AN ANALYSIS OF THE EFFECTS OF INTEREST RATE AND EXCHANGE RATE CHANGES ON STOCK MARKET RETURNS: EMPIRICAL EVIDENCE OF GHANA STOCK EXCHANGE

By

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DECLARATION

I hereby declare that this submission is my own work toward the Commonwealth Executive Master of Business Administration and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University except where due acknowledgement has been made in the text.

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DEDICATION

I dedicate this project work to the Lord Almighty and all my loved ones.

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First of all, I thank the almighty God for fulfilling his promises to my life and for granting me the strength, wisdom and knowledge to complete this work

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ABSTRACT

The study determines the effects of some macroeconomic factors that influence stock prices in Ghana, establish their relationship with stock prices and possibly use them to predict the likely changes in stock prices as a result of changes in these macroeconomic variables. The famous cointegration methodology is applied on monthly data of Ghana Stock Exchange All-share Index and the respective macroeconomic variables from January 2000 through December 2010 to determine the extent to which these macroeconomic variables influence the stock market returns. The study establishes that a long-run equilibrium and causal relationship exists between the dependent variable; GSE All-share index and the two independent variables under consideration namely, interest rate and exchange rate. It was also determined that in the short-run, effects of Interest rate and exchange rate volatility on Ghana Stock Exchange are nearly imaginary.

ACRONYMS AND ABBREVIATIONS

The following are the list of acronyms and abbreviations used in the study:

ADF	Augmented Dickey-Fuller
BOG	Bank of Ghana
DW	Durbin-Watson Statistic
EXR	Exchange Rate
GASI	Ghana Stock Exchange All-Share Index
GHC	Ghana Cedi
GSE	Ghana Stock Exchange
IR	Interest Rate
KPSS	Kwiatkowski, Philips, Schmidt and Shin
LR	Long-Run
PP	Phillips-Perron
SR	Short-Run
TBR	Treasury Bill Rate
USD	United States Dollar
VAR	Vector Autoregressive
VECM	Vector Error Correction Model

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CHAPTER ONE

INTRODUCTION

1.1 Background to study

After about a decade of relatively strong economic performance with real gross domestic product (GDP) growing at an average of about 6% annually over the last five years, there was greater uncertainty about Ghana's economic growth prospects at the beginning of 2009. Unsurprisingly, economic growth slowed in 2009, to a mere 4.7% – the lowest since 2002 – after rising to a two-decade high of 7.3% in 2008. Economic growth is expected to recover modestly to 6.4% in 2010 and accelerate to 8.3% in 2011 on the back of global recovery, exceptional public investment in the rising oil sector, and revenues from anticipated new oil discoveries (African economic outlook, 2010).

The creation of the Ghana Stock Exchange (GSE) was part of the recommendations of the economic reforms carried out in the 1980s to generate sustainable economic growth and development. As Boateng (2004) observes, after many years of experiment with heavy state intervention in the economy, a consensus emerged that the achievement of a more dynamic economic growth required a greater role for the private sector and stock markets since they are good levers for boosting private sector access to finance.

Interest rate and foreign exchange rate risks are two significant economic and financial factors that affect the common stock value**.** The stock market is supposed to play an important role in the economy in the sense that it mobilizes domestic resources and

channels them to productive investments. However, to perform this role it must have significant relationship with the economy.

A number of macroeconomic and financial variables that influence stock market have been documented in the recent empirical literature without a concensus on their appropriateness as regressors (Lane 2002, Campbell and Yogo 2003, Jansen and Moreira 2004, Donaldson and Maddaloni 2005). Major macroeconomic variables that are usually mentioned include GDP, price level, interest rate, exchange rate, balance of payments, unemployment rate, fiscal balance, inflation etc. So far, only few studies have been conducted examining the direct effects of some of the above variables on the stock exchange market of Ghana. This empirical paper narrows down its focus on the dynamic effects of IR and EXR changes on the overall stock market returns in Ghana.

The fundamental principle for the relationship between the interest rate and stock market returns is that stock prices and interest rates are negatively correlated. Higher interest rate resulting from tightening monetary policy usually has negative effects on stock market returns. This is due to the fact that higher interest rate reduces the value of equity as indicated by the dividend discount model and consequently, makes fixed income securities more attractive as an alternative to holding stocks. As a result, this may reduce the propensity of investors to borrow and invest in stocks and also, raises the cost of doing business and hence affects profit margin. On the other hand, lower interest rates resulting from expansionary monetary policy also boost stock market.

Furthermore, as concluded by Hashemzadeh and Taylor (1988), a decline in interest rates also leads to an increase in the present value of the future dividends. Interactions

between stock market returns and exchange rate exist as a result of changes in foreign investments. Rates of return on foreign investment in stocks are converted from one currency into another currency through changing spot exchange rates. When rates of return in a depreciating currency are translated into an appreciating currency, the adjusted rates of return decline. On the other hand, when rates of return in an appreciating currency are translated into a depreciating currency, the adjusted rates of return increase. Foreign portfolio investors pay close attention to timing their return conversions based on the anticipated exchange rate movement. Furthermore, increasing foreign investments in a country's stock market causes the local currency to appreciate with respect to related foreign currency through larger foreign currency inflows. Conversely, sales of a country's stock by foreign investors cause foreign capital outflows. In turn, it makes local currency to depreciate against a related foreign currency, the depictions of such relationships between stock and foreign currency markets have likely flows of bidirectional causality. The expectation is that international fund managers will readjust their stock market investment decision when depreciation and uncertainty adversely affect stock returns.

Ghana's strong growth has been achieved within a sound macroeconomic environment. Prudence in fiscal and monetary management has contributed to the easing of inflationary pressures with declining interest rates. The private sector has responded positively to the government's development programmes and the improved business environment. The rise in bank lending and capital inflows suggests increasing investor confidence. New partnerships between Ghana and emerging economies such as China

and South Korea are providing additional sources of financing and expertise for development (African Economic Outlook, 2011)

1.2 Problem statement

Ghana's stock market described as one of the emerging markets currently was established in July 1989 as a private company limited by guarantee under the Companies Code of 1963 (Act 179) and commenced trading on 12 Nov 1990 to encourage private investment in Ghana. However, the status of the company was changed to a public company limited by guarantee under the Company's Code in April 1994. The GSE is regulated by the Securities and Exchange Commission, under the Securities Industry Law, PNDCL 333, 1993, as amended. The GSE has however been making remarkable impressions with 35 companies currently listed on the stock exchange.

Various programs and policies have been implemented by government with the aim of achieving more favourable macroeconomic environment to foster private investment. The present government with its "Better Ghana" Agenda sees the stabilization of macroeconomic factors as critical for private investment. Their present term of office has also seen a reduction in inflation and interest rates and stabilization of the cedi on the foreign exchange market. The concerns are the scientific proof of a relationship between stock prices and macroeconomic variables that will assure investors that the era is indeed a better Ghana to invest especially on the stock market.

Since the inception of GSE, the exchange has performed commendably as shown by the GSE All-Share Index, which measures the overall performance of the GSE. The

performance of the GSE using year- end values, the GSE All-share index for 2001 increased by 11.42% over that of 2000. Successive increases were 45.90% in 2002, 154.67% in 2003 and 91.33% in 2004. In 2005 however, the GSE All share index fell by 29.85% over that of 2004. To many analysts 2005 is the period in which stock prices began to stabilize following persistence bullish performance. The GSE All-Share Index rose from 4,769.00 points at the end of 2005 to 10,431.60 points at the end of December 2008, before dropping to close 2009 at 5,572.34 points. Although year- on -year performance has been mixed, returns have been significant for long-term investors averaging about 3.60% over the past five years (2005 and 2009).

