Ghana Stock Exchange market performance over the period, 1990 to 2012. Specifically, the study analysed the effect of real interest rate, inflation, real GDP, exchange rate, money supply on Ghana's stock exchange performance. The study further investigates the existence of a long-run relationship among the variables that determines the performance of Ghana stock exchange market. The study employs the use of the autoregressive distributed lagged (ARDL) model for its estimations.

The results showed that real interest rate, real GDP, exchange rate and inflation had a negative influence on the performance of Ghana's stock exchange in the long-run. However, the long-run effect of real interest rate on stock performance was insignificant. Money supply was also found to have positive effect on the performance of Ghana stock exchange in the long-run. The study further finds that in the short-run real interest rate, inflation, real GDP, exchange rate had a negative impact on Ghana's stock exchange performance whereas money supply was found to have a positive effect. However, the short-run effect of real interest rate and money supply was found to be statistically insignificant.

### **5.4 Recommendations**

According to the outcome of the research, the researcher has found it necessary to recommend the following:

First and foremost it is important to know that prospective investors are very particular about the fluctuations in the exchange rate and of course the interest rate. This is because these two determine whether the economy is fertile to invest in or otherwise since their changes has a repining or long run effect on the GSE.

Factors such as inflation, and foreign direct investment and its performance in their investment decisions are crucial for investors.

Notwithstanding the points mentioned earlier, it is also prudent on the part of the Stock policy makers to annually or as and when appropriate publish their account indicating the kind of listed companies and how much they benefited; by so doing it will tell the public how well the stock exchange is performing and would therefore attract companies to be enlisted.

There are some foreign companies such as mobile networks and other mining companies which could be advised and encouraged to get enlisted on the Exchange to help boost the stock exchange performance in Ghana and for that matter the economy at large. The enticing nature of the stock exchange can even cause some investors to switch from the popular Treasury bill and get themselves enlisted on the GSE.

Again, it also behooves the government to employ discreet actions that will help to lower inflation rate and also make sure that interest rate are very stable. When this is instituted it

will compel and attract more foreign and domestic investors to invest in certain portfolios in the economy and this will make the economy flourish.

### **5.5 Suggestions for further study**

The researcher at the beginning wanted to include interbank rate as part of the determinants. This could not come to lime light for want of time. It however expedient for other researchers who may research into this topic in future to consider the interbank rate and even other macroeconomic variables like treasury bill rate, and the CPI.

## REFERENCES

- Abdalla, I.S.A., and Murinde, V. (1997). "Exchange Rate and Stock Price Interaction in Emerging Financial Markets: Evidence on India, Korea, Pakistan and Philippines", *Applied Financial Economics*, 7, 25-35.
- Adam, A.M., and Tweneboah, G. (2008). "Macroeconomic Factors & Stock Market Movement: Evidences from Ghana", MPRA Paper112556, University library of Munich, Germany.
- Adjasi, C., Harvey, S.K., and Agyapong, D. (2008). "Effect of Exchange Rate Volatility on the Ghana Stock Exchange", *African Journal of Accounting, Economics, Finance and Banking Research* Vol.3.No.3.
- Adjasi, C.K.D., and Biekpe, B.N. (2005), "Stock Market Returns and Exchange Rate Dynamics in Selected African Countries: A bivariate analysis", *The African Finance Journal*, July, Cape Town, South Africa.
- Aggrawal, R. (1981). "Exchange Rates and Stock Prices", A study of the US capital market under floating exchange rate, *Akon Business and Economic Review*, Vol. 12, pp. 7-12.
- Ang, J. S., and Ghallab, A. (1976). "The Impact of US Devaluation on the Stock Prices of Multinational Corporation", *Journal of Business Research*, 4; 25-34.
- Bahmani-Oskooee, M., and Payesteh, S. (1993). "Budget Deficits and the Value of the Dollar: An Application of Cointegration and Error-correction Modeling", *Journal of Macro Economics*, 15: 661-667.
- Bank of Ghana (2003). Working paper.
- Banny, A., and Enlaw, S. H. (2000). "The Relationship between Stock Price and Exchange Rate: Empirical Evidence Based on the KLSE Market", *Asian Economic Review*, 42, 39-49.

