2014

The Effect of Macroeconomic Variables on Stock Market Returns in Ghana (2000-2013)

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Abstract

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Dissertation Submitted in Partial Fulfillment

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Abstract

Variations in macroeconomic indicators affect the performance of the stock markets. In Ghana, although the performance of the Ghana Stock Exchange (GSE) has been affected by macroeconomic variables from January 2000 to December 2013, the mechanisms of these relationships have not been studied. The purpose of this research was to examine the relationships between selected macroeconomic variables and their effect on the stock market returns on the Ghana stock market. The research questions addressed whether macroeconomic variables had significant effect on stock market returns in Ghana within the specified period. The target sample was all 36 listed firms on the Ghana stock market. Data were obtained from the Bank of Ghana bulletins, the Ghana Statistical Service website, and the GSE website. Time-series data analysis was used to determine whether there was a statistically significant relationship between stock market returns and inflation rate, exchange rate, interest rate, and money supply. The findings revealed that interest rates and money supply had a significant negative effect on stock market returns; however, exchange rates had a significant positive effect on stock market returns. Moreover, inflation rate did not significantly affect stock market returns in Ghana. The implications for positive social change include improved knowledge about the effects of macroeconomic variables on stock returns that could guide policy makers and household agents to improve investment decisions, thus increasing the net worth of these economic agents.

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Dedication

This dissertation is exclusively dedicated to Charles Barnor (Jnr.), Tiffany Barnor, Trixie Barnor, Rebecca Nkrumah Barnor, and my adorable wife, Joyce Akyaa Barnor. The study is also dedicated to my late mother, Theodora Joannah Barnor, whose timely decisions on my education and insistence on being brought up in a mission house exposed me to the meaning of life, discipline, hard work, and a spirit-filled environment during my stay in Tut Nel Villa Missionary house at Adabraka, Accra.

Acknowledgments

This part cannot be written perfectly without mentioning firstly Almighty God, the role of Dr. Mohammad Sharifzadeh, Dr. Javier Fadul, and Dr. William H. Brent for the invaluable time they reposed in me throughout the dissertation journey. To Professor Joshua Alabi and Professor Goski Alabi, to whom I owe a great many thanks, to a great family, friends, and faculty members of the University of Professional Studies, Accra, I render my sincere gratitude for the support throughout the doctoral journey.

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Chapter 1: Introduction to the Study

Africa has reserves of gold, bauxite, oil, timber, and gas, yet the dominant discourse of African politics has been one of conflict and illegal exploitation of its natural resources. Anokye and Siaw (2010) posited that the African continent may have the largest natural resource deposits in the world, but coupled with conflicts, African governments have ineffective extraction methods to harness the natural resources. Ghana, a country in the West African sub region is gradually positioning itself as an oil exporting country because of the historic 2007 offshore discovery of oil in the Jubilee Fields. According to the Bank of Ghana (BoG) in December 2010, the country began it first commercial extraction of oil, with expected net export income of over US$1 billion per annum for the next 20 years (BoG, 2011). In addition to the large oil reserves, which have been estimated at between 800 million and 1.8 billion barrels, the extractive sector of the country has such minerals as bauxite, iron ore, manganese, salt, as well as gold deposits in commercial quantities (Bank of Ghana, 2011). Gold alone accounted for 90% of the country's export in 2011 and it was responsible for 5% of the gross domestic product (GDP) and 12% of government revenue (Bank of Ghana, 2011).

Ghana's economic prospects coupled with the vast amount of resources may provide hope and prosperity if policy makers engage in a prudent management of its natural resources. With sound macroeconomic policies and strong regulatory framework of the stock market, the country could be on a path of a sustained socioeconomic growth. To establish a contemporaneous short run positive effect of foreign direct investment (FDI)on the economic prospects of Ghana, Fosu, Bondzie and Okyere (2014) observed

that, resulting from the recent global financial meltdown, most emerging economies and particularly sub-Saharan countries have witnessed a decline in foreign direct investment (FDI). According to Devarajan and Kasekende (2011), the African continent has been constantly bedeviled with inadequate domestic and foreign capital and has lacked the drive for the mobilization of foreign and domestic economic resources for the needed accelerated socioeconomic development.

The importance of the stock market to the development of a country is linked to the effectiveness, governance, and the appropriate regulatory framework designed by both policy makers and politicians. The Ghana stock market aims at efficiently allocating scarce resources and eventually contributes to the financing of projects, thus leading to growth and economic prosperity (Anokye & Siaw 2010). The Ghana stock market thus acts as a catalyst for economic growth, mobilization of investible funds, diversification of portfolio by corporate and individual investors, and availing investible funds to corporate entities for optimal utilization. According to Olweny and Kimani (2011), a stock market facilitates the investment of surplus funds into additional financial instruments that better match their liquidity preference and risk appetite. Thus, the stock market becomes a channel for the mobilization of investible funds. As a result, the savings rate is increased, investment is stimulated, and earning returns to owners through increased capital gains.

The efficiency of the Ghanaian financial markets is tested to the degree of how relevant information reflects the fundamentals of security prices. According to Fama (1970), a market is efficient if prices of securities impound quickly to new information and the prevailing prices of securities reflect fundamentally all information pertaining to

that security. Raja and Kalyanasundaram (2010) amplified the assertion of Fama, when they posited that the fundamentals underlying the price of stock are accurate when the price of the stock becomes a surrogate and a leading indicator of future economic activities. The findings of Raja and Kalyanasundaram (2010) gave credence to the assertion that stock prices must reflect fundamentally all relevant information, a feature uncharacteristic of an emerging market such as the Ghana stock market. In a perfect market, it is expected that policy decisions aimed at influencing capital formation and stock trade processes could be done with perfect knowledge without making assumptions of information that is not readily available.

The correlation between stock market returns and macroeconomic fundamentals is important to both academics and policy makers, yet the extent and direction of the relationship is still vague and inconclusive for both emerging and developed economies (Iassahaku, Ustarz, & Domanban, 2013). In this study, I provided knowledge and insights of the causal, dynamic interactions and direction of the stated macroeconomic variables: inflation rate, interest rate, exchange rate, money supply, and stock prices. I investigated the relationship between selected macroeconomic variables, namely inflation rate, interest rate, exchange rate, and money supply, and their effect on the stock market returns of listed firms on the Ghana Stock Exchange (GSE) during the period between January 2000 and December 2013. The study outcomes are expected to assist economic policy makers in the formulation of Ghana's macroeconomic policies.

Despite its vast economic resources, Ghana ranked 130 out of 160 countries on the United Nations Human Development Index for 2010. Also, it was estimated that by

2006 about 53.6% of the country's population was still living on less than US$2 a day (Bank of Ghana, 2013). Given these challenges and coupled with fortunes of mineral reserves and oil discovery in Ghana's Jubilee Fields, Ghana is yet to have its financial markets fully developed to attract both foreign and domestic investment to help propel its economic resources (Anokye, Adam, & Frimpong, 2010). To achieve the much needed foreign inflows to drive positive socioeconomic change, the government of Ghana needs to adopt the right macroeconomic policies and interventions in order to stimulate the securities market, adopt the needed tools for the mobilization of both foreign and domestic capital for growth and prosperity.

The relationship between variations in macroeconomic variables and stock market returns has not been unidirectional. Various methodologies and econometric models have been used to establish the nature of the nexus between the variability of macroeconomic indicators and stock market returns. For example, Adjasi, Harvey, and Adyapong (2008) applied the exponential generalized autoregressive conditional Heteroskedascity (EGARCH) model and studied the relationship between foreign exchange markets and their effect on the stock markets in Ghana. Adjasi et al. found an inverse relationship between exchange rate volatility and stock market returns in the long run, though, in the short run, they reported a reduction in the stock market returns. Some researchers have applied elementary techniques to randomly study the stock market movements within the context of economics (Mandelbrot, 2001). Despite these attempts, it is only in recent times that researchers have applied the effect of financial models on the theories of price variations and the dynamics of the stock markets (Dempsey, 2013).

In relation to investor exposure to the stock markets, Dempsey (2013) reported that the empirical assertion of the capital asset pricing model (CAPM) considers the role of investors' exposure to the markets (requiring an equity risk premium). The difficulty, however, lies in the extent to which the measurements of the risk factors are done. Bornholt (2013) expanded on the popular capital asset pricing model and developed an equilibrium asset pricing model in which positive inflation rate and low earnings systems are connected with increase in overall stock return. The two studies by Dempsey (2013) and Bornhot (2013) demonstrated the inconclusiveness of different study outcomes and methodologies on the nexus between stock returns and economic fundamentals.

There have been mixed results on the effect of macroeconomic changes on the stock markets. Evidence of some studies in developing economies such as Fosu et al. (2014), Issahaku et al. (2013), Khalid (2012), Kuwornu (2012), and Okoli (2012) all established a significant positive relationship between exchange rates and the stock markets. In contrast, however, Ajayi and Mougoue (1996) and Mao and Kao (1990) reported a significant inverse connection between exchange rates and the stock markets. Although these findings suggested causal relationship between exchange rates and stock market volatilities, the extent and direction of other macroeconomic variables still remains inconclusive. As a result, the importance for this study, particularly in an emerging economy where only few studies exist, cannot be overemphasized.

The Ghanaian stock market as compared to the Kenyan and Nigerian stock markets is relatively illiquid and small. According to Kuwornu (2012) the Ghana stock market capitalization is just about US$2.7 billion, unlike Nigerian's stock market which is

US$19.0 billion or the Kenyan stock market which stands at US$15.8 billion. Anokye and Siaw (2010) observed that, for the period of 2006 to 2008 the GSE All-Share Index experienced a phenomenal bull ran, and this is considered remarkable, particularly in the backdrop of the discouraging global stock market slumps for the same period.

In sub-Saharan Africa, the stock markets have gained prominence in the finance discipline of risk diversification and funds mobilization as alternative sources of capital for investment, growth, and socioeconomic development. Some analysts have argued that when a stock market bubbles, the gains on the exchange cannot be sustained due to potential macroeconomic risks (Okoli, 2012). The fundamental backdrop of the Ghana stock market activities has given cause for stock market ebullience over the past in spite of the volatile nature of the Ghanaian stock market, real GDP growth was at a forecast of 6.4% in 2008, inflation rate soared to 18.3%, and the domestic currency, the cedi, lost 10.7% against the United States dollar for the period (Anokye et al., 2010).

Empirically, stock returns predictability have undergone constant updating since the early works by Fama and French (1988). They found strong evidence of stock returns predictability based on macroeconomic variables. Some researchers have used more robust econometric methods, such as Badarudina, Ariffb, and Khalidc (2011). They reported strong evidence of predictability, but with a much less conclusive outcome as compared with works by Fama and French (1988). In spite of the inconclusive evidence of stock return predictability, there have been few studies at furthering understanding of the phenomenon on emerging markets, particularly in sub-Saharan Africa.

The link between the stock markets and FDI has also been investigated within the African sub region. According to Ajayi, Friedman, and Mehdian (1998), the objective for establishing most capital markets in most developing economies was to increase the inflow of FDI and to assure governments and policy makers of sustained inflows, development, and growth. Osamwonyi and Evbayiro-Osagie (2012) observed that the political turbulence in sub-Saharan Africa, inflation rate, and interest rates were all remarkably high in the 1970s and the early parts of 1980s, however, sub-Saharan African governments had persisted in the steady improvement of their economies since 1983.

Several macroeconomic models had been employed to ensure a better understanding of the variations of macroeconomic variables. Adam and Tweneboah (2008) used arbitrage pricing policy developed by Ross to investigate the effect of unanticipated macroeconomic changes on asset pricing on the GSE for the period January 1997 to December 2002. They found that investors in Ghana considered macroeconomic risk factors such as interest rates, exchange rate, money supply, and inflation rate in making their investment decisions. The findings established causal relationship between the macroeconomic risk factors but the extent of the strength of the relationship is inconclusive in Ghana. According to Anokye and Siaw (2010), the forecasted inflation expectations made by the BoG hinged on a forward-looking rational expectations macroeconomic model, which is structured on short-term relationships and variables. Using a population of management and staff of the GSE and 24 listed firms, 15 unlisted firms, and 15 individual investors, Mensah, Awunyo-Victor, and Sey (2012) investigated the challenges and prospects of the Ghana stock market and found that the prime

challenges faced by the GSE were liquidity, low earnings, low media attention, and strict regulations. However, they found that the exchange had many prospects, including the stable Ghanaian political environment for investment, which favors tax policies.

Stock exchanges play an intermediate financial role by providing access to capital and liquidity to companies by assisting in raising equity capital, creating a platform for a secondary market for the trading of listed securities (Mensah et al., 2012). Ghana commenced a financial sector adjustment program (FINSAP) in 1989, which targeted reforms and improvement in the banking sector and the capital markets. According to Mensah et al. (2012), Africa's equity market has been of less concern to many researchers as compared to other developed markets in Europe and the United States of America. Olufisayo (2008) observed that there is enough evidence to show that only a few studies on the development of the capital markets in sub-Saharan Africa and particularly Ghana have been conducted because most international financial institutions and developed nations divert their attention and resources to the Asian and Latin American frontier stock markets.

Resource mobilization in an economy has not been without a challenge. The phenomenon poses great puzzle to regulators, stakeholders, investors, and financial economists. The effectiveness and efficiency of resource mobilization stimulates sustainable growth, especially when mobilized funds are channeled to sectors of an economy for optimal output. Olweny and Kimani (2011) emphasized the role of the stock market in promoting efficiency in the mobilization, formation, and allocation of capital. It is therefore not surprising to see various attempts by governments, particularly from

developing countries striving towards the development of the financial sector and striving towards stock market efficiency, as an efficient stock market acts as a barometer for economic performance and an indicator for growth or recession.

In 2004, inflation realized was 15.2%, the Net Domestic Financing/GDP ratio ended at 4.9%, and broad money supply grew by 50% (Mensah et al., 2012). The inconsistencies and volatilities of these economic indicators had a serious impact on the GSE. Ajayi and Mougoue (1996) posited that the openness of Ghana's economy is recognized by investors and policy makers as the prime cause for volatility, and the volatility is further exacerbated by exogenous macroeconomic variables.

Generally, macroeconomic variables when found to be adverse, potentially discourage investors to invest in a specific country because the uncertainty surrounding returns is increased and this has the tendency to defeat the Ghana government agenda of eliminating. Previous research that analyzed the effect of inflation rate, exchange rates, changes in money supply, and interest rates on stock market returns were underpinned by such theoretical models as the vector autoregressive model, fundamental theory, impulse response model (Ajayi & Mougoue, 1996; Kassim & Manap 2012). I employed Statistical Package for Social Sciences (SPSS) and EViews to run a multiple regression to establish the direction of relationship between the independent and dependent variables.

In Chapter 1 of this study, I provided a background of the financial markets in Ghana, and gave further insights of the natural resources, which the Ghana stock market can help mobilize as surplus funds for socioeconomic growth, thus setting the scene for the positive social implications of my study. Additionally, I introduced the nature of the

securities market as a facilitator of surplus funds investment and the creation financial instruments that better match investors' liquidity preference and risk appetite and concluded the chapter with the need to carry out this study with implications to social change. Specifically, in Chapter I, I provided a brief background of the study; problem statement; purpose of the study; research questions; hypothesis; theoretical framework; nature of the study; operational definitions; assumptions; scope and delimitations of the study; limitations; and significance of the study with implications to positive social change.

Background of the Study

Stock markets play a significant function of channeling and diversifying both local and foreign capital into productive investment, thus stimulating the formation of capital and enhancing economic growth and development. El-nader and Alarimony (2012) emphasized the importance of the stock market in the area of financial liberalization and the efficacy to which resources are allocated by the markets. Contrary to this crucial role played by the stock market, studies of the correlation between financial asset prices and macroeconomic variables revealed that financial assets prices respond to macroeconomic variations (Mensah et al.,2012).

In the early 1980s, financial economists argued that financial asset prices responded to such indicators as production index, unemployment rate, dividends yield, interest rate, inflation rate, foreign exchange, GDP, and so forth (Fama, 1981). Findings revealed the tendency for macroeconomic variables to predict variations of stock market; however, several disagreements were reported on the sign and direction of causality in

the financially advanced economies. In the case of developing countries, little or no studies were reported (El-nader & Alarimony, 2012).

In this study, I sought to provide further understanding to the nature of the relationship between macroeconomic variables and stock market returns, particularly in developing countries. The financial system of any country can be improved greatly if there is a clear understanding of the role of the stock markets as catalysts for the mobilization of foreign and domestic capital and how macroeconomic variables affect stock market returns. Both past and recent empirical investigations of macroeconomic indicators that influence stock markets have been analyzed; however, most of the studies only focused on individual stocks and disregarded several macroeconomic variables and their effects on the different sectors of the economy (Anokye & Siaw, 2010).

The decline in aid from foreign sources in the early part of the 1990s exacerbated the establishment of the capital markets in some African countries, including Ghana (Fosu et al., 2014). Though in recent times some macroeconomic indicators such as inflation rate and interest rates have been lower and less volatile than expected, it has been considered high both in absolute and comparative terms (Osamwonyi & Evbayiro-Osagie, 2012).

Excessive noise of macroeconomic variables undermines the usefulness of predicting stock returns and stock prices as a signal about the true intrinsic value of a firm. According to Olweny and Kimani (2011) the core paradigm of the informational efficiency of stock markets has been undermined by macroeconomic volatility. The GSE has in recent time been one of the best performing exchanges in sub-Saharan Africa;

however, researchers have in the past concentrated in other exchanges and very few studies have been done on factors affecting stock return in the GSE (Kuwornu, 2012). In this study, I identified the gaps in research to reveal the effect of macroeconomic variables on stock returns on the GSE. I aimed at investigating the relationship between some selected macroeconomic variables, namely, exchange rate, inflation rate, interest rate, money supply, and their effect on stock market returns on the Ghana stock market during the period of January 2000 to December 2013.

In this study I aimed to complement the efforts of policy makers by expanding knowledge that would assist in the formulation of sound macroeconomic policies for improved investment decisions and the enhancement of the regulatory framework governing the operations of the GSE. The empirical and theoretical contributions of my study will make an addition to literature and contribute to knowledge on inflation rate, interest rates, and exchange rates and their effect on stock market returns in developing economies in the subregion. The empirical results of this study on macroeconomic variables and the Ghana stock market may be used to predict stock prices, as evidenced in the study by Patra and Poshakwale (2006). Those authors examined the short-run dynamic modifications and the long-run equilibrium relationships between selected macroeconomic variables, trading volumes, and stock returns in the emerging Greek stock market during the period of 1990 to 1999.

Evidence from literature revealed various attempts by researchers to report on the nature of the association between macroeconomic variables and stock returns using several economic models and making justifications on the reliability of such models.

However, only a few studies have used multiple regression models such as the study of Sangmi and Mubasher (2013). The effect of macroeconomic variables on stock returns is without dispute. What is in contention is the various methodologies that have been used to arrive at the connections and the choice of the variables by various authors. In the case of emerging markets the evidence is rather scant, and my approach to use multiple regression method to report on the specified macroeconomic variables on stock market returns as basis for inquiry demonstrated how varying methodological approaches helped in understanding the relationships between the specified variables and stock market returns.