2009 was a particularly difficult year for the stock market and this was against the background of 2008 being one of the best years of the market. The patch that the market went through in 2009 resulted from the effect of the global financial crisis which began to be felt in the fourth quarter of 2008 and the fact that in 2009, the Exchange also effectively began migrating from paper certification to electronic book entry securities under the new automated Trading System. That process naturally requires time since investors needed to be convinced to get on board. The rise in local interest rate thus making money market instruments relatively more attractive was also a contributory factor. With a drop of 46.58% in the GSE All-Share index, the Ghana Stock Exchange ended the year 2009 as the least performing market in Africa. In the previous year 2008, the gain in the GSE All-share Index of 58% put Ghana ahead of all the African markets. It is interesting to note that Tunisia led the African markets in 2009 with a return on index of 46.60%. Due to the continuous improvement at GSE, in 2010, it was adjudged the most innovative African Stock Exchange at the African Investor (Ai) prestigious

annual index series awards held at the New York Stock Exchange out of seven African Stock Exchanges nominated.

The growing importance in the African economy due to increasing market openness, continuing unfolding strong trade relationship with outside world rising foreign investment, expanding GDP growth rate and enduring expansion in export and oriented industry and services calls for investigation into certain macroeconomic factors and its relation to the stock market.

The openness of a country's economy is recognised as a cause of volatility of its market. Ghana presents a typical example of an open economy which engages in international trade transaction. Moreover, with advert of globalization, developing economies are becoming more integrated into developed economies with the results of increasing flow of imports and exports. Ghana is not an exception. A cursory examination of foreign exchange rate and interest rate history in Ghana shows some considerable level of instability. Therefore, it would be interesting to explore the effect of its foreign exchange and interest rate changes on its stock market. Again, much work on the effect of the exchange rate and interest rate changes in the developing country like Ghana has not been done. The study is therefore intended to look at the effect of foreign exchange and interest rate changes on stock market returns in Ghana.

1.3 Objectives

The performance of the Ghana Stock Exchange (GSE) is of great interest to investors. Investors' interest in listed companies is rekindled by the increase in trading on the GSE

to alleviate the liquidity problem characterized by the exchange. Considering the volumes and values traded, the interest rate and the dependency on foreign exchange by some firms listed has influenced the choice of the GSE associated with the IR and EXR changes.

The goal of the study is to investigate how these companies on the GSE fare against a higher volatile ER and IR considering investors sensitivity to changes in both markets.

The objective of the study is to:

1. Examine whether stock market performance is influenced by interest rate and exchange rate in Ghana.
2. Determine whether other microeconomic variables affect stock market volatility in Ghana.
3. Establish the type of relationship between foreign exchange rate, interest rate and stock market returns.

1.4 Research Questions

The study seeks to find answers to the following questions:

1. What is the impact of changing interest rate on the Ghana Stock market returns?
2. What is the effect of changing exchange rates on the GSE market returns?
3. Should investors be concerned about other macroeconomic indicators?
4. Are investors affected by the volatility of EXR and IR?

1.5 Significance of the Study

This study examines whether stock market returns are influenced by interest rate and exchange rate changes in Ghana. Investors and potential investors will get to understand whether changes in IR and EXR affects returns on the stock market and to what extent it affects investment in both markets. It will assist local firms to identify periods that may be conducive to get listed on the stock market as well as assist investors to make good investment decisions.

The findings of this study would help the country and government to decide on which sector of the economy would need special attention in terms of attracting direct foreign investment and earning much revenue. In addition to being useful as a source of information, it may also arouse interest for further studies in this or related areas concerning the activities of both foreign and local investors.

1.6 Scope and Limitation of study

Obtaining and collating data for the research was one of the mitigating factors for this research; I used monthly data on TBR (representing IR), EXR and Stock Market Index from January 2000 to December 2010 which may not reflect the whole effects of the macroeconomic variables on the stock market returns since the data is limited to the year 2000 and above and not from the inception of the GSE.

1.7 Organisation of the Study

The study consists of five chapters as follows:

Chapter one comprises the background of the study, statement of the problem, objectives of the study, significance of the study, scope and limitation of the study and the organisation of the study.

Chapter two presents a review of the relevant literature on interest rate and exchange rate changes on stock market that will form the theoretical framework for the study.

Chapter three gives detail research methodology. It delineates the sources of data, and empirical design.

Chapter four reports the empirical results. It covers data presentation, analysis and discussion. Here secondary data obtained using various means outlined in the methodology is organized into a meaningful data format, analysed and discussed in order to draw conclusions.

Chapter five presents the findings from the data analysis and offers conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This part of the study dwells on a review of empirical studies that investigates the relationship between stock prices, EXR, IR and other macroeconomic variables.

Researchers to a large extent focus on studying the interactions between the financial and macroeconomic variables on stock markets in different countries with widespread econometric methods. However, little has been conducted in Ghana and this study seeks to analyse specifically the relationship that exist among the highly volatile financial markets specifically short term interest rate and exchange rate on stock market returns due to the increased focus on the African stock market in recent times.

According to Fama (1981) stock prices reflects macroeconomic variables such as exchange rate, interest rate, industrial production, real GNP, money supply and capital expenditures. Due to that an investigation was conducted by Maysani and Koh (2000) and Choi *et al* (1992) to find the impacts of the interest rate and exchange rate on the stock returns and concluded that the exchange rate and interest rate are the determinants in the stock prices. On the Other hand, a study conducted by Tabak (2006) to analyse the dynamic relationship between stock prices and exchange rate in the Brazilian economy showed that there is no long-term relationship between these variables whiles Hardouvelis (1987) points out that there exists an inverse relationship between stock

prices and changes of interest rate and this can be rationalized in terms of money supply surprises.

The goods market approach (Dombush & Fisher, 1980) and the portfolio balance approach (Frankel, 1993) is the two major theories underlying empirical studies concerning the relationship between stock price and exchange rate. The previous empirical evidences on relationship between exchange rate and stock return are at best mixed. The reason for the differences of results among different economies might be because of the different degree of the capital mobility, trade volume and economic links among them. Another reason could be an omitted variable bias-for example interest rates may have an influence on stock and currency markets Kumar (2009).

Various studies have also been conducted by different authors on several advanced economies, developing economies and some parts of Africa including Ghana.

2.1 Evidence from Advanced Economies

Levy (1987) indicates that the USD exchange rate changes can adversely affect a firm's gross profit but the degree to such impact varies sectorally. He also detected that the changes in the external value of the USD have a very great impact on profits of durable goods manufacturers as compared to certain service industries. On the contrary, Sonnen and Hennigar (1998), in their study find a negative relationship (a very weak relationship) between changes in the USD exchange rate and industrial stock price indices.

During the post-float period between January 1984 and December 1989 in Australia, a study was conducted by Loudun (1993) on stock returns sensitivity of some companies' vis-à-vis changes in the trade weighted index value of the Australian Dollar and revealed that resource stocks and industrial stock respond differently to fluctuations in Australian Dollar. Banny and Enlaw (2000) also unearthed the relationship between the exchange rate of the Malaysian Ringgit in terms of the USD and stock prices in Kuala Lumpur Stock Exchange (KLSE) through the application of single and multi-index models. Their conclusion was that a negative relationship exists between exchange rate and KLSE stock prices.

In 1976, Ang and Ghallab studied the effect of the USD devaluation on 15 US Multinational firms' stocks using data from August, 1971 to March, 1973 and reported that stock market is efficient and stock prices adjust rapidly to changes in exchange rate which is also consistent with finding of Aggarwal (1981) that between the period of 1974 and 1978, the floating value of the USD and the US stock prices are positively corrected. This however 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 US Multinational firms' stocks.