- Bento-Lobo, J. (2002). "Interest Rate Surprises and Stock Prices", The Department of Economics and Finance, The university of Louisiana. [http://www.utc.edu/ Faculty/ Bento- Lobo/Lobo%20FR%202002.pdf](http://www.utc.edu/Faculty/Bento-Lobo/Lobo%20FR%202002.pdf) accessed on 24 October, 2010.
- Bhattacharya, B., and Mukherjee, J. (2003). "Causal Relationship between Stock Market and Exchange Rate. Foreign Exchange Reserves and Value of Trade Balance: A Case Study for India", Paper presented at the Fifth Annual Conference on Money and Finance in the Indian Economy.
- Boateng, A. (2004). "Determinants of Capital Structure: Evidence from International Joint Ventures in Ghana" *International Journal of Social Economics*. 31(1/2): 56-66.
- Chen, N., Roll, R., and Ross, S. (1986). "Economic Forces and Stock Market", *Journal of Business*, 59, 383-403.
- Das A. (2005). "Do Stock Prices and Interest Rates Possess a Common Trend", *Louvain Economic Review*, 71(4).
- Dornbusch, R., and Fischer, S. (1980). "Exchange rates and current account", *American Economic Review*, 70: 960-71.
- Fama, E. (1981). "Stock Returns, Real Activity, Inflation and Money", *American Economic Review*, 71:545-565.
- French, K. R., Schwert, G.W., and Stanbaugh, R. F. (1987). "Expected Stock Returns and Volatility", *Journal of Financial Economics*, 1987, Vol. 19, pp. 3-29.
- Glosten, L.R., Jagannathan, R., and Runkle, D.E. (1993). "On the relation between the expected value and the volatility of the nominal excess return on stocks", *Journal of Finance*, 48, pp.1779 - 1801.
- Goswami, G., and Jung, S. (1997). "Stock Market and Economic Forces: Evidence from Korea", Working paper, Graduate School of Business, Fordham University.

- Hamilton, J.D., and Lin, G. (1996). "Stock Market Volatility and the business cycle" ,  
Journal of Applied Econometrics, 11(5), 573-93.
- Hardouvelis, G.A (1987). "Macroeconomic Information and Stock Prices", Journal of  
Economics and Business, 39:131-140.
- Hasan, T., and Samarakoon, L.P. (2009). "Short-term Interest Rates and Expected Stock  
Returns: Evidence from Sri Lanka", Social Science Research Network, Social  
Science Electronic Publishing Inc.
- Hristu-Varsakelis, D., and Kystrou, C. (2007). "Evidence for Nonlinear Asymmetric  
Causality in U.S. Inflation, Metal and Stock Returns", Technical Report, Working  
Group on Nonlinear Dynamics in Economic and Social Systems, University of  
Macedonia, Thessaloniki, Greece.
- <http://www.citifmonline.com/site/business/news/view/721/9>
- <https://www.modernghana.com/news/405401/1/capital-markets.html>
- Kibuthu, G.W.(2005).Capital Markets in Emerging Economies: A Case Study of the  
Nairobi Stock Exchange. Retrieved December 28, 2009  
from<http://fletcher.tufts.edu/research/2005/Kibuthu.pdf>
- Kumar.M. (2009). "A Bivariate Linear and Nonlinear Causality between Stock Prices and  
Exchange Rates". Economics Bulletin. Vol.29 no.4 pp. 2884-2895.
- Levy.M.D. (1987). "Corporate Profits and the US Dollar Exchange Rate". Business  
Econometrics. 22:31-36.
- Loudon.G. (1993). "The Foreign Exchange Exposure of Australian Stocks". Accounting  
and Finance" 33:19-32.
- Maysami.R.C..andKoh. T.S. (2000). "A Vector Error Correction Model of the Singapore  
Stock Market". International review of Economics and Finance 9.79-96.
- Mensah.S. (2008). "Securities Market and Investments ". 3rd Ed. Smartline Ltd. Spintex  
Accra.

- Mishra.K.A. (2004). "Stock Market and Foreign Exchange market in India: Are they related?".South Asia Economic Journal. 5:2. Sage Publications. New Delhi.
- Muhammad, N., and Rasheed, A. (2002). "Stock Prices and Exchange Rates: Are They Related? Evidence from South Asian Countries", The Pakistan Development Review 41(4), pp. 535-550.
- Ocran, M.K. (2010). "South African and US Stock prices and the Rand/US dollar Exchange rate", South African Journal of Economic and Management Science, Vol. 13, No. 3.
- Officer, R.R. (1973), "The variability of the market factors of New York Stock Exchange", Journal of Business, 46, 434-453.
- Phillips, P.C.B., and Perron, P. (1988). "Testing for a unit root in time series regression", Biometrika, 75:3335-3336.
- Qiao, Yu. (1997). "Stock Prices and Exchange Rate: Experience in Leading East Asian Financial Centres-Tokyo, Hong Kong and Singapore", Singapore Economic Review, 41:47-56.
- Smirlock, M., and Yawitz, J. (1985). "Asset Returns, Discount Rate Changes, and Market efficiency", Journal of Finance, 40(4):1141-1158.
- Soenin, L.A., and Hennigar, E.S. (1988). "An analysis of exchange rates and stock prices-the U.S. experience between 1980 and 1986", Akron Business and Economic Review, 19:7-16.
- Solnik, B. (1987). "Using financial prices to test exchange rate models: a note", Journal of Finance, 42:141-9.
- Tabak, B.M. (2006). "The Dynamic Relationship Between Stock Prices And Exchange Rates: Evidence for Brazil," International Journal of Theoretical and Applied Finance (IJTAF), World Scientific Publishing Co. Pte.Ltd., vol. 9(08), pages 1377-1396.