Problem Statement

The tendency for macroeconomic indicators to affect stock markets is without dispute since finance theory had laid bare the nexus between macroeconomic indicators and stock market indices (Hosseini, Ahmah, & Li, 2011). In Ghana, although the performance of the GSE All Share Index was affected by macroeconomic variables during the period from January 2000 to December 2013, the mechanism of these relationships has not been studied. Over the last decade sub-Saharan Africa has experienced a paradigm shift of economic development towards private sector approaches for the mobilization of investible funds for economic growth and sustainable development (Osinubi, 2010). According to Anokye and Siaw (2010), Ghana is an example of a small open economy and arguably has a less sophisticated stock market as compared to the United States, yet the country engages in international trade with several countries, including the United States and Europe.

The Ghana stock market recorded its highest turnover of equities in volume in 1997, with 125.63 million shares, from a volume of 1.8 million shares by the end of 1991 (Adjasi & Biekpe, 2005). The volume has been falling steadily from 125.63 million in 1997 to 91.45 million in 1998, 49.57 million in 1999 to 30.72 million in 2000. In 2001, the volume increased to 55.3 million, fell to 44.12 million in 2002, and inched up to 96.33 million in 2003 and 104.35 million in 2004 (Twerefou & Nimo, 2005). Additional variations in macroeconomic variables include inflation; the Bank of Ghana report released in January 2008 and February 2008 showed inflation rate going up by 12.8% and 13.2% respectively and this was explained as resulting from price increase in food prices and crude oil (Owusu & Kuwornu, 2012). Although there have been numerous studies on macroeconomic variables and stock market returns, not much work has been done on the relationship on the GSE.

Purpose of the Study

The study investigated the relationship between macroeconomic variables and stock market returns using the GSE All Share Index as a proxy to stock returns during the period from January 2000 to December 2013. In this study I sought to enlighten financial economists and all stakeholders both in the financial and nonfinancial sector on the much reported issue of changes in macroeconomic variables by financial institutions and the significance of the changes on stock market returns in Ghana. To achieve this purpose, I ascribed to the post positivist philosophical view that emphasized the scientific method in gaining understanding of complex social phenomena through the application and usage of numerically measuring constructs and hypothesis to generate positive social change

(Grumer & Pinquart, 2011). I used a quantitative approach to investigate the correlation between macroeconomic variables: inflation rate, interest rate, exchange rate, money supply, and volatilities on stock returns on the GSE during the period of January 2000 to December 2013. The targeted population comprised of all 36 listed firms on the Ghana stock market.

I obtained data mainly from secondary sources. The Ghana Statistical Service (GSS) website provided data on inflation rate, interest rate, exchange rate, and money supply. The BoG bulletins provided data on foreign exchange rates, inflation rates, and interest rates to cross check and complement the source from the GSS. The GSE website provided all data on the GSE All Share Index. Other sources to complement analysis of data and literature were sourced from the during the period world development indicators by the World Bank. I used nominal data and tested for stationarity in order to eliminate spurious regression results, as used by Dickey and Fuller (1979).

In this study, I employed multiple regression analysis with the aid of SPSS and Eviews to understand the relationship between macroeconomic variables and stock market returns. For data analysis, I obtained the GSE All Share Index of all 36 quoted companies in Ghana spanning through the consumer discretionary, consumer staples, materials, health care, insurance, manufacturing, and banking service companies. The GSE All Share Index was averaged on an annual basis for the period from January 2000 to December 2013. In summary, my study aimed at determining whether the selected macroeconomic variables had significant explanatory power of returns on the GSE All Share Index for the specified period.

Research Questions and Hypotheses

In this study, I sought to examine the relationship between selected macroeconomic variables, inflation rate, exchange rate, interest rate, and money supply. and their effect on stock market returns of listed firms on the GSE during the period January 2000 to December 2013. I specifically addressed the research question of whether there was a relationship between macroeconomic variables and stock returns in Ghana using a multiple regression model approach adapted from the work of Sangmi and Mubasher (2013).

Research Questions (RQ)

RQ1: Do changes in exchange rate have significant effect on stock market returns in Ghana during the period January 2000 to December 2013?

RQ2: Do changes in interest rate have significant effect on stock market returns in Ghana during the period January 2000 to December 2013?

RQ3: Do changes in inflation rate as measured by the Consumer Price Index have significant effect on stock market returns in Ghana during the period January 2000 to December 2013?

RQ4: Do changes in money supply have significant stock market returns in Ghana during the period January 2000 to December 2013?

To achieve research outcomes, I conducted data analysis in order to test the following hypothesis:

Hypothesis 1

$H_0 1$: Changes in the exchange rate have no significant effect on stock market returns in Ghana

$$H_0 1 : \beta_1 = 0$$

$H_1 1$: Changes in the exchange rate have a negative significant effect on stock market returns in Ghana.

$$H_1 1 : \beta_1 < 0$$

Hypothesis 2

$H_0 2$: Changes in the interest rate have no significant effect on stock market returns in Ghana

$$H_0 2 : \beta_2 = 0$$

$H_1 2$: Changes in the interest rate have a negative significant effect on stock market returns in Ghana.

$$H_1 2 : \beta_2 < 0$$

Hypothesis 3

$H_0 3$: Changes in inflation rate as measured by the Consumer Price Index have no significant effect on stock market returns in Ghana.

$$H_0 3 : \beta_3 = 0$$

$H_1 3$: Changes in inflation rate as measured by the Consumer Price Index have positive significant effect on stock market returns in Ghana.

$$H_1 3 : \beta_3 > 0$$

Hypothesis 4

$H_0$4: Changes in the money supply have no significant effect on stock market returns in Ghana

$$H_0 4 : \beta_4 = 0$$

$H_1$4: Changes in the money supply have a positive significant effect on stock market returns in Ghana.

$$H_1 4 : \beta_4 > 0$$

Model Specification

I selected stock market returns as the dependent variable as measured by the GSE All Share Index, and the exogenous variables were all the selected macroeconomic variables: interest rates, inflation rate, money supply, and exchange rates. In this study, I adopted a modified regression model by Sangmi and Mubasher (2013) as specified below:

$$SMI_t = \beta_0 + \beta_1 WPI_t + \beta_2 ExR_t + \beta_3 IIP_t + \beta_4 M3_t + \beta_5 GP_t + \beta_6 IR_t + \varepsilon_i \ldots (1.1)$$

SMI_t = Monthly percentage change in the stock market index;

WPI_t= Monthly percentage change in the wholesale price index;

ExR_t= Monthly change in the exchange rate;

IIP_t= Monthly percentage change in the index of production;

$M3_t$= Monthly change in the money supply;

GP_t= Monthly change in the gold price;

IR_t= Monthly change in the interest rate and

ε_i= Error term. In the above equation,

β_0 is constant and β is coefficient of variables

while ε_t is the residual error of the regression.

(Sangmi & Mubasher, 2013, para 3).

Using SPSS to analyze data, I adapted the regression model by Sangmi and Mubasher (2013) as follows:

$$SMR_t = \beta_0 + \beta_1 ExR_t + \beta_2 IntR_t + \beta_3 InfR_t + \beta_4 MS_t + \varepsilon_i \dots\dots\dots (1.2)$$

SMR_t= Monthly percentage change in stock market returns.

ExR_t=Monthly changes in the Exchange rate

$IntR_t$=Monthly change in the rate of interest

$InfR_t$=Monthly change in the rate of inflation measured by monthly changes in the consumer price index (CPI).

MS_t= Monthly change in the money supply

ε_i = Error term.

In the above equation, β_0 is constant and β are coefficients of specified macroeconomic variables while the error term is denoted by ε_t defined as the residual error of the regression. The industrial production index as an economic indicator is usually computed using mainly the fisher index. Though data of the national production in Ghana was available, the computed fisher index was not available at the time of my study and therefore I eliminated it from the adapted equation. According to Le and Zhu (2013), while gold volatility could be considered as a variable for the prediction of risk premium, there is no documented strong contemporaneous relation between gold lease rate and many financial market variables. Le and Zhu (p.174) further argued that gold is a

replica of a currency, the lease rates also replicate interest rates, and since money supply and interest rate changes are factored consistent with Sangmi and Mubasher (2013), the variable is justifiably eliminated from the adapted equation. Further, Insah (2013) complemented the position of Le and Zhu (2013) when the author argued that a very good indicator for the future of inflation is gold. From these findings, I factored inflation rate into the model and its interpretation adequately encompassed the gold price as a predictive variable.

The theoretical foundations of my dissertation were underpinned by the Fischer (1930) hypothesis, Keynesian paradigm, and the stock market efficiency (SME) hypothesis. In this study I adopted these theories in order to assist in the comprehension and sophistication of the nature of the various interrelationships between chosen macroeconomic variables.

Nature of the Study

In this study, I used a quantitative approach to investigate the relationship between the effect of macroeconomic variables, inflation rate, interest rate, exchange rate, money supply volatilities, on the GSE All Share Index during the period of January 2000 to December 2013. My targeted population comprised all 36 listed firms on the Ghana stock market. I obtained data mainly from secondary sources; the BoG bulletins provided data to complement the GSS data on foreign exchange rates, inflation rates, and interest rates. The stock markets fact book (GSE, 2013) and website provided all the data on the GSE All Share Index in Ghana during the period January 2000 to December 2013.

Other sources to complement data were sourced from the world development indicators by the World Bank.

In this study I used descriptive analysis with the aid of SPSS and Eviews. For data analysis, the average share price (ASP) of all 36 quoted companies in Ghana spanning through the consumer discretionary, consumer staples, materials, health care, insurance, manufacturing, and banking service companies were obtained during the period from January 2000 and December 2013. Additionally, I obtained time series data from the BoG's quarterly bulletins for data on the 91-Day Treasury Bill rates, GSS for data on inflation rates, the GSE publications and fact books and website for data on stock prices and stock market index. Other data on macroeconomic variables such as inflation rate, foreign exchange rate, and interest between January 2000 and December 2013 were also obtained from the Bank of Ghana bulletins to check on the veracity of other sources of data.

In carrying out this study, I used time series data from the BoG's quarterly bulletins for data on the 91-Day Treasury Bill rates; the GSS, where data on inflation rates were obtained; the GSE publications and fact books, where data on stock prices and the GSE All Share Index were obtained. I obtained other data on macroeconomic variables such as inflation rate, foreign exchange rate, and interest between January 2000 and December 2013 from the websites of the GSS, GSE, and the BoG.

Operational Definitions and Key Terms

Consumer price index (CPI): This index measured the change over time in the general price level of goods and services that households acquire for the purpose of consumption, with reference to price level.

Exchange rate: This will be measured by the monthly changes in the weighted average (the buying rate of the U.S. dollar) will be used. The exchange rate will be measured as the domestic currency (the Ghana cedi) per United States dollar (US$) and the monthly exchange rate used for the study.

Inflation rate: The CPI was applied as a proxy of inflation rate. Therefore, monthly changes in the CPI were calculated, and this represented the changes in the rate of inflation.

Interest rate: The 91-day Treasury bill rate in Ghana will be averaged to obtain the monthly changes in the 91-day treasury rate. The calculated monthly changes will be obtained to represent changes in interest rate. Therefore, the interest rate will be measured as a proxy to the treasury bill rate in Ghana, and the 91-day treasury bill rate averaged to the monthly rate for achieving study objectives.

Macroeconomic risk: Changes at variance with planned macroeconomic indicators such as variability of planned inflation rate, exchange rate, interest rate, and money supply by the central BoG.

Macroeconomic variables: These are defined as inflation rate, interest rates, exchange rate, and money supply. This definition will be consistent as specified in the dissertation topic.

M2: This will include *M1*, as defined above, and additionally short-term deposits held by Ghanaian commercial banks. $M2^{+}$ will be used as consistent with money supply definition in Ghana. This is measured by the monthly changes in $M2^{+}$. *M1*: This will include all coins and notes in circulation within the Ghanaian financial system and equivalents that can be converted to cash with ease. *M2*: This will include *M1*, as defined above and additionally short-term deposits held by Ghanaian commercial banks. Therefore MS will be the equivalent of $M2^{+}$ as specified in the regression model and the monthly changes in moneys supply applied to the study.

Scope, Assumptions, Limitations, and Delimitations of Study

My study covered the period between January 2000 to December 2013 and I used the GSE All Share Index as a proxy to aggregate stock returns. As a result my dissertation considered the overall market stock returns as an independent.

In this study, my application of the GSE All Share Index meant I did not consider the stock returns of the different listed companies separately but rather I used the GSE All Share Index as a proxy to the aggregate movements of stocks listed on the GSE. The implication of my approach was that, my study outcomes were limited in generalizability to individual stocks listed on the GSE.

The scope of my study covered the historic stock prices of the GSE of the All Share Indexes during the specified period. The indexes included all 36 listed companies and this represented approximately 99% of all listed companies in Ghana.

The sociocultural practices, particularly in sub-Saharan Africa, may also have had an effect on both economic and institutional factors. The study, apart from

macroeconomic variables, eliminated such variables as cultural and social factors, which may have the tendency to affect stock returns (e.g., Hofstede, 2011; Hofstede, Hofstede, & Minkov, 2010). In this study I used the CPI as a surrogate for inflation rate and excluded the GDP, which has the tendency to affect stock returns. The noninclusion of regulatory variables, such as the effectiveness of legal institutions, corruption due to insider trading, and political instability consequences, just to mention a few, on stock market returns also became a limitation of the study.

The period of the study was between January 2000 to December 2013 and it was expected that the mix macroeconomic events may factor into the outcome of the studies, thus addressing issues on internal validity.

In this study, I distinctly applied various statistical tools and analysis in contrast to some studies that applied a unimethodological approach in terms of statistical analysis. The distinction thus helped in the definition of constructs that I used in both Chapter 3 and Chapter 4 and this made the study unique from similar studies in terms of the specified time frame, statistical approach, and the monthly definition of variables. I was also guided by the portfolio theory of Markowitz (1952). The theory explained how investors are risk averse and will accept more risk only for a higher payoff and conversely will accept lower returns for a less volatile investment. I also applied the efficient market hypothesis by Fama (1970) to assist my study in the comprehension and sophistication of how information affects markets and finally the Fischer's theory on interest rates. The approach I adopted was consistent with previous research that analyzed the effect of inflation rate, exchange rates, changes in money supply, and interest rates on

stock market returns that examined the variables separately (Ajayi & Mougoue, 1996; Kassim & Manap, 2012) and used a unitheoretical model only.

In this study I envisaged some difficulty in the generalization of the study outcome to similar jurisdictions, because stock market regulations and economic fundamentals vary from one country to the other and there are significant differences in content and structure of stock markets all over the world. Another limitation is that in this study, I used the GSE All Share Index as a proxy to stock returns, yet the GSE All Share Index only factored the capital gains component of stock returns and excluded the dividend aspect of share returns, thus limiting full impact of actual stock returns.

Significance of Study

Some findings have been reported on the associations between macroeconomic variables and stock market returns. Findings depended on the extent of studies and the methodologies applied. However, a number of factors have been found to be universal for every stock market (Abdelbaki, 2013) As a result it would be inappropriate to make a general deduction from the responsiveness of macroeconomic variables to stock returns from one stock market to another. In this study, I investigated how the GSE All Share Index responded to selected macroeconomic variables during the period January 2000 to December 2013.

The significance of this study therefore is to enhance the understanding of stated macroeconomic variables on stock returns in developing economies, particularly in Ghana. From an empirical standpoint, my study may facilitate investor confidence and stimulate investor decisions, because the dissertation outcomes and policy

recommendations were based on the findings of this dissertation and this may assist policy makers in the formulation of economic targets and policies, thus influencing societal well-being.

Theoretically, I aimed at contributing to existing literature on inflation rates, interest rates, and exchange rates and their effect on stock returns in developing economies. The empirical results of the study may be used to predict stock prices, as evidenced in the study by Patra and Poshakwale (2006). Investors may be able to make informed decisions based on macroeconomic dynamics; investible funds to the stock market will be enhanced and will lead to an improved Ghanaian society, and ultimately global financial development. Other useful policy implications my study may contribute to are in the area of prices and economic activity; the direction of outcome of the relationship may enhance the predictive ability of policy makers; thus both contractions and expansion on the Ghanaian economy may be forecasted and predicted with some degree of certainty.

Summary

In Chapter 1 of this study, I provided a background of financial markets in Ghana and how the stock market could assist in the mobilization of surplus funds for socioeconomic growth. In this chapter, I further emphasized on the significance of the study and introduced the nature of the securities market as a facilitator of investment of surplus funds. The highlight of the chapter included the background of the correlation between stock market volatility and macroeconomic fundamentals and the policy decisions that can influence capital formation and stock market processes. In Chapter 2, I

commenced with the Keynesian prepositions in the field of monetary theory and delved into the various literatures on macroeconomic variables. The transitional connection between Chapter 1 and Chapter 2 is that, I identified gaps within the scope of literature reviewed and Chapter 2 set the direction for the research methodology that further informed some aspects of Chapter 3. Thus, the outcomes of Chapter 1 and Chapter 2 provided a strong base for the methodological approach I adopted in Chapter 3.

Chapter 2: Literature Review

Introduction

Macroeconomic variables in Ghana over the years have shown wide variations. The BoG report for January 2008 and February 2008 showed inflation going up by 12.8% and 13.2% respectively (BoG, 2010). The variation was attributed to increases in general price level of food and crude oil. Changes resulting from variations of macroeconomic variables, pose great risk to planned investment and returns. This has the potential to discourage local investment and FDI in Ghana due to increased risk to expected returns (Mensah et al., 2012). In this study, I explored the linkage between stated macroeconomic indicators and stock market returns by examining monthly changes of interest rate, exchange rate, inflation rate, and money supply effects on stock market returns in Ghana during the period from January 2000 to December 2013.

The Ghana stock market plays an important role in the economy of Ghana as it helps channel and diversify both domestic and foreign capital into investment, thus fostering and sustaining capital formation and socioeconomic development (Acheampong, 2012). The stimulance of investment and savings occur through the mediation role of the stock market where financial assets are traded (Jaffry, Ghulamd, & Cox, 2013). However, studies have indicated changes in the value of financial assets to be responsive to macroeconomic factors such as inflation rate, exchange rate, interest rates, GDP, money supply, unemployment rate, dividends yields, and so forth (Fosu, Bondzie, & Okyere, 2014). According to Poole (2010), variations in the macroeconomic conditions of a country could help predict variations on the stock market. However, what

remained to be clearly agreed on by financial economists and researchers were the signs and the direction of causality between macroeconomic variables and stock market returns. The importance of my study stemmed from the fact that Ghana is a middle-income country and has the features of an emerging market, which facilitates financial intermediary process. Though the GSE plays a vital role in the reduction of poverty and positive socioeconomic change, relatively few studies existed on the subject matter and the degree of relationship between macroeconomic variables and stock returns in Ghana.