Solnik (1987) studied the effect of a number of variables including exchange rate, interest rate and changes in inflation expectations and stock prices. The study utilised data from nine developed economies, namely, the US, Japan, Germany, France, the UK, Switzerland, Belgium, Canada and the Netherlands. Among the findings of the study

was that a fall in the exchange rate impacted positively on the US stock market as against changes in inflation expectations.

According to Fama (1981), a strong positive correlation exist between common stock returns and real economic variables like capital expenditures, industrial production, real GNP, money supply, lagged inflation and interest rates whereas Chen, Roll and Ross (1986) find that the changes in aggregate production, inflation, the short-term interest rates, the maturity risk-premium and default risk-premium are the economic factors that explain the changes in stock prices using US economic data

In examining the impact of macroeconomic variables on the Straits Times Industrial Index (STII), Ying Wu (2001) categorized the macroeconomic indicators into two groups namely money supply and interest rates. His findings was that money supply does not register any pattern of influences on the STII but interest rate does play a significant role in determining the STII on the monthly investment perspective. When time series data from January, 1982to December, 2002 on selected macroeconomic variables of major stock indices of United States and Singapore were used to examine the long–run equilibrium relationship between the two countries, Wing et al. (2005) discovered through a cointegration test that Singapore's stock prices generally display a long-run equilibrium relationship with interest rate and money supply but similar relationship does not exist in the US market.

In finding the evidence of stock market sensitivity to interest rates and inflation in the United Kingdom, Nicholas (2003), analysed the behaviour 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 indicated that interest rate movements are important determinants of equity return variability and all the industries other than forestry and paper, sectors and market portfolios are negatively related to interest rate changes. It was also established that utilities have the highest sensitivity to movements in nominal interest rates because of their high exposure to inflation. Statistical outputs conclude that there are significant differences between interest rate and inflation sensitivities across all economic sectors

Using the arbitrage pricing theory (APT) on Japanese Stock returns and several macroeconomic variables like industrial production, money supply crude oil price, short term interest rates), it was discovered by Elton and Gruber (1988) that there exists a positive relationship between stock prices and short-term interest rates. Chen et al. (1989) examine the effect of discount rate changes on the volatility of stock prices and on trading volume. The authors discovered that unexpected discount rate changes contributed to higher, though short-lived, volatility and trading volume.

It was unearthed by Smirlock and Yawitz (1985) that interest rate changes can impact 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 altering expectations about future cash flows. They discovered that an increase in interest rates causes stock prices to decline and a decline in interest rates causes stock prices to rise. Further, they conclude that if both capitalization rates and expectations about future cash flows are impacted by interest rates, these effects would influence equity prices.

2.2Evidence from Developing Countries

In a related study, Kumar (2009) examines the dynamic relation between stock index and exchange rate by using the daily data for India by the application of the unit root and cointegration tests to test for the long run relationship between the two variables. The study also uses linear and nonlinear granger causality tests after removing the volatility dependence from the series to examine the dynamic relationship between the two variables. Following Hristu-Varsakelis and Kyrtsou (2008), the nonlinear granger causality between stock index and exchange rate is investigated by using bivariate noisy Mackey Glass model. The empirical evidence suggests that there is no long-run relationship; however, there is bidirectional linear and nonlinear granger causality between stock index and exchange rates. The findings of the study strongly support the micro and macroeconomic approach on the relationship between exchange rates and stock prices.

Using monthly data on four South Asian countries, including Pakistan, India, Bangladesh and Sri- Lanka, for the period January 1994 to December 2000, Muhammad and Rasheed (2002) employed cointegration, vector error correction modeling technique and standard Granger causality tests to examine the long-run and short-run association between stock prices and exchange rates. The results of their study however show no short-run association between the said variables for all four countries. There is no long-run relationship between stock prices and exchange rates for Pakistan and India as well. However, for Bangladesh and Sri Lanka there appear to be a bi-directional causality between these two financial variables. A similar study by Smyth and Nandha (2003) investigated the relationship.

Bhattacharya and Mukherjee (2003) investigate the empirical relationship between stock prices and macroeconomic aggregates in the foreign sector in India. They applied the techniques of unit–root tests, cointegration 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 2000-01and concludes that there is no causal linkage between stock prices and the three variables under consideration.

Abdalla and Murinde (1997), with the aid of monthly data covering the period 1985 and 1994, examined the relation between stock prices and exchange rates in four Asian countries including India, Pakistan, Korea and the Philippines. The study, which used the cointegration approach, found no long-run relations between the two financial assets for Pakistan and Korea but found a long-run relationship for Korea and India. On the question of causality regarding the two variables it was concluded that the there was a uni-directional causality from exchange rate to stock prices in Pakistan and Korea. Because of 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 uni-directional.

On the other hand, Bahmani and Payesteh (1993) conclude that there exists a bi-directional causality between stock prices and exchange rate, at least in the short-run, although the cointegration analysis does not depict any long-term relationship between

these variables. However, a study conducted by Qiao (1997) reports that a bi-directional relationship exists in the stock prices and exchange rate of the Tokyo stock market.

Findings from other research specifically point out that the interest rate and exchange rate changes affect the stock market in the long run and there is no significant influence in the short run. According to Amaresh das (2005) on his study on the interrelationship between the stock prices represented by market index and interest rates measured by three month Treasury bills for monthly observation from 1985 to 2003 by sampling three Asian countries including Bangladesh, the codependence among variables shows that the relationship between stock prices and interest rate is not significant for Bangladesh and Pakistan except India. The paper further documents that the time series data for Bangladesh and Pakistan reflects strongly common cycles.

In related studies, 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) discovered that stock market volatility increases in times of recession and Glosten et al.(1993) find interest rates to be an important factor in explaining stock market volatility.

Hasan and Samarakoon (2000) studies the ability of interest rates, measured by treasury bill rates of three maturities; 3,6 and 12 months which tracks the expected monthly, quarterly and annual returns in the Sri Lankan stock market for the period 1990 to 1997. The stock return is measured by the continuously compounded monthly returns on the All Share Price Index (ASPI) and Sensitive price index. Through the application of the OLS method it was suggested that the short-term interest rates are positively related to

future returns and they are able to reliably track expected returns prospects. The authors also concluded that the 12 months maturity is the most powerful tool to track monthly and quarterly expected return among all the three maturities.

In a study conducted by Lobo (2002) which examines the impact of unexpected 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 cause stock prices to rise significantly. Surprises associated with increases in the target increase stock market volatility on the announcement day, with volatility reverting to pre-surprise levels on the day after the announcement. This volatility pattern is only evident since 1994. An implication is that concerns about immediate disclosure causing persistent and heightened stock market volatility might be misplaced.

Goswami and Jung (1997) in their study on the effects of economic factors on Korean stock market employed the VECM to verify the SR and LR relationship between stock price and nine macroeconomic variables namely; SR-IR, LR-IR, Inflation, money supply, industrial production, oil price, balance of trade for current account and foreign exchange from two different currencies i.e. Korean won per USD and Korean won per Japanese Yen. The authors conclude that the Korean Stock prices are positively related to industrial production, inflation and SR interest rate

In Mishra (2004), it was identified that there is no Granger's causality between the exchange rate and stock return. The study of Mishra (2004) indicated that stock return, exchange rate return, the demand for money and interest rate are related to each other

though no consistent relationship exist between them. Furthermore, forecast error variance decomposition evidenced that exchange rate return affects the demand for money interest rate causes exchange rate to change; exchange rate affects the stock return; demand for money affects the interest rate.

2.3 Evidence from Africa

Ocran (2010) examined the empirical relationship between the rand and the USD exchange rate and the stock prices of South Africa and the US. The study was undertaken with the aid of the Johansen cointegration technique, the Granger causality test, generalised impulse response function and forecasting error variance decompositions. Monthly data of the three variables from January 1986 to November 2005 were used in the estimations. The Johansen cointegration test could not identify a 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. Cointegration tests showed that in the long-run exchange depreciation leads to increases in stock market prices in some of the countries, and in the short-run exchange rate depreciations reduce stock market returns.