- Thorbecke, W. (1997). "On Stock Market Returns and Monetary Policy", *Journal of Finance* LII-2, 635-54.
- Thorbecke, W., and Alami, T. (1994). "The Effect of Changes in the Federal Funds Rate Target on Stock Prices in the 1970s", *Journal of Economics and Business*, 46, 13-19.
- Toda, H.Y., and Yamamoto, T. (1995). "Statistical inference in vector autoregressions with possibly integrated processes". *Journal of Econometrics* 66: 225-250.
- Wu, Y. (2001). "Exchange Rates, Stock Prices and Money Markets: Evidence from Singapore", *Journal of Asian Economics*, 12, 445-458.

## APPENDICES

```

Autoregressive Distributed Lag Estimates
ARDL(0,0,0,0,0,1) selected based on Schwarz Bayesian Criterion
*****
Dependent variable is LNGSE_CI
22 observations used for estimation from 1991 to 2012
*****
Regressor          Coefficient          Standard Error          T-Ratio[Prob]
RIR                -.0049690            .0078163                -.63572[.535]
LNGFCF             .021597             .46259                 .046687[.963]
LNEXCH             -1.4699             .41310                 -3.5583[.003]
LNGDP              -18.1059            2.2101                 -8.1923[.000]
LNM2               1.2295              1.1015                 1.1163[.282]
LNM2(-1)          1.9211              1.0109                 1.9004[.077]
C                  104.9162            11.6375                 9.0154[.000]
*****
R-Squared          .96393              R-Bar-Squared          .94950
S.E. of Regression .34640              F-stat.F( 6, 15)      66.8005[.000]
Mean of Dependent Variable 7.0242              S.D. of Dependent Variable 1.5414
Residual Sum of Squares 1.7999              Equation Log-likelihood -3.6805
Akaike Info. Criterion -10.6805              Schwarz Bayesian Criterion -14.4991
DW-statistic      2.6148
*****
Diagnostic Tests
*****
*      Test Statistics      *      LM Version      *      F Version
*****
*      *      *      *      *
* A:Serial Correlation*CHSQ( 1)= 3.5687[.059]*F( 1, 14)= 2.7107[.122]
*      *      *      *      *
* B:Functional Form *CHSQ( 1)= 5.5638[.018]*F( 1, 14)= 4.7391[.047]
*      *      *      *      *
* C:Normality *CHSQ( 2)= .51332[.774]*      Not applicable
*      *      *      *      *
* D:Heteroscedasticity*CHSQ( 1)= .012358[.911]*F( 1, 20)= .011241[.917]
*****
A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

```

```

Autoregressive Distributed Lag Estimates
ARDL(0,0,0,0,0,1) selected based on Schwarz Bayesian Criterion
*****
Dependent variable is LNGSE_CI
22 observations used for estimation from 1991 to 2012
*****
Regressor          Coefficient          Standard Error          T-Ratio[Prob]
RIR                -.0089841            .015409                 -.58303[.569]
LNINF              -.11169             .37552                 -.29744[.770]
LNEXCH             -1.3857             .49617                 -2.7928[.014]
LNGDP              -17.9696            2.1989                 -8.1720[.000]
LNM2               1.1887              1.1064                 1.0744[.300]
LNM2(-1)          1.8936              1.0072                 1.8800[.080]

```

```

C                104.9768                11.5157                9.1159[.000]
*****
R-Squared                .96413    R-Bar-Squared                .94978
S.E. of Regression        .34541    F-stat.F( 6, 15)    67.1991[.000]
Mean of Dependent Variable    7.0242    S.D. of Dependent Variable    1.5414
Residual Sum of Squares        1.7896    Equation Log-likelihood        -3.6174
Akaike Info. Criterion        -10.6174    Schwarz Bayesian Criterion        -14.4360
DW-statistic                2.6692