Literature revealed several studies have been conducted in advanced economies on macroeconomic indicators and stock markets (e.g., Alshogeathri, 2011), but there was no established evidence of whether these indicators would strongly suggest an absolute impact on stock market returns. The case of developing economies such as Ghana is also inconclusive. In the light of these gaps, I aimed examined the relationship between macroeconomic indicators and stock market returns in Ghana. I used secondary data, econometric models, and multiple regression analysis with the aid of SPSS or Eviews to provide explanations of the general policy stance of the government of Ghana (GoG) on the targeting of macroeconomic indicators on stock market returns.

In reviewing literature, I focused on inflation rate, interest rate, exchange rate, and money supply, and their effect on stock market returns of listed companies on the GSE during the period of January 2000 to December 2012. The targeted population comprised all 36 listed firms on the GSE.

A good number of studies have established the impact of macroeconomic indicators on stock market returns using various econometric models. What remained to

be clearly understood is the direction of the signs and causality, justification for the selection of macroeconomic variables, and the best method and model to be employed in Ghana.

In Ghana, studies have shown that the individual macroeconomic variables have the tendency to trigger stock market performance, albeit, positively or negatively. For example, Mireku, Sarkodie and Poku (2013) used a vector error correction model (VECM) approach and made use of monthly data to cover the period April 1991 to August 2010 to investigate the effect of macroeconomic variables on stock prices in Ghana. The cointegration and VECM indicated the existence of a long-run inverse relationship between exchange rate and interest rate with stock prices. Mireku et al. reported a direct relationship between inflation and stock prices. A different methodological approach by El-Nader and Alrainey (2012), who used the ordinary least squares (OLS) method, ARCH, and GARCH models for some six selected macroeconomic factors (real exchange rate, weighted average interest rate, real money supply, real GDP, and a dummy variable) to establish the role of macroeconomic variables in stock market returns.

Time series and other economic models have also been applied in various combinations to study the nexus between macroeconomic variables and stock market returns. For example, Quadir (2012) used monthly time series data and applied the autoregressive integrated moving average (ARIMA) model to establish a direct linkage between interest rate, treasury bill rate, and stock market returns on the Dhaka stock exchange. Over the last decade, sub-Saharan Africa has experienced a paradigm shift of

economic development towards private sector approaches for the mobilization of investible funds for economic development. Primarily, the objective of this paradigm shift is to achieve sustainable growth and development. According to Anokye, Adam and Frimpong (2010) Ghana is an example of a small open economy and arguably has a less sophisticated stock market as compared to the United States, yet the country engages in international trade with several countries, including the United States and Europe.

The exposure of Ghana's economy to international trade and financial reforms, under the FINSAP, resulted in the deregulation of Ghana's economic systems, thus making Ghana susceptible to foreign exchange volatility, interest rate volatility, and inflation (imported) rate volatility. The Ghana stock market recorded its highest turnover of equities in volume in 1997, with 125.63 million shares, from a volume of 1.8 million shares by the end of 1991 (Adjasi & Biekpe, 2005). Clearly, the Ghanaian stock market has been characterized by unstable prices, highly volatile interest rate exchange rate, and inflation rate.

According to Mensah et al. (2012), in 2004 inflation realized was 15.2%, the Net Domestic Financing/GDP ratio ended at 4.9%, and broad money supply grew by 50%. The inconsistencies and volatilities of these economic indicators had a serious impact on the GSE. Ajayi and Mougoue (1996) posited that the openness of Ghana's economy is recognized by investors and policy makers as the prime cause for volatility; however, they observed that the volatility was further exacerbated by such exogenous variables as exchange rates, interest rates, inflation rates, and money supply.

The BoG report released in January 2008 and February 2008 showed inflation going up by 12.8% and 13.2% respectively and this was explained as resulting from price increase in food prices and crude oil (BoG, 2009). Another problem facing the GSE is the illiquidity nature of the stock exchange. According to Ahmed, Rehman, and Raoof (2010), among the exchange specific issues affecting stock markets in Africa are low level of liquidity, few listed companies and the small size of the exchange, as well as efficiency. Benita and Lauterbach (2004) had earlier amplified the study outcome of Ahmed et al. and showed that exchange rate volatility affected price stability, firm profitability, and a country's stability.

Volatilities of macroeconomic variables have the potential to discourage investors as systemic risks are greatly increased (Owusu-Nantri & Kuwornu, 2012). Conspicuous among the variable proxies used to explain stock returns are various macroeconomic indicators usually planned and projected by monetary policy analysts and economic planners both in developing and developed economies. According to Kassim and Manap (2012), the importance of stock markets in the mediation process of a financial system cannot be overemphasized. El-Nader and Alrainey (2012) posited that the linkage between macroeconomic indicators and stock market returns was established as early as the 1980s and recent findings have also revealed strong nexus between changes in macroeconomic indicators and stock returns variations. Quadir (2012) studied the effect of macroeconomic variables on stock returns on the Dhaka stock exchange for the period between 2000 and 2007. Using monthly time series data and ARIMA model, the study reported a direct relationship between Treasury bill interest rate with stock market

returns. The inconsistencies and volatilities of macroeconomic variables had a serious impact on the GSE and this makes it difficult for the prediction of stock prices and returns.

Given this background, I divided Chapter 2 into five sections; in the first section I reviewed literature leading to the definition of the four selected macroeconomic variables. The section revealed various literatures on stock returns and portfolio management concepts and using literature sources, I established the nexus between stated macroeconomic variables and stock market returns in Ghana as an important research field. The second section of the chapter dealt with the various strategies employed to obtain relevant literature. This comprised of lists of library databases and search engines I used, including the various permutations and combinations of search terms employed to retrieve both related and relevant peer reviewed literature to assist my study in the evaluation of relevant theories and their sources, delineation of assumptions and the relevance and justification of the theories and how the theory is connected to the study.

The third section of my study dealt with the theoretical foundation of the study; the name and origin of the theories, a statement of the hypothesis and assumptions under the theories, a justification and rationale for the theories I used in the study. The forth section examined various works done that lead to the area of research and methodologies, the strengths and weaknesses of my adopted methodologies, the selection of research variables and justification and a statement of synthesis of independent, dependent and covariation of variables. In the fifth and final section, I identified major themes and observations and a brief summary of the chapter.

Literature Search Strategy

In this study, I limited literature search to the 5 years, however, I found various historical antecedents of theories and models relevant to the study, some which exceeded the threshold of 5 years. Therefore, I had to go beyond the threshold in some instances in order to facilitate the understanding and origins of theories and how those theories impacted my study. I also made use of EBSCOHOST databases, Business Source Complete Premier, Academic Search Premier in conjunction with narrowed search parameters and Boolean operators in varying combinations of the following key words and phrases: Inflation Rate, Interest Rates, Money Supply, Exchange Rates, Macroeconomic Variables, Macroeconomic Variables and Stock Returns, Inflation Rate and Stock Returns, Exchange Rate and Stock Returns, Stock Predictability, Money Supply (M1 and M2) and Stock Returns, Stock Returns and GSE, EGARCH, arbitrage pricing theory (APT), Stock Markets Performance Ghana.

Theoretical Foundation

The theoretical foundations of my study was underpinned by the impulse response model, Markowitz portfolio theory, the Keynesian paradigm, Fischer theory on interest rates, and the Stock Market Efficiency hypothesis. These theories and hypotheses will assist in the comprehension and sophistication of the nature on the various interrelationships between chosen macroeconomic variables.

Impulse response Model and EGARCH

In this study, I adopted the impulse response model as consistent with Kassim and Manap (2012) when they used the model to analyze the impact of interest rate volatility

on domestic and foreign banks. They also applied the multivariate EGARCH model to account for the for intra-industry transmission of stock returns and stock volatilities.

The Markowitz Portfolio Theory

The intuition behind the maximization of expected returns and portfolio risk is explained by the Markowitz (1952) portfolio theory. The conceptual framework of the theory is that, the utility of the investor is mainly a function of the first two moments (mean and variance) of returns and further takes into consideration the diversification effects of investor preferences and expectation of the risk of all assets under consideration. Fama and French (2004) posited that the Markowitz mean-variance assumes financial or stock returns to be normality. In a real world situation, this could not be the case.

In reality, returns may not depict a normal behavior, and empirical evidence suggests that financial returns are not normally distributed. In spite of these weaknesses of the model, it is widely used in both academic and real world applications. For instance, Huang and Yang (2010), considered the measures of skewness and kurtosis and proposed a general Markowitz portfolio investment model. Another consideration is that, the Markowitz theory has been tested extensively on various developed markets, but fewer studies of the theory have been reported on the frontier markets in sub-Saharan Africa. Mensah, Avuglah and Dedu (2013), investigated wealth allocation among nonfinancial and financial assets on the GSE and used the classical Markowitz theory of portfolio optimization to determine the degree of profitability on either a buy or hold strategy. The study established the proportion of investment for both nonfinancial and financial assets

for a risk averse investor. In this study I established the nature of various relationship between macroeconomic variables and stock market returns and since variability of returns connotes risks (deviation of returns), I tested and interpreted the mean-variance returns on the stock market as consistent with the study of Mensah, Avuglah and Dedu (2013).

The Keynesian Paradigm

There is irresistible empirical evidence about Keynesian proposition on the inter-relations between monetary policy and policy actions and interest rates from the typical IS-LM framework and stock market activities. Changes in any of the fiscal or monetary policy instruments, for example, money supply, may have an instantaneous effect on market interest rates. Additionally, I sought to examine the effects of money supply and interest rates on stock market returns. The Keynesian theoretical evidence suggests that fiscal or monetary policy actions are intertwined for the achievement of desirable macroeconomic objectives. Khalid (2012) suggested a policy mix of suitable level of fiscal policy and monetary policy as desirable.

Considering that the research objectives have money supply as one of the variables measured against stock returns, it is desirable to investigate the influence of policies regarding money supply when analyzing stock market activity in Ghana. According to Antwi, Mills, and Zhao, (2013) in Ghana, there has not been any attempt to analyze the stock market activities inter-temporally with fiscal and monetary policy actions. In this study, I provided additional contribution to existing literature and the existing body of knowledge on this subject. From a theoretical standpoint, a policy mix of

fiscal and monetary action may build investor confidence and motivate investor decisions. My dissertation purpose was to examine the nexus between macroeconomic variables and stock returns, thus I incorporated information on fiscal and monetary policy actions in Ghana for the period January 2000 to December 2010 and tested the efficacy of the Keynesian assertions in Chapter 4.

The Stock Market Efficiency (SME) Hypothesis

The controversy of whether government policies on macroeconomic variables and fiscal deficits have had implications on stock market returns has been a topical issue among both financial economists and policy analysts for quite some time. While some studies have found no effect of macroeconomic policy actions on stock market activity, others have disagreed and insisted that governments' actions on macroeconomic variables and fiscal deficits have effect on stock market activity. The former view is referred to as the Ricardian equivalence proposition supports the stock market efficiency hypothesis, whereas, in a semi strong form, the stock market efficiency hypothesis contends that stock prices fully reflect all publicly available information (Fama, 1970; 1991). I grounded this dissertation on the stock market efficiency hypothesis to assist in my determination of the degree of efficiency of the Ghana stock market and whether the financial sectors of the Ghanaian economy was linked to overall stock returns on the GSE. I however did not test for any of the three forms of efficiency on events announcements in Ghana.

Conceptual Framework

The conceptual framework of my study assisted in the comprehension of the relationship among the macroeconomic variables as defined by Olweny and Kimani (2011) when they studied the effect of macroeconomic factors on stock return volatility in the Nairobi stock exchange. Thus the framework of my dissertation spelt out the relationship between interest rate, inflation rate, exchange rate, and money supply (independent variables) and stock market returns (dependent variables) as measured by the GSE All Share Index. In this study I adopted a similar conceptual framework of Olweny and Kimani (2011) and sought to investigate the effects of the independent variables on the dependent variables.

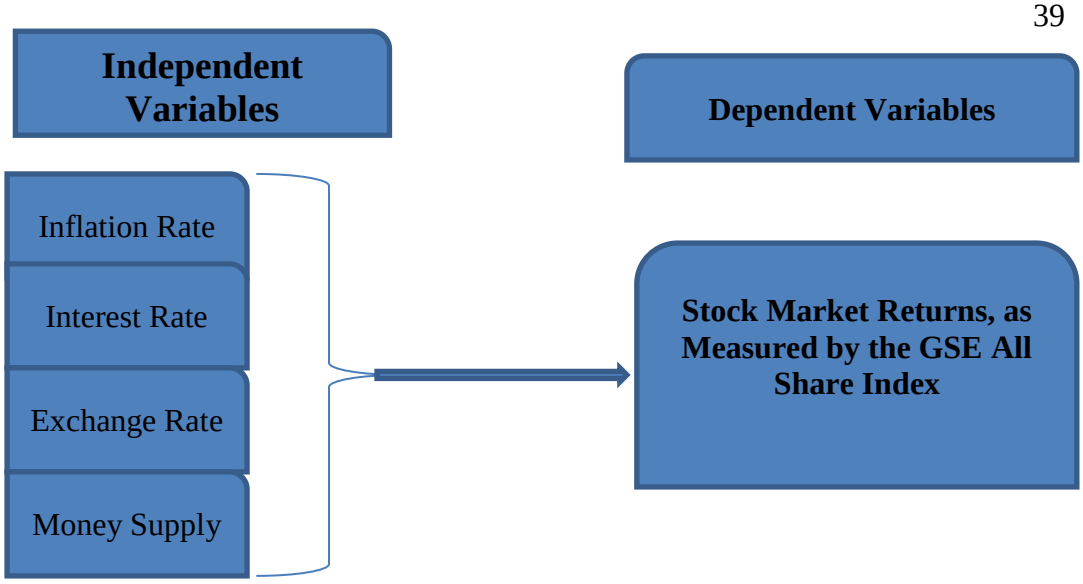

Figure 1. Schematic representation of the macroeconomic variables affecting stock market returns.

Literature Review

Exchange Rate

The price paid for a country's currency relative to another country's currency is known as exchange rate (Olweni & Omondi, 2011). There is evidence of studies of exchange rate conducted on emerging markets, for example, Okyere, Fosu, and Boakye (2014), Boakye (2014) and Insah (2013), Owusu-Nantri and Kuwornu (2012) These studies found a considerable direct relationship between stock prices and exchange rates and other macroeconomic variables.

The Ghana stock market comprises of the financial, industrial, services, and the technological sectors of the Ghanaian economy. Works on the GSE on the linkage between exchange rate markets and stock returns are relatively limited (Adjasi et al, 2008). Some studies have used the two portfolio models to explain the relationship between exchange rate and stock market volatility: the Flow-Oriented model (Dornbusch

and Fischer, 1980). The Flow oriented model refers to exchange rate movement, output levels of firms and the trade balance of an economy. The model explained that share price movements have the tendency to affect aggregate demand through wealth, liquidity effects and consequently exchange rate. Precisely, a reduction in stock prices results in a degeneration of wealth of the local investors and ultimately a decline of liquidity on an economy.

Liquidity decline pulls down interest rates thus inducing the outflow of capital, interest rates and this cause currency depreciation. The “Stock-Oriented” model considers a country’s capital account as a link to the stock market and exchange rate market. The model equates the exchange rate to the demand and supply for assets (bonds and stocks) and posits that, a depreciation of the local currency (the cedi) against a foreign currency (the British pound), will in turn increase returns on the foreign currency (the pound). As a result rational investors will be coerced to move funds from domestic assets (stocks) towards pound assets, depressing stock prices.

The importance of stock markets in national economies cannot be over emphasized. This is because the stock markets acts as a conduit in the channeling and diversification of domestic savings and foreign capital for enhanced investments and capital formation. This function of the stock markets complements other efforts in the alleviation of poverty and positive social change since growth is also enhanced. For example, El-Nader and Alraimony (2012) investigated the effect of macroeconomic factors on the Amman stock market during the period 1991 and 2010. They chose six macroeconomic variables including the CPI, real money supply, the weighted average

real interest rate on loans and advances, real GDP, real exchange rate, and a dummy variable. The study utilized the GARCH model and reported a strong correlation between selected macroeconomic variables and stock market returns. Lessons drawn from the study demonstrates the importance of the macroeconomic indicators to stock market performance and consequences on investment returns.

Du and Hu (2012) observed that a depreciating currency has a negative impact on stock market returns. Further, an analysis of the variables considering a composite index will assist in the dissertation objectives. They applied the EGARCH model (used to determine and forecast variance) on the GSE, using monthly data, and concluded that variability in stock returns is not the only reason for exchange rate volatility and that macroeconomic factors play a dominant role on stock returns. The results revealed an inverse relationship between exchange rate volatility and stock market returns. These results emphasized the need for investors to consider the macroeconomic environment for future investment decisions.

Different approaches and methodologies have been used to report on the relationship between macroeconomic variables and stock market returns. For example, Kuwornu (2012), applied the cointegration and error correction model to explore the causality between macroeconomic variables and stock market returns in Ghana and reported bidirectional causality between all stock market indices and exchange rate. In contrast, a study by Ibrahim and Musah (2014) used data spanning the period September 2000 to September 2010 to investigate the nature of the relationship between macroeconomic variables on stock returns in Ghana. Ibrahim and Musah (2014)

employed the Johansen multivariate cointegration method in addition to the VECM to report on the long run relationship between stock market returns and macroeconomic variables in Ghana. However, in applying the Granger causality test, they found no nexus between stock prices and macroeconomic variables. Systemic empirical studies that aimed at investigation the relationship between macroeconomic variables and stock returns in developing economies have reported varying outcomes.

The role of religion and behavioral effect has influenced some studies in the Gulf religions. Sbeiti and Hadadd (2011) found an inverse and significant effect of short term interest rates and stock prices in Kuwait. Their study reported that domestic credit has a direct and significant correlation in Kuwait, while an inverse relationship between domestic credit and stock prices was rather reported in Saudi Arabia and Bahrain. In Kuwait, due to the Islamic Sharia which frowns on charging interest rate on loan an inverse and significant relationship was reported.

Clearly both past and recent studies, on the outcomes and adopted methodologies of the relationship between exchange rates and stock market returns, and macroeconomic variables are not as clear cut. For example, Nieh and Lee (2001) did not establish a significant long run relationship between stock market returns and exchange rates for the G-7 countries from 1993 to 1996. They reported that the German currency depreciated as a result of a fall in stock market prices; the Canadian and United Kingdom stock returns experienced an upward stock returns in response to currency depreciation, however, within the same period in the United States, no relationship was found between stock market returns and currency exchange rates.

There is no consensus on emerging markets in sub-Saharan Africa on the direction of causality. Asaolu and Ogunmuyiwa (2011). posited that theoretical economists and empirical researchers have not reached a consensus on the nexus between stock markets and foreign exchange markets. It is therefore imperative for future researchers to carry out further tests and analyses of the interaction between a country's rate of exchange and the returns on stock for purposes of policy direction and economic growth, particularly in emerging economies.