Subair, K. and Salihu, O.M. (2010) employed a data set comprising annual stock market capitalization, GDP, inflation rate, IR and EXR volatility for the period between 1981-2007. Through the ECM, the study investigated the effects of EXR volatility on the Nigeria stock markets. It was found that the EXR volatility exerts a stronger negative

impact on the Nigeria Stock markets. However the rate of inflation and interest rate did not have long run relationship with stock market capitalization since the major participants in the market is the government. They further concluded that, the EXR volatility has a very serious implication on the Nigeria Stock market thus for any serious development of the stock market there is a need to stabilize the movement of the EXR.

2.4 Evidence from Ghana

Adjasi *et al* (2008) analysed the effect of exchange rate volatility on stock market in Ghana as well as the effect of other macroeconomic variables on stock market volatility. The authors attempted to find the nature of volatility in both the stock market and the exchange rate from 1995 to 2005 and the results showed that there is an inverse relationship between exchange rate volatility and stock market returns. The study of Adjasi *et al* (2008) indicated that there is the presence of volatility shocks of the exchange rate on stock returns on the Ghana Stock Exchange, thus given an indication that changes in the tradeoff between risk and return is predictable thus serving as a useful guide for risk management.

Using Johansen's multivariate cointegration test and Innovation accounting techniques, Adam and Twenenboah (2008) examined 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 and conclude that there is cointegration between macroeconomic variables identified and stock prices in Ghana indicating a long run relationship.

2.5 Conclusion

It is evident that macroeconomic variables such as Interest Rate, Treasury bill rate, Money Supply, Exchange Rate, Foreign Direct Investments (FDIs), Consumer Price Index (CPI) etc. have some impact on share price on Stock Exchange Markets in both developed and developing countries where studies have been conducted. It is expected that these findings would also be applicable in Ghana and would be tested accordingly.

The above studies on Ghana concluded on the existence of either a positive or a negative relationship of EXR and GASI and if there exist a Cointegration between some macroeconomic variables and the stock market returns. This study seeks to contribute to the above studies by determining sufficient relationship in the modern stocks and EXR and IR by considering detailed share price movement using monthly data and to as well determine the long run and short run relationship amongst the variables being considered.

The researcher therefore envisage that future research will focus on other specific macro and microeconomic variables that has a causal relationship with the GSE returns since Ghana is now becoming a spot light in the African Stock Market.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This study seeks to investigate the relationship between the Ghana Stock Exchange All-Share Index, the exchange rate specifically the Ghana cedi and the US dollar and the Interest rate (91 day treasury bill rate) issued by the bank of Ghana. Consequently, this chapter is concerned with the description of the dataset that was used and the time series methodology that will aid in unveiling the dynamism between these variables.

3.1 Data Collection and Source

The data used in the empirical analysis was mainly secondary data collected from the period, January 2000 to December 2010 consisting of 120 monthly observations for each variable. The stock indices were obtained from the Ghana Stock exchange whereas the macroeconomic variables namely, exchange rate and interest rate as measured by the 91 day Treasury bill rate was sourced from the Bank of Ghana website and quarterly bulletins published by the Bank of Ghana.

The choice of these variables is as a result of the interrelationship and interdependence. Investors would want to consider either investing on the stock market or exchange rates market or buy a fixed rate treasury bill in order to ensure higher profitability. The macroeconomic variables in addition help in making investment decisions due to their great impact on investment returns. The Treasury bill rate was used as interest rate since

savers usually invest their savings for higher interest with certainty when investment in the stock market does not seem profitable to them.

The data on exchange rate between the Ghana cedi and the US dollar was used due to the dominance of the U.S. Dollar in international transactions and evolving strong trade as well as financial relationship between Ghana and US economy.

3.1.1 Description of Variables

A brief description of the variables is presented below:

GSE All-Share Index (GASI): The GASI represents the dependent variable in the empirical formula (equation 3.1) and it captures the performance of the market. It is the principal stock index of the Ghana Stock Exchange. This index is calculated from the values of each of the market's listings.

The GASI is the only one index that is compiled and published by GSE. GASI is a market capitalization. The base period market capitalization is the average capitalization of the market for the period from 12 November 1990 to 30 December 1993 calculated by averaging the market capitalization for all trading sessions during this period. Base index value is 100. To maintain the continuity of the index, the base year total market value is adjusted for all events affecting the capitalization of the companies included in the index that are not caused by price changes. These include new share issues, new listings, de-listings and right issues. The change in the value of the index reflects the change in overall market capitalization from the previous trading session.

Exchange Rate (EXR): Ghana's import sector dominates the export sector; therefore depreciation of the Ghana cedi will lead to an increase in prices of production and thereby reducing cash flows to the import dominated companies. Repatriation of earning will also be relatively unattractive to foreign portfolio investors who play a major role on the GSE. It is therefore expected that the exchange rate will have a negative influence on the performance of GASI.

Interest Rate (IR): It is established that a negative correlation exist between interest rate and stock market returns. An increase in interest rate will increase the opportunity cost of holding money and investors substitute holding interest bearing securities for share hence falling stock prices. The Treasury bill rate is used as a measure of interest rate in this study because investing in Treasury bill is seen as opportunity cost for holding shares. The most actively traded money market instruments are Treasury bills which are government issues with maturities of 91 and 182 days. The Bank of Ghana holds auctions of Treasury Bills every week on Fridays. High Treasury bill rates encourage investors to purchase more government instruments. Treasury bills thus tend to compete with stocks and bonds for the resources of investors. The expected relationship between stock prices and Treasury bill rates is thus negative.

3.2 Analysis Plan

In this section, the researcher discusses the time series methodologies that will be used in analyzing the dataset. The following tests are expected to be employed: Unit root test for stationarity, Augmented Dickey-Fuller Test, Ordinary Least Square (OLS) method Cointegration test, Vector error correction model, etc. We rely on R statistical computing

software to implement the time series methods that will be discussed in this section and all statistical tests were carried out at 0.05 level of significance.

3.2.1Exploratory Data Analysis

The techniques used in this section are mostly graphical and descriptive statistics. This procedure will enable the researcher to gain an insight into the data set, extract important variables and their distributions, detects other anomalies.

From literature, we notice that it is common to take the natural logarithms of times series which are growing over time. These variables are estimated in natural logarithms for the following reasons:

- To interpret the coefficients of the cointegrating vector as long-term elasticities.
- To interpret the first difference as growth rates.

The data distribution was examined using graphs and standard descriptive statistics namely mean, median, standard deviation, skewness and kurtosis. The Jarque-Bera (1980) test is also conducted to ascertain the normality of the data distribution. Under the null hypothesis of normal distribution, Jarque-Bera (J-B) is 0. As a result, J-B value greater than zero is said to have deviated from the normal distribution assumption. Similarly, skewness and kurtosis represent the nature of departure from normality. In a normally distributed series, skewness is 0 and kurtosis is 3. Positive or negative skewness indicate asymmetry in the series and less than or greater than 3 kurtosis coefficient suggest flatness and peakedness, respectively.

3.2.2 Unit Root Test

Most macroeconomic time series data are found to be non-stationary. A stochastic process is said to be stationary if its mean and variance are constant overtime, while the value of the covariance between two periods depend only on the gap between the periods and not the actual time at which this covariance is considered. If one or more of these conditions are not fulfilled then the process is said to be non-stationary (Charemza and Deadman, 1992).

The time series property of each variable is then investigated using univariate analysis by applying the Augmented Dickey-Fuller Test (ADF) to check nonstationarity following Dickey and Fuller (1981) and Fuller (1996). The Pillips-Perron test is also implemented following Philips (1986); Phillips and Perron (1988). The KPSS is also applied as a counterpart of ADF and Phillips and Perron test to test for stationarity (no unit root) following Kwiatkowski *et al* (1991).