```

Diagnostic Tests

```

*****
*      Test Statistics      *          LM Version          *          F Version
*****
*      *                    *                    *                    *
* A:Serial Correlation*CHSQ( 1)= 3.3080[.069]*F( 1, 14)= 2.4777[.138]
*      *                    *                    *                    *
* B:Functional Form *CHSQ( 1)= 1.7575[.185]*F( 1, 14)= 1.2155[.289]
*      *                    *                    *                    *
* C:Normality *CHSQ( 2)= .46038[.794]*          Not applicable
*      *                    *                    *                    *
* D:Heteroscedasticity*CHSQ( 1)= .0040947[.949]*F( 1, 20)= .0037232[.952]
*****

```

```

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

```

Autoregressive Distributed Lag Estimates

```

ARDL(0,0,0,0,0,1) selected based on Schwarz Bayesian Criterion
*****

```

```

Dependent variable is LNGSE_CI
22 observations used for estimation from 1991 to 2012
*****

```

```

Regressor                Coefficient                Standard Error                T-Ratio[Prob]
RIR                -.033836                .016578                -2.0410[.059]
LNINF                -.79390                .41153                -1.9292[.073]
LNGFCF                .35663                .60888                .58571[.567]
LNGDP                -13.8015                1.9202                -7.1876[.000]
LNM2                -.078132                1.2391                -.063054[.951]
LNM2(-1)                1.8880                1.2300                1.5349[.146]
C                88.7565                12.1021                7.3340[.000]
*****

```

```

R-Squared                .94670    R-Bar-Squared                .92538
S.E. of Regression        .42106    F-stat.F( 6, 15)    44.4034[.000]
Mean of Dependent Variable    7.0242    S.D. of Dependent Variable    1.5414
Residual Sum of Squares        2.6594    Equation Log-likelihood        -7.9744
Akaike Info. Criterion        -14.9744    Schwarz Bayesian Criterion        -18.7931
DW-statistic                1.9181

```

Diagnostic Tests

```

*****
*      Test Statistics      *          LM Version          *          F Version
*****
*      *                    *                    *                    *
* A:Serial Correlation*CHSQ( 1)= .012208[.912]*F( 1, 14)= .0077731[.931]

```

```

*
* B:Functional Form *CHSQ( 1)= 8.9855[.003]*F( 1, 14)= 9.6659[.008]
*
* C:Normality *CHSQ( 2)= 2.9742[.226]* Not applicable
*
* D:Heteroscedasticity*CHSQ( 1)= .39923[.527]*F( 1, 20)= .36964[.550]
*****
A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

```

Autoregressive Distributed Lag Estimates

```

ARDL(0,0,0,0,0,1) selected based on Schwarz Bayesian Criterion
*****
Dependent variable is LNGSE_CI
22 observations used for estimation from 1991 to 2012
*****
Regressor          Coefficient          Standard Error          T-Ratio[Prob]
RIR                -.0089841            .015409                -.58303[.569]
LNINF              -1.3209              .51901                 -2.5451[.013]
LNGDP              -17.9696             2.1989                 -8.1720[.000]
LNEXCH             -1.3857              .49617                 -2.7928[.014]
LNM2               1.1887              1.1064                 1.0744[.300]
LNM2(-1)           1.8936              1.0072                 1.8800[.080]
C                  104.9768            11.5157                9.1159[.000]
*****
R-Squared          .96413              R-Bar-Squared          .94978
S.E. of Regression .34541              F-stat.F( 6, 15)      67.1991[.000]
Mean of Dependent Variable 7.0242              S.D. of Dependent Variable 1.5414
Residual Sum of Squares 1.7896              Equation Log-likelihood -3.6174
Akaike Info. Criterion -10.6174              Schwarz Bayesian Criterion -14.4360
DW-statistic      2.6692

```

Testing for existence of a level relationship among the variables in the ARDL model

```

*****
F-statistic 95% Lower Bound 95% Upper Bound 90%Lower Bound 90% Upper Bound
34.3234      5.2776          4.6371          4.4069          3.1235

```

```

W-statistic 95% Lower Bound 95% Upper Bound 90% Lower Bound 90% Upper Bound
41.5831      20.4706         30.9516         17.1121         26.0099

```

```

*****
If the statistic lies between the bounds, the test is inconclusive. If it is above
the upper bound, the null hypothesis of no level effect is rejected. If it is below
the lower bound, the null hypothesis of no level effect can't be rejected. The
critical value bounds are computed by stochastic simulations using 20000
replications.

```

Diagnostic Tests

```

*****
* Test Statistics * LM Version * F Version
*****
*
* A:Serial Correlation*CHSQ( 1)= 3.3080[.069]*F( 1, 14)= 2.4777[.138]
*
* B:Functional Form *CHSQ( 1)= 1.7575[.185]*F( 1, 14)= 1.2155[.289]
*

```