The theoretical framework used by Tian and Ma (2010), further grounds my study in two main theories. And this explicates the relationship between exchange rate and stock price and returns; the goods market theory otherwise known as the ‘flow-oriented model’ or the traditional approach and the portfolio balance theory otherwise known as the stock oriented model.

The goods market theory postulates that the appreciation of a local currency will have the tendency to hurt exporters and, consequently the shares of such firms would be less attractive. Resulting from the unattractiveness, the market share of an export-oriented economy is likely to fall. The presumption is the existence of causality between exchange rate and stock returns, which is found to be inversely connected. The portfolio balance theory puts an emphasis on the causality between the exchange rate markets and the stock markets. However, the extent of causality of empirical studies is still mixed, and even in some cases, it is contrasting.

In this study, I applied the goods market theory to prove that an appreciation of the Ghanaian cedi would cause the GSE All Share Index to fall. According to the

portfolio approach perspective, since the Ghanaian currency has been under a managed float system, stock prices are not expected to affect the exchange rate as much as they would in a flexible exchange rate regime. Economies all over the world undergo constant structural changes and most structural change may result in economic and political crisis or prosperity. Even some result in institutional policy reforms to mitigate economic and political crisis, with an imputed expectation of prosperity. The exploration of various methodologies to ensure this prosperity or change had also been constant.

Some researchers have justified the application of the auto regressive distributed lag (ARDL) cointegration approach. Tian and Ma (2010) employed the ARDL cointegration method to investigate the impact of financial liberalization on the relationship between share performance and exchange rate in China. Tian and Ma (2010), observed that the conventional augmented Dickey–Fuller (ADF) and Phillips-Perron (PP) (Phillips & Perron, 1988) unit root is also appropriate when the unit root null hypothesis has structural breaks in series.

Exchange rate, inflation rate and interest rate play a critical role in the stock market. In emerging economies macroeconomic variables such as foreign exchange and inflation rate have progressively been very volatile. Olweny and Kimani (2011) observed that growing inflation rate may compel interest rates to surge upwards, and may result in investors shifting investible funds from the equities market to the bonds market to benefit from the higher returns (Asaolu and Ogunmuyiwa, 2011).

Olweny and Kimani (2011) investigated macroeconomic indicators and variations on stock returns on the Nairobi Securities Exchange in Kenya. Three macroeconomic

variables were selected, namely, inflation rate, interest rate, and foreign exchange rate. The study used monthly time series data for the period between January 2001 and December 2012 and adopted the EGARCH and the threshold generalized auto regressive conditional heteroskedasticity (TGARCH). They reported macroeconomic variables affect stock return volatility.

Scanty literature on Ghana stock market data justifies the further investigation into the relationship between exchange rate and stock. The study by Tian and Ma (2010) established the existence of cointegration between the Shanghai All Share Index and the exchange rate of the US dollar and Hong Kong dollar since 2005. The studies found both money supply and exchange rate are all positively related. The study reported that the cause of increase in money supply was largely due to the inflow of "hot money" flowing from external sources which have repercussions on the local currency.

In this study I examined the effect of inflation rate, interest rate, exchange rate volatilities, and changes in money supply on stock market returns in Ghana for the period 2000 -2013. Since the exposure of the Ghana stock market to foreign investment, the market capitalization has increased rapidly over the last few years, the expected results should be of interest to foreign investors because of their currency exposure on the Ghanaian stock markets.

Adjasi, Harvey and Adyapong (2008) studied the relationship between foreign exchange markets, stock markets and their effect on the stock markets in Ghana. They applied the exponential generalized autoregressive conditional heteroskedascity (EGARCH) model to determine the existence of the relationship between exchange rate

volatility and volatility on the Ghanaian stock market exists. The study found an inverse relationship between exchange rate volatility and stock market returns in the long run, however, in the short run, there was a reduction in the stock market returns.

Exchange rate sensitivity affects the rates of return of both domestic investors who aim at diversifying their portfolios in foreign markets and foreign investors in the domestic stock market as well. Ghana is an import dominant economy, and therefore it is expected that when the currency appreciates in value, input costs will reduce and will invariably have positive effect on domestic stock prices. Some notable researches were, for example, Verdelhan (2010) have conducted various studies to establish the extent and degree of the relationship between the sensitivities of exchange rates and stock returns.

Generally exchange rate changes under a floating or flexible exchange rate system is of prime importance to both listed companies and investors on the GSE, irrespective of the nature of trading these agents. Also the direct effect of exchange rate fluctuations on net foreign monetary and real domestic assets of the firm and the indirect effect on aggregate and industry demand, on the cost of traded inputs, competing imported goods, and on inflationary expectations cannot me emphasized.

Modern portfolio theory postulates that systematic risk cannot be diversified away and therefore shareholders should be paid a premium to compensate for systematic risks. This means, if the risks associated to foreign exchange is insignificant or diversified away through hedging, then, this source of risk should be priced and as a result need not be added to the cost of capital of firms. The sensitivity of exchange rates theoretically is a source of risk that can be diversified away in an efficient financial market. I chose the

study period to be from January 2000 to December 2013, because the period was characterized by floating and volatile (risk) exchange rate with occasional intervention on the market by the GoG.

Ali, Rehman, Yilmaz, Khan, and Afzal (2010), posited that, an efficient foreign exchange system and stock markets arbitrage forces enforce consistently the pricing of risks between the foreign exchange and stock markets. Resulting from these forces, the transactions cost of hedging and the reduction of foreign exchange risks eventually offset. There are studies that have found no impact of exchange rates on firm's investment decisions, while evidence of studies by Okoli (2012) revealed significant nexus between stock returns and exchange rate fluctuations. With the growth of the Ghana stock market, the determinants of stock market volatility and the responsiveness of returns and mean returns on the GSE to exchange rate variability deserve particular attention. Stock market volatility has implications on expected returns, since higher variability of exchange rate implies greater risks, with implication to stock returns.

The responsiveness of mean returns and variability of returns to changes in exchange rates is of prime importance for my study since the depreciation of the domestic currency may have the tendency to reduce stock prices, thus leading to a decrease in returns. The relevance of the responsiveness of stock returns or the mean stock returns to variability of the domestic currency helps in the understanding of the responsiveness of stock returns and exchange rate volatility. Thus it is important that policy makers are properly informed of the linkage between the stock market outcomes and exchange rate decisions. Unfortunately, the extent of investigation of the potential link has rather

favored the industrialized economies, and even in the case of emerging economies, mixed results of the effect of exchange rate changes or variability on stock returns have been reported.

In other developing economies outside sub-Saharan Africa, there are only a few studies that have examined the impact of exchange rate volatilities on stock returns. For example, Nucu (2011) examined the relationship between stock prices and exchange in Romanian stock markets and reported that stock market returns was inversely responsive to the domestic currency depreciation. Jain, Narayan, and Thomson (2011), used an EGARCH-X model to examine the relationship between stock returns and exchange rates and established a nexus between selected macroeconomic variables and stock market returns.

In the financial sector, there has been limited analysis on how bank stock returns respond to changes in both interest rate and exchange rate. Jain et al. (2011), used the EGARCH model and both short term and long term interest rates and their volatilities to estimate portfolio returns in some selected Australian banks and found that there is evidences of an increase in returns during period of appreciation of the Australian dollar. The Currency Crises that emerged from Asia, the introduction of floating exchange rate regimes the early 1970s coupled with reforms in the financial markets in the early 1990s have provoked research by financial economist for the determination of a nexus between these two markets (Mishra, 2004). The effects of information on stock markets and the behavior of speculative prices has been an area of much interest to both academic researchers and investment analysts and research outcomes had been mixed.

Evidence of past research demonstrates how various models and the application of statistical tools have been used to investigate the relationships between exchange rate changes and stock market dynamics. Some studies have used a Markov-state switching approach to investigate the linkage between exchange rate and stock market prices and returns, while others have used macroeconomic variables on stock returns. Evidence in line of literature on stock market returns revealed the effect of economic sentiment indicators on stock markets has also been examined. For example, some researchers have attempted to uncover whether investor sentiments is important in the prediction of stock market performance and returns. Emrah, Evik, Turhan, and Erdal (2012) applied a time varying Markov regime-Switching (MS) properties in all shares stock returns in the USA covering some non-manufacturing business activity index and supply chain management within transitional equation. The study tested for the common factors that affect both stock returns and business confidence in the selected sectors and the possibility of a common factor effect of stock returns on business confidence. Emrah et al. reported an effect of business activity on nonmanufacturing sectors have effect on stock returns. Some had applied different tests to establish the nexus. Karnizova and Khan (2010) reported that changes in the stock market index and consumer confidence are directly correlated in Canada. This result was achieved with the application of a Granger-causality tests. This means variations that occur on the stock market index Granger-cause variation in consumer confidence index. Generally, economic theory makes a clear relationship between confidence indicators and macroeconomic variables, and this was

amplified by .Kurov (2010) who investigated the effect of sentiments on macroeconomic variables. Such methodological approach have not been used in

Studies in sub-Saharan African countries have looked at the stock market and economic growth. The long run and causal relationship between stock market development and economic growth for seven countries in sub-Saharan Africa was investigated. They applied the ARDL bounds test approach, and found a cointegration of stock market development with economic growth. Using the ARDL bounds test, the study concluded that that stock market development had a significant positive long run impact on economic growth. A further test by the same authors used the Granger causality test based on VECM further showed that stock market growth Granger caused economic growth in some selected sub-Saharan countries, notably among them is Egypt and South Africa.

Granger causality within the context of VAR also showed evidence of bidirectional relationship between stock market and economic growth in Morocco, Zimbabwe, and Cote D'Ivoire, though Nigeria showed a weak evidence of growth-led finance of using the stock market as a development indicator (Enisan and Olufisayo,2008). Based on these results, it is important to investigate whether over the years the Ghanaian stock markets have developed through appropriate regulatory and macroeconomic policies, rather than exogenous influence such as FDI.

Using CPI as a proxy to inflation rate, Adjasi, Harvey and Agyapong (2008) investigated the relationship between Stock Markets and Foreign Exchange market in Ghana. The objective of the study was to determine whether movements in exchange

rates have an effect on stock market in Ghana. The study made use of the EGARCH model to determine the relationship between exchange rate volatility and stock market volatility. The study found an inverse relationship between exchange rate volatility and stock market returns. To give a more succinct interpretation of the findings by Adjasi, Harvey, and Agyapong (2008), the depreciation of the currency, has a long run effect on the stock market, albeit, positive or direct, however, in the short run, there is a reduction in stock market returns.

Inflation Rate

The instability that permeated the American stock markets since the economic crash of 2008 has some rippling effect on the world financial systems, including sub-Saharan Africa. The effects of inflation on an economy are varied and can have either positive or negative repercussions. According to Mensah, Awunyo-Victor, and Sey, (2012) in May 2007, the BoG announced the adoption of a primary monetary policy that aims at targeting full-fledged inflation as a tool for the stabilization of price (inflation) levels in Ghana. Prior to the May 2007 announcement, the GoG had targeted monetary aggregates by adopting a broad range of variables to make its monetary policy decisions as a policy tool for the stabilization of price levels.

Economic theory, amplifies the existence of a relationship between inflation rate and stock market returns, yet, the causal link has constantly posed some dilemma about whether the causality is unidirectional or bidirectional. Kuwornu and Owusu-Nantwi (2011) and Adam and Frimpong (2010), Kimani and Mutuku (2013) pointed to an inverse relationship between inflation and stock prices. In a study by Raja and

Kalyanasundaram(2010) applied a bivariate correlations to verify the relationship among macroeconomic variables and studied the relationship between stock market index and economic variables among emerging economies and reported a high direct correlation between the GDP and stock market index.

The Ghanaian economy had faced double digit inflation since the last five years. During the period 2008 to date, the GoG had targeted a single digit inflation which aims at encouraging borrowing by potential investors and sustaining economic growth among others. According to the BoG (2012) report, the structure of the Ghanaian financial market has no semblance with the structure of developed markets, as a result, the stock market index movement of Ghana may show significant variations as compared to developed markets.

One significant feature of the Ghana's macro-economy over the past 40 years is the soaring and mostly variable inflation and rates of interest. According to Frimpong and Fosu (2011), in addition to the political turbulence, inflation has been remarkably high in the 1970s in Ghana, and the early parts of 1980s and had even persisted in the steady improvement of the economy since 1983.

Some past studies had classified the inflation-stock returns relationship into three. For example, Patra and Poshakwale (2006) classified stock market return-inflation relationship into three categories: (i) No correlation between inflation and stock market returns (ii) Inverse correlation between inflation and stock market returns and inflation which is contrast to the generalized Fisher hypothesis (iii) Positive relationship between stock market returns and inflation which is consistent with the generalized Fisher

hypothesis. The outcome of this dissertation will refer to which of this classification is consistent with the Ghanaian inflation-stock market returns relationship.

The BoG had mostly aimed at the pursuing sound monetary and financial policies for the stabilization of price with implications to low levels of inflation and an environment that will result in sustained growth in the Ghanaian economy. Contrary to Fama and Schwert (1977), an inverse correlation between interest rate and stock market index was reported by Raja and Kalyanasundaram (2010) . According to Anokye and Siaw (2010), Ghana in recent times has witnessed inflation both in high, absolute, and comparative terms. In addition, a sustained rise of prices of goods and services over a period of time is referred to as inflation. Generally, an incessant rise in the general price level will result in the currency of a country buying fewer goods and services, and the erosion of the currency will naturally result in a loss in the real value of the currency as a medium of exchange and a unit of account. Alshogeathri (2011)that the direct and indirect after-effects of inflation on sectors of an economy include unemployment, low or high stock market returns, investment, and exchange rates among others. Therefore inflation and stock markets have a very close relationship and the effect on the economy cannot be ignored.

Fisher (1930) hypothesized that stock market returns is independent of inflation expectations, but the two variables, namely inflation and stock market returns are positively related. Fisher's conclusions and hypothesis gave credence to the assertion that if inflation and stock market returns are positively related, then, equities serve as a hedge against inflation. However, Fama (1980) further pronounced the ambiguity of what

Fischer postulates and explained that, the relationship between inflation and stock market returns can be significantly negative (Fama, 1981). The Fischer hypothesis is of prime significance in the field of global finance, because it sheds light on the expected nominal stock market returns, which equates the sum of expected inflation and real rate of return. The “Fisher Effect” postulates that expected nominal asset returns have a unitary effect on expected inflation. Thus, the hypothesis predicts a direct positive relationship between inflation and stock market return.

From Fischer’s findings, stocks can be used as a hedge against inflation, and investors will be rewarded for inflationary tendencies on an economy. This means real stock market returns are not affected by inflation. Included in this dissertation, is the variable, inflation rate, and its effect on stock market returns in Ghana over the period 2000 to 2013. It is expected that the dissertation outcome will test for the consistency of the Fischer hypothesis, and the extent to which the Ghana stock market inflation-stock returns outcome will be a hedge to inflation.

The depreciating value of the cedi has been key concern to businessmen. In the year 2012 the cumulative depreciation of the cedi was as high as 17.5% against the US dollar. Importers struggled because it has become increasingly expensive for them to buy their goods. Moreover, businessmen suffer currency losses in the period between buying their goods in foreign currency and selling them in local currency. There are other pressures on the value of the cedi. The current account remained heavily in deficit in 2012; and the capital and financial accounts were fairly weak. Foreign exchange reserves were being drawn down to the extent that in August 2012 gross international reserves

provided cover for 2.4 months of import, compared to 3.3 months of import at the beginning of 2012 (BoG, 2013).

Generally, inflation can cause distortions in prices. Inflation can raise uncertainty in an economy which in the long run discourages business investment decisions. Magnus and Fosu (2011) observed that low inflation and sustained growth by the BoG is premised on the common consensus the gives credence to existing explanation that, inflation could be costly insofar as it weakens economic activity and does not help the course of poverty alleviation policies by the GoG. Thus, the effect of inflation can result in losses in efficiency in investment and reduce productivity because productive resources are diverted into speculative activities, and invariable cause negative social consequences.

Economic theory suggests a relationship between inflation and stock market returns. Therefore, firms can make estimates of forecasted profit margins because equity stocks has a relationship with both current and future earnings of the firm. Their assertion implies that, the stock market operates as a hedge against inflation. The findings by to Magnus and Fosu (2011) explained the means by which investors are in the long-run compensated against increases in inflation through a corresponding upward adjustment in nominal stock market returns, and from the adjustments, real returns on stock is expected to remain constant.

Although there are many studies on the link between inflation and stock market returns, the direction of the relationship is still inconclusive because the causal link is not without ambiguity; the consensus vary from causality from stock market returns to inflation or from inflation to stock market returns. Using a model of key structural

relations and variables as well as short term models, and ARIMA and VECM, Anokye and Siaw (2010), posited that the BoG forecasts inflation expectations on forward looking rational expectations macroeconomic model.

Inflation can result in the reduction of the real value of money and other monetary variables over a certain period. Also, the uncertainty over projected inflation rates may have the tendency to discourage investment and savings. Therefore inflation accentuates interest rates increase, thus putting pressure on creditors to jerk up lending rates primarily to compensate for the vicious erosion caused by inflation.

The consequences of inflation on an economy are numerous. For instance, a sudden upsurge of general and sustained price levels may result in shortages of goods as consumers begin to hoard out of anxiety. Prices may further increase in the future, thus triggering inflation. Asalou and Ogunmuyira (2011) posited that inflation has both direct and indirect consequences in every sector of the economy ranging from investment, exchange rates, interest rates, unemployment, and stock markets among other variables. From the foregoing, inflation and stock markets share a very close correlation, and the rate of inflation influences the socioeconomic life the people in a county.

Al-Jafari, Rashed, Salameh, and Habbash (2011) selected macroeconomic variables such as inflation, interest rates, money supply and exchange rate for the period from January 2002 to December 2008, and investigated the relationship between stock market returns and macroeconomic variables. They used various testing models such as the Granger causality test, Pedroni panel cointegration test, and obtained data from 16 developed and 16 emerging markets to investigate the causal relationship between stock

returns and stated macroeconomic variables. The study found significant causal relationship between macroeconomic variables and stock returns. However, interest rate and money supply showed exception. The study also found a significant causal link between stock prices and macroeconomic variables for both emerging and economically advanced countries. However, macroeconomic variables such as exchange rates and money supply showed an exception, in the case of developed countries, while in the case of emerging markets, the study revealed that the relationship between stock returns and macroeconomic variables is significantly established in developed markets.

In this study, I established the relationship between macroeconomic variables and stock returns on the GSE. I used a multiplicity of tests as revealed by literature to discover if the relations between the variables will be similar to existing studies in other economies, both developed and emerging. The importance of the dynamic nexus between stock markets and macroeconomic variables was amplified Al-Jafari, Rashed, Salameh, and Habbash (2011) when they posited that political instability coupled with currency turbulence and a high foreign debt has been a feature of emerging economies. Additionally, emerging markets have distinguished themselves from the capital markets of developed economies in the degree of information efficiency and institutional infrastructure.