In order to check the stationarity of the variables, the ADF test is performed where three regression forms are generated:

$$\Delta Y_t = \alpha_1 Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \varepsilon_t, \quad (None), \qquad (i)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \varepsilon_t, \quad (With\ Constant), \qquad (ii)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_1 t + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \varepsilon_t, \quad (With\ Constant\ and\ Trend), \quad (iii)$$

for all $t = 1,2, \ldots,120$ and ε_t is a white Noise.

The additional lagged terms are included to ensure that the errors are uncorrelated. In a unit root test as per the above regressions, the null hypothesis to be tested is that the coefficient of Y with one lag is equal to zero $(H_0: \alpha_1 = 0)$i.e. no unit root exists thus integrated of order zero against the alternative hypothesis that there is a presence of a unit root, thus not integrated of order zero.

3.2.3 Empirical Design (Model Specification and Estimation)

The fundamental estimating equation in log-linear form is as follows:

$$InGASI_t = \beta_0 + \beta_1 InER_t + \beta_2 InTBR_t + \varepsilon_t, \quad t = 1,2,\dots,120 \tag{3.1}$$

where, $InGASI$ = natural log of GSE All share index, $InER =$ natural log of exchange rate and $InTBR =$ natural log of Treasury bill rate. The error term, ε_t is assumed to be independent and identically distributed and $t =$ time subscript. The expected signs of the above equations are $\beta_0 > 0$, $\beta_1 < 0$and $\beta_2 \lessgtr 0$(i.e. positive or negative).

If the unit root test in section 3.2.2 confirm the stationarity in time series data of each variable, then equation (3.1) is estimated appropriately by the Ordinary Least Square (OLS) method. This is done to avoid misleading inferences in the presence of spurious correlation (Granger and Newbold, 1974). As a rule of thumb, (Granger and Newbold, 1974) suggested that one should be suspicious if R^2 is greater than Durbin-Watson statistic.

If the unit root test rejects the null hypothesis that the series has a unit root, it means that the series is stationary and thus can be used for VAR. But, if the unit root test cannot

reject the null hypothesis, it means that the series are not stationary and we can apply difference operator to make the series stationary before testing for VAR

3.2.4 Cointegration

If the variables are found to have unit roots (nonstationarity), and are of the same order of integration, the cointegrating relationship among variables determined, that is the tendency of the variables to move together in the long run is studied either by the Engle-Granger (1987) procedure or the Johansen-Juselius procedure (Johansen 1988; Johansen-Juselius 1992, 1999) to overcome the associated problem of spurious correlation and misleading inferences. If the variables are found to be cointegrated, the relationship may be interpreted as a long run relationship. However, in this study the Johansen-Juselius procedure was used.

3.2.4.1Johansen-Juselius Procedure

The Johansen procedure is applied at this point to test for cointegration and this can be done through the Vector Autoregressive (VAR) approach as outlined in Granger (1988). The appropriate lag-length (p) is selected with the aid of the Final Prediction Error (FPE) criterion (Akaike, 1969) and Akaike Information Criterion (AIC) to ensure that errors are white noise. A time series H_t is called white noise if $\{H_t\}$ is a sequence of independent and identically distributed random variables with finite mean and variance. This is to help overcome the problem of over or under parameterization that may induce bias and inefficiency in the estimates.

The analysis then begins with a congruent statistical system of unrestricted reduced form as stated below:

$$Y_t = \alpha + \sum_{i=1}^{p} \Pi Y_{t-i} + \zeta_t; \quad \zeta_t \sim N(0, \Omega); \quad i = 1,2, \ldots 120. \qquad (3.2)$$

Where $Y_t$is an $(3\ x\ 1)$ vector of order $I(1)$ and/or of order $I(0)$ variables, and α is an $(3x1)$ vector of constraints, Letting $\Delta Y_t = Y_t - Y_{t-i}$ then equation (3.2) then becomes

$$Y_t = \alpha + \sum_{i=1}^{p-1} \Psi \Delta Y_{t-i} + \Pi Y_{t-i} + \zeta_t; \qquad (3.3)$$

Since ζ_t is stationary, the rank, r of the long-run matrix Π determines how many linear combinations of $Y_t$are stationary. If $r = n$, all $Y_t$are stationary, while if $r = 0$so that $\Pi = 0$, $\Delta Y_t$is stationary, as are all linear combinations if Y_t is of order $I(1)$. For $0 < 1 < n$, there exist r cointegrating vectors meaning r stationary linear combinations of Y_t. If this is the case since the study seeks to investigate the long-term relationship between stock market returns and macroeconomic variables in Ghana, then the hypothesis for the cointegration vectors is stated as $H_0: \Pi = \alpha\beta'$ where both α and β are nxr matrices. The cointegration vectors of β are the error-correlation mechanisms in the system, while α contains the adjustment parameters. In order to test the hypothesis, the order of the cointegration vector needs to be determined first.

The order (rank) of cointegration, r is determined by constructing the trace statistics$(\lambda_{trace})$and the estimated values of the characteristic roots or eigenvalues(λ_{max}). Since in practice the order of cointegration (r) is not known,

Johansen (1991) proposes two ways to perform likelihood ratio tests for the value of (r) which differ in assumptions of alternative hypothesis. These are computed as follows:

- $\lambda_{trace} = -T\sum_{t=r+1}^{n} In(1-\hat{\lambda}_i)$, where the null is $r = q$ against the more general alternative $r \leq 1$.
- $\lambda_{max} = -TIn(1-\hat{\lambda}_{r+1})$, where the appropriate null is $r = q$ cointegrating vectors with $(q = 0, 1,2,3, \ldots)$ against the alternative that there exists only one additional cointegrating vector i.e. $(r \leq q+1)$.

In the Johansen-Juselius procedure λ_{trace} and λ_{max} tests are conducted. For any conflict between these tests, the λ_{max} test should prevail for inferences (Johansen and Juselius, 1992).

3.3.4 Vector Error Correction Model

The vector error correction model (VECM) is estimated to find out long-run causality and short-term dynamics if there is an evidence of cointegration relationship among the variables. The VECM is estimated as shown below

$$\Delta InGASI_t = \alpha + \lambda\varepsilon_{t-1} + \sum_{i=1}^{n} u_i \Delta InGASI_{t-i} + \sum_{i=1}^{m} v_i \Delta InEXR_{t-i} + \sum_{i=1}^{k} w_i \Delta InTBR_{t-i} + \xi_t, \quad (3.4)$$

where ε_{t-1} is the Error Correction Term which reflects the deviation from the long-run equilibrium path.

This allows causality to be determined in two ways namely:

- Short run causality, which is determined by the lagged differences of the variables and;
- Long-run causality, which is determined by the significance of the coefficient of the error-correction term.

The null hypothesis that EXR or IR does not Granger cause GASI is rejected if $v_i$or$w_i \neq 0$ are jointly significant and / or the coefficient of the error-correction term λ is significant. This implies that the variable EXR or IR can Granger cause GASI even if the coefficients on the lagged changes in variables EXR or IR are not jointly significant.Equation (3.4) shows that the variables are cointegrated if the estimate of $\lambda$is negative and statistically significant in terms of the associated t-value. This thus will indicate unidirectional long-run causal flows from changes in exchange rate and Treasury bill rate to change of the GSE all-share index as well as long-run convergence. Changes in exchange rate and treasury bill rate Granger cause the changes in stock market return when v_i's and w_i's are jointly significant in terms of the joint F-test as determined by Bahamani and Payesteh (1993). However if λ is positive and statistically significant, there will still be an existence of long-run causality, but with divergence.