According to Al-Jafari, Rashed, Salameh, and Habbash (2011) taxation of dividends, restriction of capital flow, capital gains, and the quality of information, is the foundation of a stock market's institutional infrastructure. According to Guglielmo and Soliman (2013), there has been an increase in the average level and volatility of inflation

and as a result more theoretical and empirical research on the nexus between stock returns and such monetary variables as exchange rates, interest rate, money supply, and inflation rate. Olweny and Kimani (2011), observed that stock markets play the mediation role of bringing together surplus and deficit spending units together and matching the liquidity preferences and risk appetite of both units through a preferred financial instruments, and thereby stimulating investments in the economy. Evidently, the liquid nature of the markets stimulates the exchange of ownership of securities, and reap capital gains in the process.

The effects of inflation on the stock market performance greatly influence the prices of financial instruments (assets). Kimani and Mutuku (2013) obtained data from the central bank of Kenya and used quarterly data for the period between December 1998 and June 2010. They measured inflation by the arithmetic mean on consumer basket and computed an index based on the geometric mean of stock prices for some selected top performing listed firms on the Kenya market. Kimani and Mutuku (2013) then used a unit root test based on the formal ADF test procedures and the Johansen-Juselius VAR based cointegration test procedure. The cointegration model showed an inverse relationship between inflation and stock market performance in Kenya.

Nevertheless, evidence has shown that equities in industrialized countries have not maintained their value during periods of high inflation rates. In the case of developing nations, there has not been any such study. Asalou and Ogunmuyiwa (2011) posited that in the later part of 2000s in Nigeria, stocks did not keep pace with general price levels, although there is some evidence of the factors influencing stock market returns and

macroeconomic variables, majority of the study have focused entirely on developed countries and some few emerging market. The theoretical postulations of a study by Kimani and Mutuku (2013) on common stocks indicate that returns on common equity shows the tendency of inflation hedged against inflation. The case of Ghana has not been investigated, however, this proposition has been extensively tested in the context of Fisher hypothesis (Fisher, 1930). Kimani and Mutuku found an inverse relationship between inflation rate, net effective exchange rate, inflation and deposit rate with overall stock performance. The policy guide implied that the Nairobi securities exchange is not a perfect hedge against inflationary pressures. The finding by Kimani and Mutuku (2013) gives credence to the theoretical postulations of the relationship as already specified between inflation and stock market returns and to further put the GSE to the test.

Ghana carried out an economic restructuring in the 1980s and the financial sector reforms that followed required the adherence to strict monetary and fiscal policies. Despite the reforms, macroeconomic indicators have remained high compared to developed economies. For example, inflation rate in Ghana has shown a general upward trend from 1990 in spite of the institution of reforms and the struggle to implement prudent macroeconomic policies. The GSE capital appreciated by 116% in 1993 and gained 124.3% in its index level in 1994 (GSE quarterly bulletin, March 1995) adjourning GSE as sixth and best performing emerging market in 1993 and 1994 respectively. In 1995, the index grew 6.3%, this abysmal performance is partly attributed to high inflation rate and interest rate in Ghana during the specified period.

The Fischer (1930) hypothesis has not been extensively tested in Ghana. Anokye and Siaw (2010) based their study on the Fisher hypothesis, which originally states that, the market interest rate is made up of expected real interest rate and expected inflation, to test whether the Ghana stock market has the capacity to hedge against inflation in the long run. The study made use of the monthly databank stock price index obtained from the databank group research for the period 1991 to 2007 and applied cointegration techniques, specifically Johansen (1995). The inflation variable used was the CPI for Ghana which was obtained from the International Financial Statistics (IFS) of the International Monetary Fund (IMF) covering the same period.

Prior to analyzing data, the rate of inflation and the returns on the stock market, Anokye and Siaw (2010) differences of the logarithmic price levels of the respective series and reported on the statistical indicators such as the sample mean, skewness, standard deviation, and the Jacque-Bera statistics. The study by Anokye and Siaw (2010) revealed a strong nexus between databank stock prices and inflation, however, though there is a correlation between the movement of stock prices and inflation rate which was positive. The lag was one month. The study found enough evidence and concluded that the Ghana stock market is efficient during period of inflation because, investors are rewarded through high stock returns during periods of general increase of price levels of goods and services in Ghana.

There has been several studies and analysis of stock market development and returns with inflation as an independent variable, however, majority of such studies have entirely focused on the developed economies and some few emerging markets. In Ghana,

there is scarce evidence on the nature of interaction between the Ghana stock market and various economic fundamentals. This study included inflation as a variable for study and it is expected that the outcome will shed light on how inflation rate as an economic variable impacts the securities market in Ghana.

Interest Rate

Stocks are sensitive to interest rates. Researchers have reported that the financial structure of some industry makes firms in that industry more susceptible to interest rates volatilities than others (Khan & Mahmood, 2013). Plethora of studies has empirically tested interest rate sensitivity to stock market returns, and has reported an inverse relationship between interest rate and stock returns. In contrast, some studies had reported a direct relationship between stock returns and interest rates (Titman and Warga 1989). Interest rate sensitivity to stock returns can also be subject to causality. The effect of interest rates on the bond market is direct, however, interest rates sensitivity to stock returns had been inconsistent and not direct (Park & Choi 2011).

Some studies had reported the time varying dimensions of interest rates and the inverse relationship between interest rates sensitivity to stock prices (eg Titman &Warga, 1989). The Neoclassical theory of interest rate states that, the cost of loans for investment by entrepreneurs becomes costly when there is an upshot in interest rates, therefore, investment activities in an economy shrinks as a result. According to Khan and Mahmood (2013) the demand for loans is lessened as a result of increase in interest rate and consequently, investment dwindles.

The theory of interest rates relates the nominal interest rate i to the rate of inflation π and the "real" interest rate r. The real interest rate r is the interest rate after adjustment for inflation. It is the interest rate that lenders have to have to be willing to loan out their funds. The relation Fisher postulated between these three rates is:

$$(1 + i) = (i + r)(1 + \pi) = 1 + r + \pi + r\pi \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.1)$$

Thus, according to this equation, if π increases by 1 percent the nominal interest rate increases by more than 1 percent. In this study I investigated whether interest rate sensitivity has any effect on stock market returns on the GSE. Lee (1992) study Titman and Warga (1989) had used inflation rates and interest rates to investigate variations of stock return. Nevertheless, they reported a direct relationship between interest rates and stock return. Other studies, for example, Okyere, Fosu and Boakye (2014) had used the Granger Causality test to ascertain the sensitivity of interest rate to stock returns and reported a statistical significance between interest rate sensitivity to stock returns. These outcomes was reinforced by the study of Khalid (2012) when they also reported significant impact of interest rate sensitivity to stock return for different countries.

Some studies identified the repo rate/policy rate and the treasury bill rate, and selected the treasury bill rate as a proxy of interest rate sensitivity (Brewer & Lee 1990; Schrand 1997; Karam & Mittal 2011). The authors found stock returns of financial institution demonstrates positive sensitivity to market index and are statistically significant. One of the key purposes of this dissertation is to investigate how stock returns responds to interest rate sensitivity in the context of the GSE. The interest rates sensitivity and stock return at GSE is important because it will give a hint as to how the

Ghanaian investor responds to changes to the rate of interest. In this study I used the 91-Day T-bill rate will be used as a proxy to interest rate as consistent with Karam & Mittal (2011).

A rise in interest rate influences investing decisions, thus investors make changes in their investment structure, generally from capital market to fixed income securities (Syed and Anwar 2012). Theoretically an upsurge of interest rates will result in a decrease in rate of returns; thus, interest rate sensitivity and stock returns variations are theoretically inversely related. For example Alam, and Uddin (2009) has measured interest rates sensitivity to stock return and concluded, that, unanticipated interest rates are directly correlated to stock return. The extent to these findings on interest rates sensitivity as a hedge to stock market returns remains unknown in emerging markets such as Ghana.

The variations in methodologies demonstrate the inconsistencies of the required methodology for the reporting on the relationship between interest rate and stock returns. Models and tools have been employed in prior studies to bring to light the understanding of the relationship between stock returns and interest rates for both advanced and emerging markets. One of the common tools used to evaluate variations of stock returns is the multivariate VAR. For example, Shubita a and Al-Sharkas (2010) used the VAR to analyze the causal relationship between interest rates, inflation rate, and real activity and stock returns in the USA, and reported stock reports appeared Granger-causal with the macroeconomic variables, including interest rate. They also computed the impulse response functions and the generalized forecast error variance decomposition. The results

revealed an unrestricted VAR as a function of the size of stock returns. Findings suggested that stock returns is an indicator of macroeconomic performance, however, though stock returns is affected by interest rate, it does not lead to real economic activity as represented by industrial production.

Sensitivity analyses performed on the relationship between interest rate and exchange rate revealed significant relationship of the two variables to stock returns. Syeed and Anwar (2012) confirmed that even in the banking sector investors should invest stocks when exchange rate and interest rates are highly volatile. Though this indicates some risks and variations in expected returns, the result, however, supports the view that exchange rate and interest rate can be used as an indicator for investment decision making in banking sector stocks. Earlier studies had reaffirm that stock prices were negatively related to long-term interest rates in the US stock price index (S&P 500) for the period 1975 to 1999. Fewer studies have been reported in the case of emerging markets in sub-Saharan Africa both in the past and recent studies.

Money Supply

There is no dispute about the theoretical justifications between the macroeconomic and stock returns. In addition monetary portfolio theory have explained how changes in money supply can be used to vary the equilibrium position of money, thus altering the composition and price of assets in an investor's portfolio (e.g. Ahmed (2011). Numerous studies link monetary conditions to stock market returns and some studies have established a link between stock price movements with knowledge of past and potential money supply changes (Maitra and Mukhopadhyay (2011).

Changes in money supply have been considered as a risk factor to stock returns. For example, Ahmed (2011) examined the long run relationship between money supply and selected macroeconomic factors in Sudan and established causality between money supply and macroeconomic variables. The study used a Granger causality test to establish the causality. The study concluded that money supply variability is one of four other macroeconomic factors that showed significant influence on expected stock market returns.

In order to maximize investment-returns decisions, investors constantly exploit relevant published monetary data and reports about stock prices. According to Becher, Jensen and Mercer (2008), investors' expectations on information instantly impounds into security prices without the lag effect of money supply developments. Studies on the extent of efficiency of GSE about money supply are scanty. Maitra and Mukhopadhyay (2011) examined the causal link between money supply and exchange rate in India. The study was carried out under the basket peg and market determination regimes in India and found that inflation rate is directly related to the growth of money supply; an increase in money supply may result in an increase in inflation and consequently the discount rate. This implies, monetary growth policy resulting from economic stimulus will have negative consequences on stock prices and invariably stock returns. Dovern and Welsser (2011)examined the relationship between money, output and stock prices. The study tested six different indices of stock exchange including money supply (both M1 and M2) and GDP as a proxy of output. The study reported a significant efficiency in the informational content of selected macroeconomic variables.

One of the theoretical underpinnings of this dissertation is the efficient market model. In the Ghanaian context, information on the planned money supply data is made publicly available and data on the performance of the stock market, and this data is available to all investors, though, data on stock returns on the GSE is not cointegrated with other macroeconomic variables as this study seeks to do. In the USA, the Fed publishes data about money supply growth. According to Dovern and Welsser (2011), variations in stock prices are in anticipation of variations in money supply. Thus US investors may have to take into consideration data on money supply as it is relevant to stock prices. The use of reported data or information about changes in money supply will induce stock prices that fully reflect new information when published. This will be a test to the efficiency of the US stock markets. The rate of money supply growth to the economy of Ghana and the GSE is important to policy makers and financial economists. Tests similar to the US on the degree of efficiency on the Ghanaian markets are yet to be carried, and this test is implied in the investigation between money supply and stock market as revealed by literature.

Most stock analysts in Ghana contend that money supply changes have become a superior indicator and an important source of information about the future of stock market returns or variability. Antwi, Mills and Zhao (2013) observed that the BoG base rate and the reserve requirements have constantly been a subject of discussion in both the electronic and print media. In addition the discount rates are widely reported in the Ghanaian financial press as acceptable indicators of the government’s monetary policy.

Changes in growth rates of monetary aggregates pave way to stock price changes and returns, including other financial assets.

The proportion of money held by the investor as cash on hand underlies the monetary portfolio model. Money, goods, stocks, and bonds, according to the model, are held by investors in varying proportion driven by rational behavior. Thus, an increase of money supply result in the readjustment of the portfolio mix through the purchases of other assets such as stocks and demand for stocks increase, and stock price increase.

One important issue that has recently generated keen interest in research by financial economists is the effect of government fiscal deficits on the stock market activities. Although the Keynesian paradigm projects adequate theoretical evidence about the effect of monetary or fiscal policies on stock market returns, the existence of the evidence alone are not a panacea to the achievement of targeted macroeconomic objectives (Dovern and Welsser, 2011). Research also suggests that a policy mix comprising of some fiscal and monetary policy have been found to achieve desired or targeted results (Antwi, Mills & Zhao (2013)). This dissertation tests hypotheses on money supply and stock market returns in Ghana. Most published works on the money supply effect on stock market returns are found in developed economies (see, Guglielmo Maria and Alaa M. Soliman (2013). An investigation into the effect of money supply on stock market returns using the GSE All Share Index is unique since post Keynesian money supply theory suggests causation effect of money supply on stock returns.

Empirically, the Keynesian suggestion of the relationship between monetary policy and fiscal policies and interest rates that originates from the IS-LM framework

suggests some dependence of the stock market activities to the two variables, that is, fiscal and monetary policy. Antwi, Mills and Zhao (2013) found that, adjustments in the fiscal or monetary policy instruments have an instantaneous effect on market interest rates which compels investors to reevaluate their portfolio decisions. Some researchers have argued that there is no relationship between fiscal policy and activities on the stock market.

Stock market speculators contend that, the relationship between stock market activity and fiscal deficits may result from interest rates volatility that ultimately triggers a portfolio reevaluation by investors. For example, the Ricardian equivalence suggestion by gave credence to the stock market efficiency hypothesis. It indicates that in its semi strong form the stock market efficiency concludes that stock prices fully reflect all publicly available information (Fama, 1970; 1991).

In contrast to the Ricardian argument, Tobin (1969) and Blanchard (1981) among others found a relationship between fiscal policy and stock market and this was emphasized by Tobin (1969) when he established a link between stock returns and the financial sectors of the economy. Tobin demonstrated how growth in money supply and deficits in budgets affect stock returns. In a more recent study Tervala (2012) posited that taxes increases associated to governmental expenditure if remain unchanged would lead to a decrease in asset returns because investors will be deterred from investing in the capital markets .

There are divergent views among financial economists on the (neutrality) of monetary policy on the stock market. Pierdzioch, Rulke and Stadtman (2011) observed

that there has not been any empirical evidence on the effects of monetary policy on the economy in quantitative terms and economic literature seem to give credence to this assertion because the effect of monetary policy on stock market returns is viewed from either money supply or the interest rate (prime rate). For example, the direct relationship between money supply and market interest rates is explained by changes in money supply directly leading to changes in market interest rates and the effect of these changes is the readjustment or realignment of investors' portfolio. Tobin (1969) found a clear relationship between monetary policy and stock market activity. In his seminal work entitled. "A General Equilibrium Approach to Monetary Theory" Tobin (1969) lay emphasis on the importance of stock returns as a connection between the real and financial sides of an economy.

The relationship between monetary policy and expected returns on investment has been greatly emphasized by some academics. For example, Poole (2010) demonstrated how surprises on an occurrence days can be attributed to surprises due to arrival of news event of a monetary policy. To achieve this Poole estimated equity returns to the days of which occurrence were arrived at from the sample of days for which the event of monetary policy was announced. The findings show a direct response of yields and inverse responses of returns on the stock. In his study of the effects of monetary policy and stock returns. The relationship between monetary policy surprises centered on the heteroskedasticity linked with the days the announcements were made and found an inverse effect on stock returns. For example Schwert (1989), finds weak evidence

between macroeconomic volatility and stock return. But instead suggested that it is more likely that stock market volatility causes macroeconomic volatility.

Using a structural time series analysis Maitra and Mukhopadhyay (2011) analyzed how money supply responds to macroeconomic indicators and reported that the covariance between inflation triggered by equity prices and shocks resulting from policy accounts for the response of stock markets to monetary policy. There is evidence of some studies having focused on the effects of macroeconomic events on prices of diverse financial assets, like stocks, T-Bills, or exchange rates. Some researchers have used microstructure models as a dominant framework for the generation and application of high-frequency data. Several models and studies have been conducted to find how important effects of news and implications for price level as measured by the CPI, monetary policy variables on the price formation process of financial assets (Ahmed, 2011).

Gaps in Research

After reviewing literature, I found that there is lack of consistent methodological rigor and standard statistical control for the conduct of my study. The application of different methodologies in the analysis of macroeconomic variables has been mainly the use of econometric models such as the GARCH, EGARCH, and APTs. The use of multiple regression analysis has been very minimal and virtually absent in emerging markets. In this dissertation, I aimed to fill this gap by the application a multiple regression approaches with a comprehensive statistical tests to bring to light the statistical evidence on the nexus between macroeconomic variables and stock market returns in

Ghana. Additionally, both past and contemporary studies on outcomes and methodologies of the relationship between exchange rates and stock market returns and macroeconomic variables are not as clear cut (Buyuksalvarci, 2010).). For example some studies established a significant long run relationship between stock market returns and exchange rates, other studies had rather reported a depreciation of currency as reasons for changes in stock market prices. Despite of these gaps and inconsistencies in reporting outcomes of various studies, there are fewer studies that examines the linkage between stock market volatility and macroeconomic variables for the emerging markets in sub-Saharan Africa.

The case of Ghana is even more unique considering that various methodologies have used econometric models instead of a multiple regression approach which this dissertation seeks to do. My study is expected to fill the gap in the current related literature and will make significant differences in the response of the Ghana stock market returns to change in macroeconomic variables such as inflation, interest rate, exchange rate, and money supply. Advanced economies have evidence of studies in relation to macroeconomic indicators in early (e.g., Fama and French 1989; Jensen, Mercer, and Johnson 1996), but there is no established evidence of whether these indicators strongly suggests an absolute impact on stock market returns. The case of developing economies such as Ghana is also inconclusive. In the light of these gaps, I explored the relationship between macroeconomic indicators and stock market returns in Ghana.

Summary

Theoretical economists and empirical researchers have not reached a consensus on the nexus between stock market returns and macroeconomic variables. It is therefore

imperative for future researchers to carry out further tests and analyses of the interaction between a country's rate of exchange, inflation rate, interest rates, and money supply on the returns on stock for purposes of policy direction and positive social change. Though theory amplifies the existence of a relationship between macroeconomic variables and stock market returns, literature shows that the causal link between all chosen macroeconomic variables and stock returns has constantly posed some dilemma about whether the causality is unidirectional or bidirectional. For example, Ngugi and Kabubo(1998) posited that interest rate stimulates the deployment of financial resources and the efficient utilization of resources, however Chen et al(1986) indicated that interest rate had direct effect on stock return, whereas Wongbangpo et al(2002) posited that interest rate had an inverse effect on southeast Asian countries.