3.3.5 Vector Autoregressive Model

The vector autoregressive (VAR) model is estimated in first-difference when there is absence of cointegrating relation among the variables by excluding the error correction term, $\lambda\varepsilon_{t-1}$as stated in equation (3.4) for Granger causality with a short-term interactive feedback relationship following Granger (1988). Equation (3.4) then becomes:

$$\Delta InGASI_t = \alpha + \sum_{i=1}^{n} u_i \Delta InGASI_{t-i} + \sum_{i=1}^{m} v_i \Delta InEXR_{t-i} + \sum_{i=1}^{k} w_i \Delta InTBR_{t-i} + \xi_t, \quad (3.5)$$

Where Δis the difference operator, ξ_t = the white noise error term and $t - i$ = the time lags.

CHAPTER FOUR

DISCUSSION OF RESULTS

4.0 Introduction

This chapter presents the empirical findings of the research by estimating the following: graphs, descriptive statistics, ADF, PP, KPSS, Johansen Multivariate Cointegration and estimates of the Vector Error Correction Model. The results of the above test will be discussed and analyzed to give meaning to the raw data used.

4.1 Exploratory Data Analysis

4.1.1 Graph of Time Series Plots

The Graph below shows the trend of the GASI, TBR and EXR over the period January 2000 to December 2010 in natural logarithm.

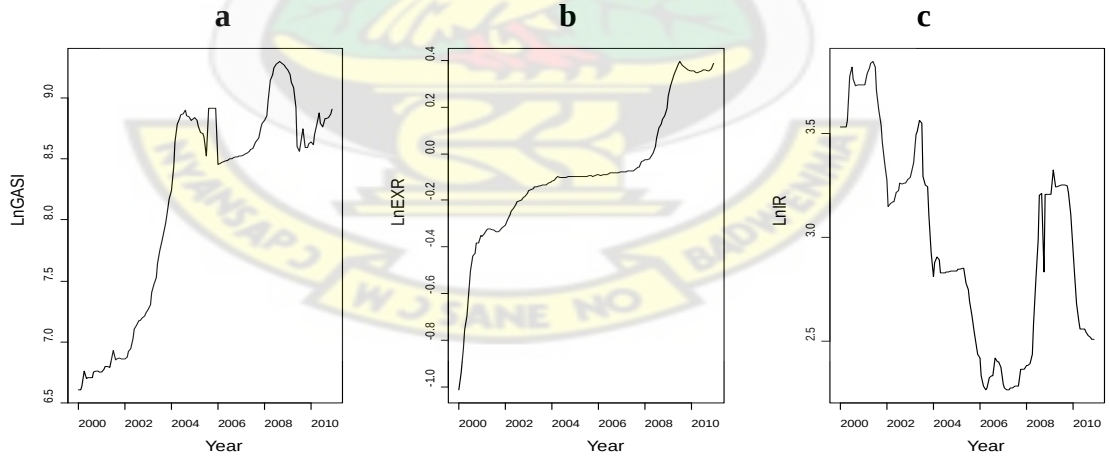

Figure 4.1: Time series plots of the logarithms of GASI, EXR and IR

From Figure 4.1a, it is evident that the InGASI shows a positive trend and increases over the years under review. However, there were some fluctuations between the year 2004

and 2006. In the year 2008, it can be deduced that there were high returns from the stock market but reduced drastically from 2009 to 2010.

The In EXR graph in Figure 4.1b shows a continuous incremental trend over the period though it showed a slight stability between year 2004 and 2008 but soared up high from the year 2009. This perhaps indicates the fact that over the period under review the exchange rate of the GHC to the USD usually does not reduce but either increases or stabilize over a period.

Finally, the InIR graph in Figure 4.1c gives a negative slope as compared to the InEXR and InGASI. The graph also peaks at specific years namely;2001, 2003, and 2009. This can be attributable to the fact that at certain times between the years under review especially during electioneering year and immediately after a general election in the country where the economy is usually not stable and thus brings about high interest rates.

4.1.2 Descriptive Statistics

The descriptive statistics as evidenced in Table 4.1 reveals approximate normality in the data distribution of each variable in terms of skewness and kurtosis.

Table 4.1: Summary of Descriptive Statistics

	LnGASI	LnEXR	LnIR
Mean	8.158	-0.080	2.978
Median	8.544	-0.097	2.918
Maximum	9.298	0.396	3.850
Minimum	6.606	-1.014	2.262
Std. Deviation	0.879	0.274	0.487
Skewness	-0.598	-0.351	-0.095
Kurtosis	-1.263	-1.089	-1.209
Jarque-Bera	16.465	10.073	7.879
Probability	0.0003	0.0065	0.0195

The Stock market returns (LnGASI) has a larger standard deviation among all the index returns, which supports the general intuition that the stock market is highly volatile. The coefficient of skewness is low and negatively skewed. The value for kurtosis in each variable is below the benchmark for normal distribution of 3 which confirms near normality. The mean-to-median ratio of each variable is approximately 1. The range of variation between maximum and minimum is quite logical. The Standard deviation, compared to the mean is low which indicates small coefficient of variation.

The J-B statistics also indicate that the distributions of all the variables during the sample periods have long left tails and flat than the normal distribution. On the whole, by the J-B test the variables do not conform to normal distribution but display negative skewness and a flat distribution. These results are, however, based on the null hypothesis of normality and provide no information for the parametric distribution of the series.

4.2 Unit Root Test

The time series property of each variable is examined using the ADF and PP test for the unit root whiles the KPSS test for stationarity (no unit root).

From Table 4.2, the calculated ADF and PP statistic accepts the null hypothesis that there is unit root at 1%, 5% and 10% significance levels when compared with the respective critical values. Additionally the calculated KPSS statistics also clearly accept the alternate hypothesis of no stationarity (presence of unit root) at 1%, 5% and 10% levels of significance when compared with the corresponding critical values. It suffices

to state that the ADF, PP and KPSS test all consistent confirming the non stationarity of each variable.

Table 4.2: ADF, PP and KPSS Unit Root Test

	Type of Test	Variable	Deterministic Term	Lags	Test Value	Critical Values		
						1%	5%	10%
LEVEL	ADF	LnGASI	Constant	1	-1.6151	-2.57	-2.88	-3.46
		LnEXR	Const. & Trend	2	-2.8305	-3.13	-3.43	-3.99
		LnIR	Constant	1	-1.3114	-2.57	-2.88	-3.46
	PP	LnGASI	Constant	Long	-1.5585	-2.58	-2.88	-3.48
		LnEXR	Const. &Trend	Long	-1.5585	-3.15	-3.44	-4.03
		LnIR	Constant	long	-4.7725	-2.57	-2.88	-3.48
	KPSS	LnGASI	-	-	1.2603	0.35	0.46	0.74
		LnEXR	-	-	1.3573	0.35	0.46	0.74
		LnIR	-	-	0.8420	0.35	0.46	0.74
FIRST DIFFERENCE	ADF	LnGASI	Constant	0	-8.9974	-2.57	-2.88	-3.46
		LnEXR	Constant	1	-4.6631	-2.57	-2.88	-3.46
		LnIR	Constant	0	-9.0067	-2.57	-2.88	-3.46
	PP	LnGASI	Constant	Long	-9.6566	-2.58	-2.88	-3.48
		LnEXR	Constant	Long	-4.2849	-2.58	-2.88	-3.48
		LnIR	Constant	long	-9.4473	-2.58	-2.88	-3.48
	KPSS	LnGASI	-	-	0.1938	0.35	0.46	0.74
		LnEXR	-	-	0.3149	0.35	0.46	0.74
		LnIR	-	-	0.0777	0.35	0.46	0.74

It is also evident from Table 4.2 that all the variables under study (i.e. LnGASI, LnEXR and LnIR) are of all $I(1)$ behaviour. The stationarity of all the variables is restored on first differencing, which shows the same order as required.