Keynesian preposition of the relationship between monetary policy and fiscal policies and interest rates that originates from the IS-LM framework suggests some dependence of the stock market activities to the two variables, that is, fiscal and monetary policy. Antwi, Mills and Zhao (2013) found that, adjustments in the fiscal or monetary policy instruments have an instantaneous effect on market interest rates which compels investors to reevaluate their portfolio decisions, yet, the causal link has been found to be inconclusive.

Although the Keynesian paradigm projects adequate theoretical evidence about the effect of monetary or fiscal policies on stock market returns, the existence of the relationship alone is not a panacea to the achievement of targeted macroeconomic objectives. A policy mix comprising of some fiscal and monetary policy have been found

to achieve desired or targeted results (Antwi, Mills & Zhao, 2013). This dissertation tests the hypotheses of some selected macroeconomic indicators and implication of stock market returns. It is expected that the chosen variables will direct policy makers to the appropriate policy mix that will help achieve desired socioeconomic target for positive social change.

In conclusion, over the past decade, the Ghanaian economy had experienced deviations from planned macroeconomic indicators. Significant variations of planned interest rates, inflation rate, exchange rate, and money supply variations have had some repercussions on the Ghanaian economy and particularly the money and capital markets (Anokye and Tweneboah, 2008). In instances of growth and stability of major sectors of the economy, the money and capital markets have been said to gain significantly from planned macrocosmic policies, yet, much attention has not been given to the GSE. Kuwornu (2012) posited that stability of planned macroeconomic indicators can significantly contribute to the growth and stability of the Ghana stock market. In spite of increased FDI and capital flows from developed markets to emerging markets and the attendant increase in returns on investments, emerging stock markets in developing countries like Ghana have not been well studied (Insah, 2013).

The overall purpose of my study was to investigate the relationship between Macroeconomic variables on stock market return on the GSE. I selected foreign exchange rate, inflation rate, interest rate, and money supply in Ghana as my prime focus for macroeconomic variables in addition to the GSE All Share Index. I used monthly time series data for during period between January 2000 to December 2013 and in instances of

annual time series data, I converted to monthly series to ensure consistency in analysis and study outcome.. In Chapter , I contextualized the study methodology and provided a basis for analysis and research findings.

Chapter 3: Research Method

Introduction

International tariff barriers have gradually been eliminated by the advent of globalization; as a result, international financial markets demonstrate the tendency to mutually influence each other. The interdependence of globalized financial systems was illustrated by the Asian financial crisis that occurred in July 1997. Evidence of numerous investigations into stock movements and macroeconomic variables among South Eastern Asia exist, but few studies investigated the effect of macroeconomic variables on stock markets. The effects of financial development on growth can be viewed in terms of the proportion of investible income that is actually invested, and this is dependent on the degree of efficiency of financial intermediation in the economy (Abdelbaki, 2013).

Abdelbaki (2013) observed that methodologically, models have been developed to investigate the extent to which the financial markets are affected by economic variables and growth. There are a growing number of study methodologies spanning from firm, industry, and country levels. Mostly, data used to investigate stock market movements included GDP, investment rate, M2+, GDP deflators, national accounts, interest rates, inflation rate, exchange rates, and some instances data from the Bretton Woods institutions. Abdelbaki (2013) observed that real interest rates and inflation rates are important indicators to use when measuring macroeconomic stability, because these macroeconomic indicators can help financial economists determine the impact of market capitalization and stock market liquidity.

Stock market reforms, privatization, emerging interest about stock markets in Africa, south of the Sahara, have characterized the financial sector in sub-Saharan Africa. These reforms mostly occurred in the financial sector and were driven by the IMF through a financial sector liberalization and FINSAP. The application of macroeconomic policy instruments as catalysts for sustainable development and growth has also increased the variability (risks) of stock returns in Ghana (Anokye & Siaw, 2010).

In this study, I investigated the relationship between macroeconomic variables on stock returns of listed companies on the GSE during the period of January 2000 to December 2013 using a multiple regression approach. I also conducted various statistical tests to reveal the nexus between the predictive variables on the GSE All Share Index. Kuwornu (2012) observed that the liberalization of the financial sector coupled with prudent macroeconomic policies are but some few steps taken by African governments to develop their private sectors, stimulate economic development and social growth. I placed prominence on the relationships between stock market returns and macroeconomic variables to empirically determine whether the changes or "noise" of macroeconomic variables undermined the operations of the Ghanaian stock market.

In this study, in addition to the investigation of the nexus between the dependent and independent variables, I also aimed at establishing whether stock returns represented an accurate signal of the intrinsic performance and investment decisions on the Ghanaian stock market considering the constant change of macroeconomic indicators such as inflation rate, exchange rate, interest rate, and money supply.

Trends and variations of economic activities affect investments, particularly stocks. Generally a growing and sound economy is likely to attract FDI and some of these investments are routed through the stock markets, thus economic prosperity makes the stock market attractive as investments are constantly stimulated. On the contrary, an unattractive economy will dampen stock market growth. Insa (2013) argued that the behavior of stock prices depends on macroeconomic factors such as money supply, inflation rate, interest rates, GDP, oil, gold, and so forth. Stock market investors will always watch leading economic indicators to make investment decisions in shares with a view to maximize returns. One such indicator is the GSE All Share Index in Ghana (Insa, 2013).

In Chapter 3 of this study, I presented a brief description of the problem under investigation, the purpose of the dissertation, and the theoretical framework that assisted in addressing both the research questions and formulated hypotheses. I also presented the research design, hypothesis, data sources, and showed how data were analyzed with the application of SPSS and Eviews. My study was quantitative in nature and I obtained data primarily from secondary sources. To achieve research objectives, I designed the study to provide explanations specified in the research questions and the formulated hypothesis. Chapter 3 was therefore structured to include the study design, description and definition of variables, methodology, rationale of the study, data collection procedures, analysis of data, threat to validity, and ethical considerations. Finally, I summarized the chapter and made transitional statements to Chapter 4.

Research Design and Rationale

In this study, I planned for the procedures for the study based on a broad range of assumptions to detailed methods of data collection techniques and analysis that aided in my accomplishment of research objectives. The stated assumptions are as follows:

Assumption 1: Linear regression model. The regression model is linear in the parameters, as shown in Equation 3.1 below:

$$Y_t = \beta_1 + \beta_2 X_t + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (3.1)$$

In Equation 3.1 above I assumed that the relationship between the predictors variables designated as X_t and the dependent variable Y_t is linear.

Assumption 2: *X* values are fixed in repeated sampling. I considered values taken by the regressors *X* as fixed in repeated samples and I assumed *X* to be nonstochastic.

Assumption 3: Zero mean value of disturbance u_i. Given the value of *X*, the mean, or expected, value of the random disturbance term u_t is 0. Technically, the conditional mean value of u_t is 0. Symbolically the equation is deduced as follows:

$$E(u_t|X_t) = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.\ldots\ldots\ldots\ldots\ldots..\ldots.. (3.2)$$

Assumption 4: Homoscedasticity or equal variance of u_i. Given the value of *X*, the variance of u_t is homoscedastic. That is, the conditional variances of u_i are identical. Symbolically, I had: var to be $(U_t|X_t) = E[U_i - E(U_i|E(X_i)]2 = E(U_i2|X_i)$ because of Assumption 3 = σ_2 where var stands for variance.

Assumption 5: No autocorrelation between the disturbances. Given any two *X* values, X_i and X_j $(i \neq j)$, the correlation between any two u_i and u_j $(i \neq j)$, is 0. Symbolically $cov(U_iU_j|X_iX_j) = E\{[U_i - E(U_i)]|X_i\}\{[U_j - E(U_j)]|X_j\} =$

$E(U_i|X_i)\left(U_j\middle|X_j\right) = 0$, where i and j are two different observations and where cov means covariance.

Assumption 6: Zero covariance between u_i and X_i, or $E(U_iX_i) = 0$

Formally, $Cov(U_i, X_i) = E[U_i - EU_i][X_i - E(X_i)]$

= E$[U_i(X_i - E(X_i)]$ since E$(U_i) = 0$

= E$[(U_iX_i) - E(X_i)E(U_i)$ since E(X_i) is nonstochastic

= E$[(U_iX_i)$ since E(U_i) = 0

= 0 by assumption

Assumption 7: The number of observations *n* must be greater than the number of parameters to be estimated. Alternatively, the number of observations *n* must be greater than the number of explanatory variables.

Assumption 8: Variability in *X* values. The *X* values in a given sample must not all be the same. Technically, var (*X*) must be a finite positive number.

Assumption 9: The regression model is correctly specified. Alternatively, there is no specification bias or error in the model used in empirical analysis.

Assumption 10: There is no perfect multicollinearity. That is, there are no perfect linear relationships among the explanatory variables.

Assumption 11: The Gauss–Markov theorem holds, which is stated thus: If all the 11 assumptions based on the Gauss–Markov theorem hold, then the multiple parameter estimates of the independent macroeconomic variables I obtained from the multiple regression results would be the best predictors of the criterion variable, which is the GSE All Share Index (Bornholt, 2013). I used four predictors (exchange rate, interest rate,

inflation rate, and money supply), while the criterion variable was stock market returns, measured as the GSE All Share Index. I assumed that the selected macroeconomic variables were the best predictors for the GSE All Share Index; if not, then I needed to conduct a further tests in order to eliminate any potential biases to make the OLS regression estimated best linear unbiased estimators (BLUE).

In Chapter 3 of this study I provided specific methods of data collection, data analysis, and bases for which findings were interpreted in Chapter 5 of the study. The method was based on the nature of the research problem I formulated and the phenomena I aimed to address. According to Addelbaki (2013), in conducting a quantitative research, one of the means of testing objectively the relationship among variables is to engage in an inquiry by having assumptions clearly stated and testing for theories deductively while guarding against bias, controlling for substitute clarifications, and be skillful to generalize and replicate findings.

According to Addelbaki (2013), the problem variable is referred to as the dependent variable and the independent variable is that whose influence to the dependent variable is to be established.

The Dependent Variable (Stock Market Returns)

In this study, I modeled the effect of macroeconomic variables on stock market returns in Ghana. Macroeconomic variables included inflation rate, interest rate, exchange rate, and money supply.

The dependent variable of interest was stock market returns which is a measure of the GSE All Share Index for the period January 2000 to December 2013. I used the GSE

All Share index as a statistical concept to enable me make predictions about the performance of the GSE.

Anokye and Tweneboah (2008) examined the role of macroeconomic indicators on stock returns in Ghana. They chose stock returns as the dependent variable using the Databank stock index as proxy to stock market returns and the CPI as a proxy of inflation rate in Ghana, the Treasury bill rate as measure for interest rate in Ghana, exchange rate, and FDI. The choice of the dependent variable (stock market returns) is consistent with Anokye and Tweneboah (2008). The operational definitions are adopted for this dissertation.

The time varying effect for my study is from January 2000- December 2013. The relationship between the dependent variable and independent variables are not static, and therefore the constant change in stock returns and macroeconomic variables made this study more expedient to undertake. Finally, I took into consideration those macroeconomic variables that have been ignored by previous studies (Nkoro & Uko, 2013). For example using the GSE All Share Index instead of the individual listed stocks on the GSE.

The Independent Variables

In this study, I used macroeconomic variables as independent variables in relations to a single dependent variable (stock market returns). The independent variables are: inflation rate, exchange rate, interest rate, and money supply. According to Nkoro and Uko (2013), various studies on the choice of independent macroeconomic variables do not have clear cut criteria for variable selection. However, various researches

emphasized the wide use of inflation rate, interest rate, exchange rate and money supply as commonly used to explain stock movements. The independent variables I chose were consistent with the study by Nkoro and Uko (2013).

The dependent variable for my study was stock market returns which was measured by the GSE All Share Index for the time series spanning the period January 2000 to December 2013. The rationale for the period I chose was in part due to different phases of macroeconomic policies of the Ghanaian economy and the extent to which the stock market in Ghana had reacted to the information cycle of the chosen variables. The choice was therefore expected to assist in the investigation and testing of the hypotheses about the relationship between macroeconomic variables and stock market returns in Ghana. In addition, the inclusion of the entire listed stocks when I used the GSE All Share Index, gave a true reflection of the effect of the independent variables on the dependent variables.

Some studies have used variables synonymous to macroeconomic indicators to establish a causal link with the stock markets. For example, Hjalmarsson (2010) used four forecasting variables; short term interest rate, spread, dividend price, and earnings price ratios, and tested for stock return predictability for 24 developed and 16 emerging economies for data of over 20,000 monthly observations. The study relied on 40 international markets, and concluded that, spread and short term interest rate are quite robust predictors of stock returns in developed economies. The study found no strong or consistent support of predictability for earnings per share and dividend price ratios as predictors of stock returns.

In this study, I used a multivariate regression model and panel data analysis to examine the relationship between macroeconomic variables to stock market returns and tested for the significance of the regression coefficients. In using the panel data, I sought to establish the relationship that existed between variables and to identify how one variable affects the other. In summary, I aimed at measuring the nexus between macroeconomic variables (independent) and stock market returns (dependent) on the GSE during the period 2000 to 2013.

Methodology

Targeted Population and Sampling Procedures

Issahaku et al. (2013) posited that a population refers to the sum of all members, elements or cases about which the researcher wishes to draw conclusions. In this study, I targeted all 36 listed firms on the Ghana stock market. As regards the sample size, they explained that, sampling is the process of selecting a sufficient number from a population, so that by studying the sampled elements the researcher forms an understanding of the properties or characteristics of the sampled elements in order to generalize the properties of the sampled to the population of interest. In this study , because I used the GSE All Share Index, the sampled size is the same as the population, as a result the conclusions I drew from the study outcome were based on the entire population of all 36 listed firms of the GSE. Since all 36 firms were included in this study, I subjected the entire population for statistical testing and included the entire listed stocks in the regression model. I found no need to carry out any form of sampling.

In this study, I made use of descriptive analysis with the aid of (SPSS) or EViews as an analytic tool to achieve study outcomes. For data analysis, I used the Average Share Index (ASI) of all 36 quoted companies in Ghana spanning through the calculated monthly consumer discretionary, consumer staples, materials, healthcare, insurance, manufacturing, and banking service companies between January 2000 and December 2013.

Data Collection Procedures

In this study, I used nominal data which was sourced to include the aggregate stock market returns of all listed institutions on the GSE, using the GSE All Share Index. I obtained the annual data and calculated the monthly data for the GSE All Share indices. The data collection approach was consistent with the one used by Khan and Mahmood, (2013). I obtained data mainly from secondary sources from GSS website, stock market fact book, the GSE website, BoG website, and monthly bulletins published by the BoG. The monthly BoG bulletins provided data on foreign exchange rates, inflation rates, interest rates, and money supply. The stock markets fact book provided the GSE All Share index in Ghana. To complement the data quality and check for consistency, I further obtained data from the websites of the World Development Indicators by the World Bank.

Data Analysis

In this study, I aimed at answering the research questions whether exchange rate, interest rate, inflation rate volatilities and money supply changes have an effect on stock

market returns in Ghana. To answer the research questions, I tested the following hypotheses:

The Null Hypothesis:

$H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$

The Alternative Hypothesis:

H_1 : Not all the slope coefficients are simultaneously equal to zero.

Flowing from the hypothesis and the resultant regression model, I analyzed the coefficients of the resulting multivariate regression and index values across the macroeconomic variables within the context of the research questions. I used panel data which consisted of monthly closing values of the selected macroeconomic variables during the period January 2000 to December 2013. In this study, I chose the monthly data instead of quarterly or annual data in order to avoid spurious correlation problem that might be apparent when the annual or quarterly data were rather used. I also did not want to compromise on the degrees of freedom that were required in the choice of the appropriate lag structures.

Theoretically the basic money supply model makes a distinction between M1 and M2, where M1 represents the narrow and M2 the broad definitions. M1 is made up of private holdings of currency in circulation (C), Demand deposits (D) is used by the private sector to settle transactions on goods and services. The narrow definition is the aggregation of currency in circulation and demand deposits, that is, $M1 = C + D$ ... ... (1.1) The inclusion of savings and time deposits (T) held by private holdings, thus defines *M2* as $M2 = C + D + T = M1 + T$ ... ... (3.3)

Notwithstanding the definitions of M1 and M2, the bulk of money supply in a money economy will largely consist of bank deposits. This dissertation will use $M2^{+}$ as consistent with the study by Sangmi and Mubasher (2013) who observed that the stimulants for changes in deposits, and eventually money supply, is the quantum of currency issued by central banks. In this study, I used the CPI as proxy to inflation rate, and defined by broad money supply, that is $M2^{+}$, the 91-Day Treasury bill rate was applied as proxy to interest rate, and exchange rate was measured as the domestic currency (the Ghana cedi) per United States dollar (US$).

Model Specification and Measures of Variables

In this study, I adopted and modified the model used by Sangmi and Mubasher (2013) who used time series data on macroeconomic variables and stock indices collected from the annual reports of the Reserve Bank of India for the period April 2008 to June 2012. They expressed Stock Market Index (SMI) as a function of selected macroeconomic variables. The model used by Sangmi and Mubasher (2013) was specified as:

$$SMI_t = \beta_0 + \beta_1 WPI_t + \beta_2 ExR_t + \beta_3 IIP_t + \beta_4 M3_t + \beta_5 GP_t + \beta_6 IR_t + \varepsilon_t \ldots\ldots (3.4)$$

Where

SMI_t=Monthly percentage change in the Stock market index;

WPI_t= Monthly percentage change in the wholesale price index;

ExR_t=Monthly change in the exchange rate;

IIP_t=Monthly percentage change in the index of production;

$M3_t$=Monthly change in the money supply;

GP_t=Monthly change in the gold price;

IR_t=Monthly change in the interest and

ε_t= Error term

In the above equation, β_0 is the constant term and β represent the coefficient of the variables while ε_t is the residual error of the regression. The OLS method was used and all estimations were performed in the econometrical software program SPSS whereas the ordinary calculations is Excel.

The GSE All Share Index and stock market returns: The use of indices to track stock market performance has received wide acceptance in the field of finance. Information on the average indices are used by all categories of investors; individual households, institutional or even foreign investors to determine the barometric direction and future performance of the exchange. For instance, the Dow Jones, FTSE, and Nikkei are globally accepted indices that gives direction on stock performance and returns because these indices show and track changes in the market values of the various exchanges and thus show the performance of the stock market.

The official index on the Ghana stock exchange is the GSE All Share Index which includes all listed equities on the GSE. The GSE All Share Index has its base as the average capitalization for the period covering November 12, 1990 to December 31, 1993 and this base is pegged at 100. In this study, I used the monthly average price index which was calculated from the daily closing price indices with the application of the following formula:

$$MR = \frac{(M_{t-}\ M_{t-1})}{(M_{t-1})} * 100 \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . \ldots \ldots . \quad (3.5)$$

With MR being the monthly percentage change in the average price index, M_t is the Average Monthly Closing price index at time t and M_{t-1} represents the Average Monthly closing price index at time t-1.