4.3 Cointegration Test and Error Correction Model

The optimal lag length was determined by both Final Prediction Error (FPE) and Akaike Information Criterion (AIC) using 8 maximum lags in the general VAR model. The aim

is to choose the number of parameters, which minimizes the value of the information criterion. The results of the tests are presented in Appendix Table 5A.

4.3.1Johansen-JuseliusMultivariate Cointegration Test

In order to detect the cointegration relationship between the variables, the Johansen-Juselius procedure was implemented. Table 4.3A & 4.3B below indicate that-both trace statistics and maximum eigenvalue points show one cointegrating relationship which indicates the presence of a long-run equilibrium relationship between the variables.

Table 4.3: Johansen Multivariate Cointegration Test Results

Table 4.3A (Trace Statistic)

Hypothesized No. of CE(s)	Trace Statistic	Critical Value		
		1%	5%	10%
None (r=0)*	46.5	48.45	42.44	39.06
At most 1 (r≤1)	15.57	22.76	25.32	22.06
At most 2 (r≤2)	6.13	16.26	12.25	10.49
*(**) represents rejection of the hypothesis at the 5%(1%) level of significance				
The Trace test indicates 1 cointegration at 5% level.				

Table 4.3B (Maximum eigenvalue)

Hypothesized No. of CE(s)	Max-eigenvalue	Critical Value		
		1%	5%	10%
None (r=0)*	30.93	30.34	25.54	23.11
At most 1 (r≤1)	9.43	23.65	18.96	16.85
At most 2(r≤2)	6.13	16.26	12.25	10.49
*(**) represents rejection of the hypothesis at the 5%(1%) level of significance				
Max-eigenvalue test indicates 1 cointegration equation at 5% level				

Given the evidence in favour of at least one cointegrating vector, we proceed to estimate the VECM to examine the long-run causality and short-run causal linkages between the variables

4.3.2 Vector Error Correction Model

The VECM results from Table 4.4 below points to the fact that the variables will adjust to a long-run trend. This is evident from the value of the estimated coefficient($\lambda = -0.043247$) of the error correction termε_{t-1} at 5% level of significance which is also significant with respect to the associated t-value.

Table 4.4: Vector Error Correction Model

Variable	**Coefficient**	**Std Error**	**t-statistic**	**Probability**
C	0.014153	0.009407	1.504	0.1354
Res	-0.043247	0.019668	-2.199	0.0300 *
$\Delta InGASI_{t-1}$	0.213539	0.092208	2.316	0.0224 *
$\Delta InGASI_{t-2}$	0.068765	0.091794	0.749	0.4554
$\Delta InGASI_{t-3}$	0.122262	0.090759	1.347	0.1807
$\Delta InGASI_{t-4}$	0.175601	0.091296	1.923	0.0570
$\Delta InGASI_{t-5}$	-0.149234	0.091504	-1.631	0.1058
$\Delta InEXR_{t-1}$	-0.570665	0.739592	-0.772	0.4420
$\Delta InEXR_{t-2}$	0.942455	0.760343	1.240	0.2178
$\Delta InEXR_{t-3}$	0.897931	0.800526	1.122	0.2645
$\Delta InEXR_{t-4}$	-0.943871	0.705634	-1.338	0.1838
$\Delta InEXR_{t-5}$	-0.565612	0.633985	-0.892	0.3743
$\Delta InIR_{t-1}$	0.110251	0.096838	1.139	0.2574
$\Delta InIR_{t-2}$	-0.080635	0.097900	-0.824	0.4119
$\Delta InIR_{t-3}$	-0.061646	0.096381	-0.640	0.5238
$\Delta InIR_{t-4}$	0.005100	0.097757	0.052	0.9585
$\Delta InIR_{t-5}$	0.117044	0.098032	1.194	0.2351
Multiple R^2	0.2064	Mean dependent variable		0.017448
Adjusted R^2	0.0899	S.D. dependent variable		0.084151
Sum squared residual	0.70252	Akaike info criterion (AIC)		-260.2873
Log likelihood	148.144	F-statistic		1.771
Durbin-Watson Stat	1.9435	Prob (F-statistic)		0.04426
Residual Std Error	0.08028	Bayesian Info criterion (BIC)		-209.2343

This indicates that there is a long-run equilibrium relationship that exists among the variables and also confirms that a unidirectional long term causal flow runs from changes in exchange rate and interest rates to the Ghana Stock Exchange All-Share Index. The result of the VECM represents a short-run relationship between the variables. The coefficient of the first lag of the differenced GASI variable was significant in explaining the variations in the GASI. This implies that previous month's GASI would have a positive influence on current year's GASI. However the lags of the second to fifth month were found to be insignificant in explaining the variation in the GASI.

The coefficients of the lagged terms of the changes in the EXR divulge a short-term net negative feedback effect from EXR to GASI, as their sum is negative. The finding is however contrary to expectation. Aside of that, the associated t-values of the lagged variables are insignificant. The reason behind the negative relationship between the EXR and GASI may be attributed to the depreciation of the Ghanaian cedi at certain months within the period understudy which lowers the adjusted rate of return for foreign investors. This may discourage foreign investors from investing into portfolios in Ghana.

In the same way, the positive sum of the coefficients of the lagged changes in the IR indicates a short-term net positive feedback from IR to the GASI. Additionally, the associated t-values of the coefficients of the lagged variables are insignificant which reveals no influence of the IR on GASI.

The value of the adjusted $R^2 = 0.08986$ implies that about 8.9% of the variations in GASI are explained by the independent variables. This shows a very low explanatory power of the model. The F-statistic at 1.771 explains that the coefficients of the

variables are not zero. The Durbin-Watson Statistic as indicated from Table 4.4 i.e. 1.9435 gives an indication that there is no auto-correlation between the variables.

CHAPTER FIVE

SUMMARY, CONCLUSION & RECOMMENDATION

A lot of studies have been done on the relationship between macroeconomic variables and stock market prices in previous years. A few studies have investigated the relationships between exchange rate and stock price across a range of countries, with mixed conclusions. Solnik (1987) finds a significantly positive relationship between stock prices and exchange rates and this result is consistent with Ajayi and Mougoue (1996). However, little has been done on the Ghana Stock Exchange to ascertain the relationship that exists between the stock market returns, Interest rate and exchange rate in Ghana.

5.1 Summary and Conclusion

The study used monthly data from January 2000 to December 2010. The GSE All-Share Index, the GHS to the USD Exchange rate and the 91-day Treasury bill rate representing interest rate were considered in the analysis to determine the dynamic effects of interest rate and exchange rate changes on GSE market returns.

A long run relationship between the variables was explained using the VECM and Johansen Multivariate cointegration test. Contrary to the hypothesis stated earlier, it was detected that IR is positively related to GASI in the short run whereas the EXR was also found to be negatively related to the GASI in the short run which is consistent with Banerjee and Adhikary (2009) and Adjasi et al (2008) on exchange rate and the stock market returns.

It was also evident that a long-run equilibrium relationship exists between the variables and a unidirectional causal flow runs from changes in the IR and EXR to GASI. However, given the very low numerical value of the adjusted R^2, the variables exhibit near independence of each other. The changes in the IR shows very low short term net positive feedback effects on stock market returns which is contrary to expectations. This relationship can be attributed to the fact that 91-day Treasury bill rate have been positive most of the time with much stability although lower in magnitude and also evident from the fact that the rate went down by 10.81% to 12.89% within the first half of year 2010.

Investigation of the EXR reveals a short term net negative feedback from the EXR to the GASI with insignificant associated t-values of the coefficients the existing and lagged variables. This postulates that the EXR and GASI are nearly independent of each other which is also enhanced by the results of the adjusted R^2 and F-statistic. This is probable because there is a limited foreign portfolio investment in Ghana stock market and the depreciation of the Ghana cedi to the USD. In the inter-bank market, the Ghana cedi for instance depreciated marginally by 0.7% against the US dollar during the second quarter of 2010.

It can therefore be concluded that the GSE market, TBR and foreign Exchange Rate of the USD seem to move independently, although there is some evidence showing an existence of a long-run equilibrium relationship between the variables.

5.2 Recommendations

Based on the results, the researcher recommends that:

Potential investors pay attention to both exchange rate and interest rate dynamics due to the relationship that exist with the GASI in the long run. Investors are advised to also consider other factors like inflation and foreign direct investment and its performance in their investment decisions. This is because macroeconomic variables may serve as a guide in forecasting stock market viability and to decide if it is worthwhile to invest in such portfolios. Investors, apart from the fundamental factors should consider firm specific factors in their decision to purchase the firm's stock.

In order to achieve better stock performance, policy makers of the Ghana Stock Exchange must put in place measures to ensure better corporate performance by listed firms. This is because investors would like to know the performance of the stock market in the previous year before they decide to invest in them. It is likely the falling performance of the GSE would dampen its stock prices.

Foreign players in Ghana like the telecoms, energy and mines sector should be encouraged to be listed to add up to the 35 already listed companies on the stock market. This is expected to boost the economy and allow Ghanaians to also reap some of the profits. In view of that, the GSE can be more attractive than the other investment instrument like exchange rates market and the treasury bills. This is because investors see Treasury bills as alternative assets to GSE stocks and would switch to the Treasury bills if the rate of returns from the GSE is lower.

The government must also continue to ensure that prudent measures are put in place to ensure that inflation rates are kept low to keep the levels of interest rate stable over a period of time which will as such move in the same direction as the stock market. By so doing, investors will wish to invest in both short term and long term portfolios and will also encourage foreign investors into the Ghanaian market to boost the economy.

Monetary stakeholders should be keen on macroeconomic indicators and diligently assess the impact of EXR and IR volatility on the GSE market returns. Volatility would depend on both the degree of openness of domestic economy and the degree of the trade imbalance. Capital account transactions should be well monitored to ensure a sound portfolio balance. According to Frankel (1993), a rising stock market would attract capital flows into the economy which increases for domestic currency and cause exchange rate to appreciate.

5.3 Suggestions for Further Research

The researcher initially attempted to include the interbank interest rate for the study. However, due to the limited time available and low rate of response, he could not do that. It would therefore be compelling to perform an empirical analysis using a wide range of data of the interbank interest rate on deposits to know if those who save in Ghana commonly invest their savings in bank deposits for higher interest rate with certainty when investment on the stock market does not seem profitable to them.

Lastly, other macroeconomic variables like inflation, consumer price index, Money supply etc. can be used as variables to determine its effect on GSE index to be able to

determine if there is a general long term or short term effect of these macroeconomic variables on stock market returns in Ghana.

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APPENDICES

Figure 1A: Graph of Logarithms of Variables (combined)

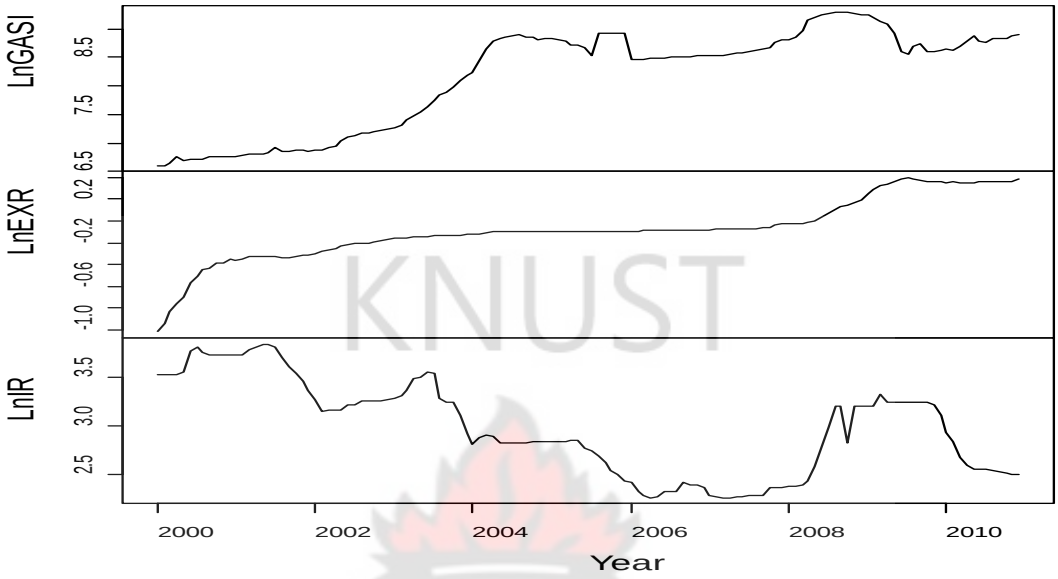

Figure1B: Graph of Logarithm of variables (All-in-one)

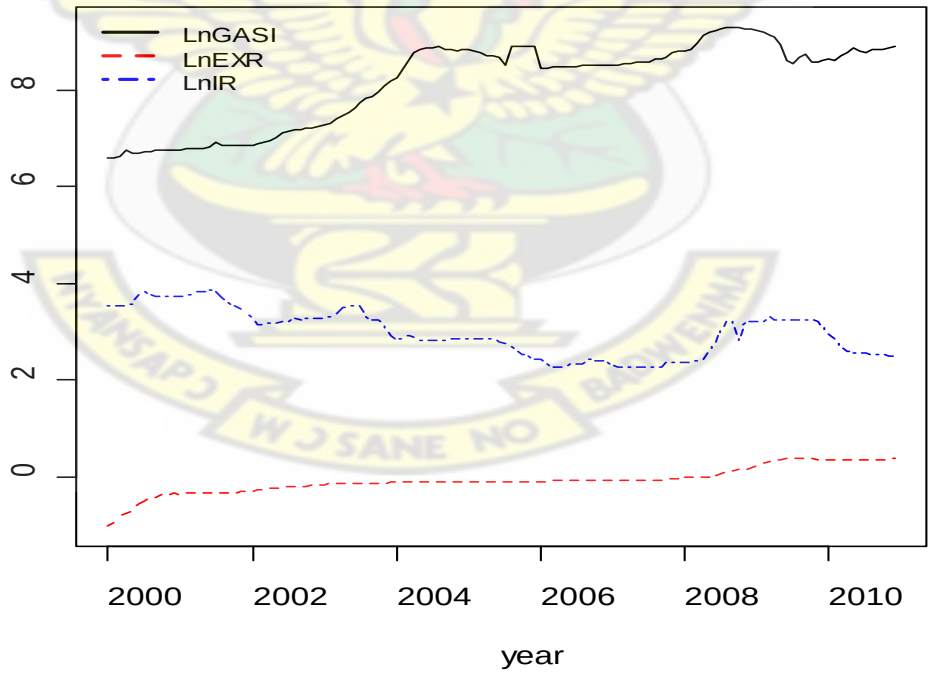

Table 5A: VAR lag order number selection criterion

lag	AIC	FPE
1	-1.904240e+01	5.370895e-09
2	-1.928743e+01	4.205437e-09
3	-1.929901e+01	4.160588e-09
4	-1.938093e+01	3.839075e-09
5	-1.943172e+01*	3.657439e-09*
6	-1.936244e+01	3.932782e-09
7	-1.937288e+01	3.909525e-09
8	-1.931691e+01	4.159076e-09

**indicates lag order selected by the criterion*
FPE: Final Prediction Error; AIC: Akaike Information criterion