Inflation rate: The rate of inflation was calculated from the Wholesale Price Index (WPI) as:

$$IF = \frac{(WPI_t - WPI_{t-1})}{(WPI_{t-1})} * 100 \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . \ldots . \ldots . . \ldots . . \quad (3.6)$$

Where WPI_t is monthly WPI at time t and WPI_{t-1} is monthly WPI in time t-1.

Exchange rate is the Monthly change in weighted average exchange rate (the buying rate of the US dollar) was used and calculated by the below-mentioned formula.

$$ER = (ER_t - ER_{t-1}) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \quad (3.7)$$

Where ER_t is monthly changes in the weighted average exchange rate in time t and ER_{t-1} is monthly weighted average exchange rate in time t-1

The index of production was calculated as the percentage change in the Monthly index of production has been used and calculated by the following formula

$$IP = \frac{(IP_t - IP_{t-1})}{(IP_{t-1})} * 100 \ldots \ldots \ldots \ldots \ldots . . \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . . \quad (3.8)$$

Where IP_t is monthly index of production in time t and IP_{t-1} is monthly index of production in time t-1

Money supply was defined as changes in Monthly money supply have been used and calculated by the following formula;

$$MS = M2_t - M2_{t-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.9)$$

Where $M2_t$ is monthly money supply (M2) in time t and $M2_{t-1}$ is the monthly supply (M2) in time t-1. MS is the broad money supply in the economy of Ghana. An increase in MS will result in an increase in liquidity in the Ghanaian economy. The ultimate effect will be an increase in the purchasing power of all economic agents and this will result in increased money for both consumption and investment. A positive correlation between money supply and stock market returns is therefore expected (Issahaku et al., 2013).

Gold price was defined as the monthly change in weighted average of gold price is used and calculated by the below-mentioned formula.

$$GP = (GP_t - GP_{t-1}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.10)$$

Where GP_t is monthly weighted average of gold price in time t and GP_{t-1} is monthly weighted average of gold price in time t-1

Interest rate is defined as the monthly change in the interest rate is used. It is the weighted average rate of the month end. The formula is as follows;

$$IR = (IR_t - IR_{t-1}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.11)$$

Where IR_t is monthly interest rate in time t and IR_{t-1} is monthly interest rate in time t-1.

The Adopted Model

The modified model used in this study is specified as:

$$SMR_t = \beta_0 + \beta_1 IntR_t + \beta_2 ExR_t + \beta_3 Inf_t + \beta_4 Ms_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.12)$$

Where, β_1, β_2, β_3, β_4, are parameters of the model which will be estimated using the SPSS software.

Where:

$$SMR_t = \beta_0 + \beta_1 IntR_t + \beta_2 ExR_t + \beta_3 Inf_t + \beta_4 Ms_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.13).$$

Where:

$SMR_t =$ Monthly percentage change in stock market returns

$ExR_t =$ Monthly changes in the exchange rate

$IntR_t =$ Monthly change in the rate of interest (πr^2)

$Inf_t =$ Monthly change in the rate of inflation measured by monthly changes in the CPI and measure in Ghana cedi and US$ terms.

$Ms_t =$ Monthly change in the money supply

ε_t = Error term

In the above equation, β_0 is constant and β is coefficient of specified macroeconomic variables while the error term is denoted by ε_t is the residual error of the regression. In this study, I used variables consistent with Zhu (2013) and eliminated the industrial production index and gold price from the equation.

The Stock Market Returns

In this study, I determined the stock market returns by applying changes in the monthly GSE All Share Index by first calculating the monthly average price from the daily closing price index after which the stock market return is calculated using the formula:

$$SMR = \left(\frac{M_t - M_{t-1}}{M_{t-1}} \right) * 100 \quad \ldots\ldots\ldots \quad \ldots\ldots\ldots \quad \ldots\ldots\ldots (3.14)$$

Where:

SMR is the Monthly percentage change of closing values of the respective indices

M_t is Average Monthly Closing price index in time t and

M_{t-1} is Average Monthly closing price index of time t-1.

Inflation Rate

Logically empirical results of the GSE All Share index and inflation relationship could be classified into a direct relationship between inflation and the GSE All Share index. Such results of a direct correlation will be consistent with the generalized Fisher hypothesis. An expected inverse relationship between the GSE All Share index and inflation rate, will rather contrast the generalized Fisher hypothesis,

Finally, an outcome of no relationship between the GSE All Share index and inflation rate could be a possible outcome considering both independent and dependent variables. Notwithstanding these three possible outcomes, a theoretical justification for an inverse short run correlation between the GSE All Share index and inflation rate could be as a result of the influence of revisions in inflationary expectations on stock prices.

With respect to inflation, I expected the GSE All Share index to correlate negatively with stock returns since changes in inflation expectation correlates with purchasing power. Monthly inflationary figures were obtained from the GSS. The rate of inflation was calculated using the CPI in the following formula:

$$InF = \left(\frac{CPI_{t} - CPI_{t-1}}{CPI_{t-1}} \right) * 100 \quad \text{..... ....} (3.15)$$

Where CPI_t is monthly Consumer Price Index in time t and CPI_{t-1} is monthly Consumer Price Index in time t-1.

Exchange Rate

According to Mehdi, Mehrizi, and Elahi (2011) continuing increases in global trade and capital mobility have made exchange rates as an important determinant of business success and invariably a key determinant of equity prices. Investors have utilized the relationship between exchange rate and stock market returns to predict future trends. This is because for theoretical and empirical reasons exchange rate and stock market returns together play significant roles in determining the extent to which a country's economy is developed.

In finance theory, the effect of foreign exchange rate volatility on the value of the firm cannot be overemphasized, because future cash flows are affected by fluctuations in the foreign exchange rates. When a country's current appreciates exporters are likely to have their competitiveness in the international market diminished, thereby affecting net income with a rippling negative effect on stock prices, which is likely to decline. On the contrary, importers will make positive gains in terms of exports thus, improving on their competitive position on the domestic economy. As a result importers will realize higher profits (Mehdi, Mehrizi & Elahi, 2011).

The main currency for international trade in Ghana is the United States dollar (US$), therefore eventual cross rates are finalized in US$ terms for both inputs and imported raw materials. In this study, I used the monthly Cedi-US dollar exchange rate which was obtained from the GSS and the BoG. The exchange rate the Monthly change in weighted average exchange rate (the buying rate of the US dollar) was used and calculated by the below-mentioned formula.

$$ER = (ER_t - ER_{t-1}) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .. (3.16)$$

Where ER_t is monthly weighted average exchange rate in time t and ER_{t-1} is monthly weighted average exchange rate in time t-1

Interest Rate

In theory, there are two index models that illustrate how the return of an underlying security reacts to interest rate changes and stock market index (Khan and Mahmood, 2013). The importance of interest rate variations have been extensively applied by researchers in determining how securities reacts to interest rate changes.

While checking the sensitivity of stock return to interest rates, Khan and Mahmood (2013) recommended two variables with the tendency to predict changes in stock return, that is, interest rate and stock market index. In this study, I used the GSE All Share index to represent stock market index, however, as consistent with prior studies other macroeconomic variables that are sensitive to stock indices have been included in this study.

To operationalize this study, I defined the rate of interest as the monthly change in the interest rate. The interest rate was the monthly equivalent of the 91 Day Treasury Bill rate There is no dispute about the nexus of interest rate to economic activity, as a result, I used the 91-day Treasury Bill as a proxy to interest rate because it served as an opportunity cost to investment on the GSE and for holding shares. The 91-day treasury bill rates were obtained from the monthly bulletins published by the BoG and the BoG website. The formula is as follows:

$$IR = (IR_t - IR_{t-1}) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.17)$$

Where IR_t is monthly equivalent rate of the 91 day treasury bill rate interest rate in time t and IR_{t-1} is monthly equivalent rate of the 91 day treasury bill rate time t-1.

Broad Money Supply ($M2^+$)

Research revealed a positive relationship between Broad Money supply and stock returns. This is evidenced by the general assertion that a decline in the rate of monetary growth precedes bear markets and on the flip side an increase in monetary growth rate leads to a bull market (Sprinkel, 1971). In this study I defined Broad Money supply as changes in monthly money supply. This was calculated as:

$$MS = M2_t - M2_{t-1} \quad (3.18)$$

Where $M2_t$ is monthly money supply (M2) in time t and $M2_{t-1}$ is the monthly money supply (M2) in time t-1

Operationalization of Macroeconomic Variables

In this study, I investigated the effect of inflation rate, interest rate, exchange rate volatilities, and changes in money supply on stock market returns on the Ghana stock market using data for period January 2000 to December 2013. The macroeconomic variables I used in this dissertation were consistent of those that were used in Sangmi and Mubasher (2013) except for the elimination of gold price and production index which have been justified: I chose the CPI to represent inflation rate, Money Supply $M2^{+,}$ (MS) as used by Hashemzadeh and Taylor (1998), Exchange Rate (ExR) as used by Ming-Shiun et al., (2007), Interest rate (IR) as used by Melina (2005). I chose the CPI as a proxy for inflation rate and the 91 day Treasury bill rate as a proxy for interest rate and GSE All share index. The operational definitions were therefore consistent with prior

studies but within the context of this dissertation I sought to define the variables as follows:

Inflation Rate: This was measured as changes that occur and as a proxy of the Ghanaian monthly CPI

M1: Was defined as all coins and notes in circulation within the Ghanaian financial system and equivalents that could be converted to cash with ease. M2: Was defined to include M1, as defined above and additionally short-term deposits held by Ghanaian commercial banks. Therefore MS was equivalent of $M2^{+}$ as specified in the regression model and the monthly changes in moneys supply applied to the study. Interest Rate: This was measured as a proxy to the treasury bill rate in Ghana, and the 91-day treasury bill rate averaged to the monthly rate for achieving study objectives.

Exchange Rate: This was measured as the domestic currency, the Ghanaian cedi per United States dollar (US$) and the monthly exchange rate used for my study.

Analytical Strategies

In this study I used descriptive with the aid of Statistical Package for Social Sciences (SPSS) and Eviews to explore the patterns of the data. The data was analyzed and tested for stationary in order to eliminate spurious regression results, after which I analyzed the results and reported on my findings.

Research Questions and Hypotheses

RQ_1: Do changes in the monthly exchange rate have significant effect on stock market returns in Ghana during the period January 2000 to December 2013?

RQ_2: Do changes in the monthly interest rate have significant effect on stock market returns in Ghana during the period January 2000 to December 2013?

RQ_3: Do changes in the monthly inflation rate have significant effect on stock market returns in Ghana during the period January 2000 to December 2013?

RQ_4: Do changes in money supply have significant effect stock market returns in Ghana during the period January 2000 to December 2013?

Resulting from literature, the following hypotheses were formulated:

Hypothesis 1

$H_0$1: Changes in the monthly exchange rate have no significant effect on stock market returns in Ghana

$$H_0 1 : \beta_1 = 0$$

$H_1$1: Changes in the monthly exchange rate have a negative significant effect on stock market returns in Ghana

$$H_1 1 : \beta_1 < 0$$

Hypothesis 2

$H_0$2: Changes in the monthly interest rate have no significant effect on stock market returns in Ghana

$$H_0 2 : \beta_2 = 0$$

$H_1$2: Changes in the monthly interest rate have a negative significant effect on stock market returns in Ghana.

$$H_1 2 : \beta_2 < 0$$

Hypothesis 3

$H_0$3: Changes in the monthly inflation rate as measured by the CPI have no significant effect on stock market returns in Ghana.

$$H_0 3 : \beta_3 = 0$$

$H_1$3: Changes in inflation rate as measured by the CPI have a positive significant effect on stock market returns in Ghana.

$$H_1 3 : \beta_3 > 0$$

Hypothesis 4

$H_0$4: Changes in the money supply have no significant effect on stock market returns in Ghana

$$H_0 4 : \beta_4 = 0$$

$H_1$4: Changes in the money supply have a positive significant effect on stock market returns in Ghana

$$H_1 4 : \beta_4 > 0$$

Test Statistic

In this study, I tested the hypothesis that macroeconomic variables (interest rate, inflation rate, exchange rate and money supply) influence stock market return in Ghana during the period January 2000 to December 201. Since the hypothesis had multiple parameters, I utilized the F-test to investigate whether there is significant evidence that all the specified independent variables had zero coefficients at a level of significance of 5% ($\alpha = 0.05$). In testing the hypothesis, the null hypothesis (H_0) and the alternative

hypothesis (H_1) identified the claim that:

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0 \text{..... ....} (3.19)$$

H_1 : At least one of the partial slope coefficients is not equal to zero.

In this wise, my the claim was that macroeconomic variables affected stock market returns. The test Statistic I used was the F-statistic since I was interested in a joint test of significance of all the regressors. The F-statistic specified as:

$$F = \frac{R^2/(K-1)}{(1-R^2)/(N-K)} \text{..... ....} (3.20)$$

Where:

K is the number of parameters estimated in the model

N is the sample size

R^2 is the coefficient of determination

The critical value given the level of significance and the degrees of freedom was (α). The level of significance for the F-test could be 1%, 5% and 10% but in this dissertation, I used the 5% level of significance and the degrees of freedom applied in computing the F-critical (F_α) were (*K-1*) numerator degrees of freedom and (*N-K*) denominator degrees of freedom. Thus the F-critical was specified as $F_{N-K;\alpha}^{K-1}$. I computed the test value (F-calculated) using the procedure outlined below. The coefficient of determination (R^2) was then obtained using:

$$R^2 = \frac{ESS}{TSS} \text{..... ....} (3.21), \text{ where;}$$

ESS is the Explained Sum of Squares. Thus the part of variation in the dependent variable (Stock Market Returns) explained by the independent variables (macroeconomic variables) specified in the model. TSS is the Total Sum of Squares. This was the sum of the total variation in the dependent variable.

The F-test value was obtained using:

$$F = \frac{R^2/(K-1)}{(1-R^2)/(N-K)} \quad \ldots\ldots\ldots \quad (3.22)$$

I then proceeded to make decisions by comparing the F-test value computed above with the critical value also computed above. The decision rule was to reject H_0 if F-calculated was greater than F-critical. F calculated was not rejected if it was less than that F-critical. As I have already indicated, I used SPSS and Eviews software packages to obtain the probability values associated with the various tests and used the resultant p-value to make the claim that macroeconomic variables affect stock market return.

In this study, I set the rules as follows: (i) there is a significant evidence in support of the claim when the p-value calculated is smaller than the level of significance (α=0.05) against which the test will be conducted. Thus for the study, when the p-value is smaller than 5%, it can be concluded that there is significant evidence in support of the claim that macroeconomic variables affect stock market returns (ii) if the p-value is greater than the level of significance (α =0.05) then, the researcher will conclude that there is no significant difference between the parameters and zero. This meant that, a p-value greater than 5% implied a that there was no significant evidence in support of the

claim that macroeconomic variables affect stock market returns in Ghana during the specified period.

Test Statistic Justification

The justification for the multiple regression model instead of the widely used GARCH model for macroeconomic variables as revealed by literature was consistent with the explanation given by Koulakiotis et al (2006), that the GARCH: (i) assumes that there is a negative correlation between current returns and future volatility; (ii) imposes parameter restrictions that are often violated by estimated coefficients which may unduly restrict the dynamics of the conditional variance process; and (iii) is difficult to interpret whether shocks to conditional variance persist or not in the GARCH. This is because the usual norms measuring persistence often do not agree (Issahaku et al., 2013).

The uniqueness of this study is that, I made use of multiple regression model interspersed with macroeconomic models and various test statistics to address the research objectives and questions. I applied those specific test statistics to determine whether the prior research findings were consistent with findings of this study using various statistical tests and models to uncover the nature of the relationship between dependent and independent variables. I sought to use the unit root test as a diagnostic tool to guide the recommendations I made in Chapter 5. Indeed early motivations for the unit root test were premised on the determination of forecasting models in differences or levels within the context of variables that demonstrates constant.

Threats to Validity

The extent to which the findings of a research can be generalized to a larger population is one of the concerns of external validity. This means non representative samples can be problematic to this dissertation. In this study, the population (all listed stocks on the GSE) was purposely predetermined to ensure that the dissertation outcome could be made generalizable to the population of interest. I also took into consideration all 36 listed stocks on the GSE, and therefore none of the stocks were sampled, but rather aggregated and included in the GSE All Share Index. To this effect, the generalization of findings to all elements or firms listed on the exchange will be valid on all listed stocks on the GSE.

In terms of internal validity, I selected macroeconomic variables that were widely used in previous studies as proxies for economic indicators and eliminated those macroeconomic variables that may have the tendency to affect generalizability. The choice of macroeconomic variables and models has also varied. For example, Chen (2010) explored a dynamic capital structure objective of how countercyclical fluctuations in risk prices, default probabilities, and default losses arise endogenously through firms' responses to macroeconomic conditions. The choice of monthly data instead of quarterly or annual data is to avoid spurious correlation problem that might be apparent when using annual or quarterly data, and without acceding to a compromise on the degrees of freedom that are required in the choice of the appropriate lag structures

Ethical Procedures

Before I commenced this study I obtained prior approval from the Institutional Review Board (IRB). I am therefore obliged to go by the terms and conditions of the IRB. Following the approval of the IRB I obtained data from secondary sources, and from the official websites of Ghanaian institutions mandated to publish those macroeconomics variables. As a result, I will ensure the protection of data as consistent with the requirements specified by the IRB.

I am also obligated to ensure that the rights and integrity of all institutions listed for data collection and analysis are kept confidential and used only for the purpose of this dissertation (American Psychological Association, 2002, p. 3). In Chapter 4 of this study, I laid bare an overview of the results of the study as consistent with the objectives and research questions set in the earlier chapters.

Chapter 4: Results

Introduction

In this quantitative study, I sought to investigate the relationship between macroeconomic variables, namely inflation rate, interest rate, exchange rate, and money supply changes, and stock market returns of listed companies on GSE during the period January 2000 to December 2013. I applied a multiple regression model from the works of Sangmi and Mubasher (2013). The research questions were whether changes in exchange rate, interest rate, inflation rate, and money supply would have significant effect on stock market returns in Ghana using the GSE All Share Index as a proxy for stock market returns. The null hypothesis (H_0) was that macroeconomic variables would have no significant effect on stock market returns in Ghana, and the alternative hypothesis was that macroeconomic variables would have significant effect on stock market returns in Ghana.

On the basis of the literature reviewed, I sought to answer the research questions whether monthly changes in selected macroeconomic variables would have significant effect on stock market returns in Ghana during the period January 2000 to December 2013. Because the hypothesis had multiple parameters, I utilized the F-test and other statistical tests to investigate whether there was significant evidence that all the specified independent variables had zero coefficients at a level of significance of 5% ($a = 0.05$).

In testing the hypothesis, the null (H_0) and the alternate (H_1) identifies the claim that $\mathrm{H}_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$.

H_1 : At least one of the partial slope coefficients is not equal to zero.

In this study, I formulated the research hypothesis as expressed mathematically based on the research questions where β_1, β_2, β_3, and β_4 represented the coefficients of the regressors: exchange rate, inflation rate, interest rates, and money supply respectively.

In Chapter 4, I provided transitional materials from the study findings for further advancement to both academic inquiry and contributions to Chapter 5. The chapter focused on the analyses, interpretations, and discussions of the empirical tests. Chapter 4 was divided into four sections: the first section dealt with data collection and described the time frame of the study and the extent of representation of the sampled data relative to the populations of interest; the second section presented the statistical output for the time series, spanning the period January 2000 to December 2013. The third section focused on all statistical inferences from SPSS, Eviews, and Excel output necessary for further comprehension and appreciation of chosen variables and study outcomes. In the fourth and final section, I showed the summary of the result and reported on descriptive statistics in response to the formulated research questions.

Data Collection

In Chapter 1, I presented the fundamentals of the Ghanaian economy and implications of the selected macroeconomic indicators on stock market returns using the GSE All Share Index as proxy to stock market returns. The sampled period for this study spanned the historic GSE All Share Index returns during the period from January 2000 and December 2013. To ensure reliability of the large monthly data sets of all macroeconomic indicators and stock market returns, I used time series data that spanned

the period January 2000 to December 2013. I thereafter calculated the monthly changes and data sets of selected macroeconomic variables with the expectation that the larger time period would provide a more robust analysis of the performance of the stock market returns using the GSE All Share Index.

Sample Size

The determination of the optimal sample size aims at assuring an adequate power to establish statistical significance of findings in connection with the nexus between the selected macroeconomic variables and stock market returns (Nucu, 2011). For significant statistical effect, a minimum of 80% is usually set as the rule of thumb because a smaller sample size may reduce the power of the statistical results (Agalega & Antwi, 2013).

In this study, I applied a population size without sampling that consisted of time series data during the period January 2000 and December 2013. Therefore the data sets for the GSE All Share Index covered 168 monthly observations, which yielded 5,040 trading days. This size far exceeded the threshold of 80% and represented almost 99% of trading days within the period of my study. Thus the sample size is sufficient and large to achieve the intended study outcomes.

I considered the sample period ranging from January 2000 to December 2013 for selected macroeconomic variables and stock market returns or estimated 168 monthly observations or 5,040 daily observations. The large sample size I used had the tendency to increase the power of the test and decrease the possibility of a Type II error, thus eliminating the possibility of accepting a wrong null hypothesis.

Report on the Evaluation on Statistical Assumptions of Study

In seeking to analyze the effects of macroeconomic variables on stock market returns, I used several econometric models with a multiple regression model, which was given as follows:

$$SMR = \beta_0 + \beta_1 EXR_t + \beta_2 IntR_t + \beta_3 InfR_t + \beta_4 MS_t + e_t \ldots\ldots\ldots\ldots\ldots\ldots (4.1)$$

Where,

SMR is the monthly percentage change in stock market returns.

ExR is the monthly changes in the Exchange rate

IntR is the monthly change in the rate of interest

InfR is the monthly change in the rate of inflation measured by monthly changes in the CPI.

MS is the monthly change in the money supply

ε_t is defined as the error term

In the above equation, β_0 is constant and β_1, β_2, β_3, β_4 are the coefficients of specified macroeconomic variables, while the error term denoted by ε_t is the residual error of the regression. To estimate the coefficients of the macroeconomic variables in the above model, I applied a multiple regression analysis based on OLS estimation and assumed that small sample properties of the OLS estimator, that is, the Gauss–Markov assumptions for time series data, stated below were all consistent:

The standard set of Gauss–Markov standard assumptions (Gujarati, 1995) or classical linear regression model is given by:

Assumption 1: Linear regression model. The regression model is linear in the parameters, as shown in Equation 4.2 (Sangmi Mohi-u-Din and Hassan Mohd. Mubasher (2013):

$$Y_t = \beta_1 + \beta_2 X_t + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4.2)$$

In Equation 4.2 I assumed that the relationship between the predictors variables designated as X_t and the dependent variable Y_t is linear.

Assumption 2: *X* values are fixed in repeated sampling. I considered values taken by the regressors *X* as fixed in repeated samples and I assumed *X* to be nonstochastic.

Assumption 3: Zero mean value of disturbance u_i. Given the value of *X*, the mean, or expected, value of the random disturbance term u_t is zero. Technically, the conditional mean value of u_t is zero. Symbolically the equation is deduced as follows:

$$E(u_t|X_t) = 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4.3)$$

Assumption 4: Homoscedasticity or equal variance of u_i. Given the value of X, the variance of u_t is homoscedastic. That is, the conditional variances of u_i are identical. Symbolically, I had: var to be $(U_t|X_t) = E[U_i - E(U_i|E(X_i)]2 = E(U_i 2|X_i)$ because of Assumption 3 = σ_2 where var stands for variance.

Assumption 5: No autocorrelation between the disturbances. Given any two *X* values, X_i and X_j ($i \neq j$), the correlation between any two u_i and u_j ($i \neq j$), is zero. Symbolically$cov(U_i U_j | X_i X_j) = E\{[U_i - E(U_i)]|X_i\}\{[U_j - E(U_j)]|X_j\} =$ $E(U_i|X_i)(U_j|X_j) = 0$, where i and j are two different observations and where cov means covariance.

Assumption 6: Zero covariance between u_i and X_i, or $E(U_i X_i) = 0$

Formally, $Cov(U_i, X_i) = E[U_i - EU_i][X_i - E(X_i)]$

= E$[U_i(X_i - E(X_i)]$ since E$(U_i) = 0$

= E$[(U_iX_i) - E(X_i)E(U_i)$ since E(X_i) is nonstochastic

= E$[(U_iX_i)$ since E(U_i) = 0

= 0 by assumption.

Assumption 7: The number of observations *n* must be greater than the number of parameters to be estimated. Alternatively, the number of observations n must be greater than the number of explanatory variables.

Assumption 8: Variability in X values. The X values in a given sample must not all be the same. Technically, var (X) must be a finite positive number.

Assumption 9: The regression model is correctly specified. Alternatively, there is no specification bias or error in the model used in empirical analysis.

Assumption 10: There is no perfect multicollinearity. That is, there are no perfect linear relationships among the explanatory variables.

Assumption 11: The Gauss–Markov theorem holds, which is stated thus. Given the assumptions of the classical linear regression model, the least-squares estimators, in the class of unbiased linear estimators have minimum variance are BLUE.

If all the eleven assumptions based on the Gauss–Markov Theorem hold then the multiple parameter estimates of the independent macroeconomic variables I obtained from the multiple regression results would be the best predictors of the criterion variable, which is the GSE All Share Index. I used four predictors (exchange rate, interest rate, inflation rate and money supply), while the criterion variable was stock market returns,

measured as the GSE All Share Index and I assumed that the selected macroeconomic variables were the best predictors for the GSE All Share Index, if not, then I needed to conduct a further tests in order to eliminate any potential biases to make the OLS regression estimated BLUE.

Time Series Results and Measurements of Macroeconomic Variables

In this study, I selected four macroeconomic predictors namely: exchange rate, interest rate, inflation rate, money supply and the criterion variable was stock market returns, as measured by the GSE All Share Index. I made use of 168 monthly time series observations for all variables from January 2000 to December 2013, that is, N=168 (See Table 1 below) and performed the calculations for the various descriptive statistics for the selected variables under study. This approach was to aid in the description of the basic characteristics of selected variables. Descriptive statistics of my study variables were presented in Table 1. The table displayed data for sample means, medians, maximums, minimums, standard deviations, skewness, kurtosis as well as the Jarque-Bera statistics and probabilities (p-values).

Table 1

Results of Descriptive Statics of Study Variables

	ASI	EX	INT	INF	MS
Mean	3901.654	1.129417	21.1194	224.5368	5624.751
Median	3675.75	0.9235	19.23	200.25	3338.25
Maximum	10890.8	2.0882	47	1401.1	20190.4
Minimum	739.7	0.3626	9.13	53.98	392.9
Std. Dev.	2938.126	0.412844	10.18022	144.3246	5554.998
Skewness	0.577904	0.669578	0.838699	3.341081	1.079256
Kurtosis	2.28347	2.394636	2.915	27.26664	2.937497
Jarque-Bera	12.94515	15.11864	19.74622	4434.646	32.64157
Probability	0.001545	0.000521	0.000052	0	0
Sum	655477.9	189.742	3548.06	37722.19	944958.2

Sum Sq. Dev.	1.44E+09	28.4635	17307.35	3478543	5.15E+09
Observations	168	168	168	168	168

Note: Variables were all asymmetrical and positively skewed with right tails longer that left tails. There is no randomness and exchange rate, interest rate, inflation rate, interest rate and money supply are all very sensitive to periodic changes and speculation.

The descriptive statistics indicated that the mean values of variables (*ASI, EX, INT, INF,* and *MS*) were 3901.654, 1.129417, 21.11940, 224.5368, 5624.751 , respectively, for aggregate share price index, exchange rate, interest rate, inflation rate and money supply. The maximum values of the variables between the study periods were 10890, 2.088200, 47.000, 1401.100 and 20190.40, for the GSE All Share Index, exchange rate, interest rate, inflation rate and money supply, respectively. The standard deviations for each variable indicated that data were widely spread around their respective means.

Generally skewness measures the symmetry of the distribution and explains whether the mean is at the center of the distribution with a skewness value 0 if considered normal. Therefore negative value indicates a skew to the left (left tail is longer that the right tail) and a positive values indicates a skew to the right (right tail is longer than the left one. The descriptive statistics from Table 1 revealed that the variables were all asymmetrical. In this study, I found all variables to be positively skewed, meaning that their right tails are longer than their left ones.

In this study, I conducted statistical analysis to ascertain the characteristics of the location and variability of the various sources of the secondary data and to determine the extent to which the data was peaked. I used the Kurtosis as a statistical measure to ascertain the extent to which the data was peaked or flat in relation to the normality of the

distribution. A normal distribution has a value of 3. A kurtosis >3 indicates a sharp peak with heavy tails closer to the mean (leptokurtic). A kurtosis < 3 indicates the opposite a flat top (platykurtic). Looking at the results shown in Table 1, the distributions of variables were platykurtic and the p-value of the Jarque-Bera test statistic for all variables were lesser that the 0.05 critical values. The statistical implication of the Jarque Bera test statistic is that the null hypothesis was rejected and the alternative hypothesis was accepted since the residuals were normally distributed.

The descriptive statistics from Table 1 showed that the values were not normally distributed about their mean and variance. I found no randomness in data. This indicated that aggregate stock prices on the GSE and the macroeconomic variables of exchange rate, interest rate, inflation rate, interest rate and money supply were all very sensitive to periodic changes and speculation. To interpret, I found that an individual investor could earn considerably higher normal rate of profit from the GSE and this revelation demonstrated the degree of efficiency of the GSE. Additionally, individual investors and corporations could earn higher profits and interest rates from the economy and foreign companies could earn considerably higher returns in terms of exchange rate pointing to the generally highly volatile nature of Ghana's economy.

Statistical Tests

Tests on Time Series Data: Unit Root, Stationarity and ADF Test

To perform a pretest to ensure there is a stationary cointegration relationship among variables, I assumed macroeconomic data to be nonstationary. Therefore to proceed with the OLS estimations, I investigated the time series properties of the

variables by utilizing unit root test and to test for the existence of a stochastic trend in the adapted regression model. This is equivalent to the testing of the null hypothesis and this can be established by testing for the unit root test. The motivation for this approach is the research expositions such as Fosu, Bondzie and Okyere (2014), when they applied the ADF test and the unit-root testing on the ADF test. In consistent with these expositions, I performed the ADF test as presented in Table 3.

Statistically it has been established that many economic time series data such as inflation rate, interest rates and stock indices just to mention a few exhibit trending behavior of nonstationary in the mean, standard deviation and other statistical inferences. Though the unit root testing has been criticized as unnecessary and complicated because the test does not exploit prior knowledge of the growth status of the time series (Nymong and Misati, 2010), yet the unit root tests will help to determine the difference time series data and ensure stationarity.

In this study, I used statistical tests together with economic theory to answer the research questions whether macroeconomic variables has significant effect on stock market returns in Ghana. The time series data is defined to be strongly stationary on condition that the joint distribution is not time relevant. In this case the statistical inferences from the data I obtained did not depend on time and the correlations across time were expected not to change.

As a result of the persistent change that could occur in the specified macroeconomic variables, it is important to make the possible effect of the relationship between the selected macroeconomic variables and the GSE All Share Index clear with

respect to the research time dimensions. To get around this problem, I performed the unit root test to ensure stationarity. The stationarity test ensured that the statistical properties of the selected variables, namely; inflation rate, exchange rate, interest rate, and money supply did not change overtime. Additionally, the stationarity estimation on nonstationary variables had the tendency to give a misleading parameter estimate of the relationship between macroeconomic variables and stock market returns, and therefore the test was necessitated by this condition.

Stationarity is important for estimation: applying least squares regressions on nonstationary variables can give misleading parameter estimates of the relationships between variables. Finally, I checked for stationarity to enable me make an accurate prediction in forecasting the effect of the macroeconomic variables on the GSE All Share Index.

The ADF unit root tests will therefore help in determining the difference time series data and ensure stationarity (Nyamongo & Misati, 2010). Hence I conducted the ADF test with constant intercept only scenario and assumed the same null hypothesis of no unit root in the data series. However, because the ADF test is sensitive to the lag length of the series, first the optimal lag length was determined by performing a test. A maximum lag order of 2 was selected based on the Schwarz information criterion (See Table 2).

Table 2

Lag Selection Test Endogenousvariables: ASI INF INT EX MS Exogenous Variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4461.717	NA	1.22e+18	55.83396	55.93006	55.87298

1	-3262.678	2308.150	5.16e+11	41.15847	41.73507	41.39261
2	-3138.535	231.2157	1.50e+11	39.91919	40.97628*	40.34843
3	-3086.301	94.02077	1.07e+11	39.57876	41.11635	40.20313*
4	-3069.005	30.05153	1.18e+11	39.67507	41.69315	40.49454
5	-3042.853	43.80597	1.17e+11	39.66066	42.15924	40.67524
6	-3008.566	55.28743	1.05e+11	39.54457	42.52365	40.75427
7	-2982.156	40.93435	1.05e+11	39.52696	42.98653	40.93177
8	-2941.483	60.50169*	8.80e+10*	39.33104*	43.27111	40.93096
0	-4461.717	NA	1.22e+18	55.83396	55.93006	55.87298

Note: * indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC:Akaike information criterion
SC: Schwarz information criterion
HQ:Hannan-Quinn information criterion

After determining the optimal lag length, the ADF test I proceeded to test for the stationarity or otherwise of all the variables in the series at level. The results are indicated in Table 3.

Table 3

Results of Augmented Dickey- Fuller (ADF) Stationarity Tests at Level

Variables	ADF test statistic	Test Critical Values at 5%	*P-value
ASI	-1.460804	-2.878723	0.5511
INF	-2.600786	-2.878937	0.0948
INT	-2.267946	-2.879045	0.1837
EX	0.501059	-2.878829	0.9863
MS	2.833022	-2.880088	1

**MacKinnon (1996) one-sided p-values.*

In this study, I compared test statistic value with that of test critical value at 5% significance and considering p-value I found that all five variables (*ASI, INF, INT, EX* and *MS*) had unit roots. This is because the absolute values of the ADF test statistic for each of these variables were lesser than the absolute variables of the test critical values at 5%. In addition, the p-values corresponding to each of the ADF test statistics for all variables *ASI, INF, INT, EX* and *MS* were greater than 5% (55.11%, 9.48%, 18.37%,

98.63% and 100%), respectively. Resulting from this result, the null hypothesis of no unit roots in the data series could not be rejected and therefore accepted. All the variables having unit roots have been transformed into first difference to bring stationarity in these data, thereafter, the modified data was used in the multivariate regression model in this study.

In order to ascertain whether or not the variables were integrated or not, I carried out the ADF test at first difference. The results shown in Table 4 indicated that all the variables; *ASI, INF, INT, EX* and *MS* were stationary at first difference, meaning that they all had one unit root and represented a stable (1) series. I found that the p-values of all variables were are less than 5%, the absolute values of the ADF test statistics for all of *ASI, INF, INT, EX,* and *MS,* were also found to be greater than their corresponding test critical values at 5%. This implied that the null hypothesis of *ASI, INF, INT, EX* and *MS,* each having unit roots at first difference could not be accepted at 5% significance level. Hence, I concluded that at first difference all variables, that is., *ASI, INF, INT, EX* and *MS* represented a stationary series integrated of first order, I (1).

Table 4

Results of Augmented Dickey- Fuller (ADF) Stationarity Tests at 1st Difference

Variables	ADF test statistic	Test Critical Values at 5%	*P-value
ASI	-10.97896	-2.878829	0
INF	-11.82857	-2.878905	0
INT	-8.767147	-2.878829	0
EX	-6.843981	-2.878829	0
MS	-17.0577	-2.878829	0

**MacKinnon (1996) one-sided p-values.*

Report on the Variance Inflation Factor (VIF): A Test for Multicollinearity (MC)

In this study, I examined macroeconomic variables effect on the GSE All Share Index. Since economic variables are not static, the tendency for multicollinearity to pose some problems with respect to the independent variables (inflation rate, interest rate, exchange rate, and money supply) strengths to explain the behavior of the GSE All Share index may arise.

Multicollinearity exists when the predictive variables, in this case the chosen macroeconomic variables are correlated. Generally, the rule is that in a correlation matrix, a range of -0.70a and +0.70 is acceptable (Kuwornu, 2012). In order to check multicollinearity among independent variables, a suggested rule of thumb is that if the pairwise correlation between two regressors is very high in excess of 0.7, multicollinearity may pose serious problem. I conducted a test for multicollinearity based on Pearson's correlation analysis. The test was conducted on the sample data based on one of the basic assumptions underlying OLS estimation that regressors should not be mutually correlated. If more than one of them is correlated with others, multicollinearity is said to exist. The logic behind this assumption of no multicollinearity and the need to carry out the test is that, if two or more independent variables are linearly dependent on each other, one of them should be included instead of both, otherwise, it will increase standard error thereby making my results biased.

Since the highest correlation numbers are lower than 0.7, for interest rates and exchange rates ($r = -0.335$), inflation rate and exchange rate ($r = 0.694$), inflation rate and interest rate ($r = -0.395$), money supply and interest rate ($r = -0.320$), money

supply and interest rate ($r = 0.664$) (Issahaku et al., 2013). The results clearly showed that none of the independent variables were highly correlated, except money supply and exchange rate ($r = 0.966$). However, given that money supply has a weak association with interest rates and inflation rate, it could be assumed that there was no existence of serious multicollinearity amongst independent variables. In Ghana it has been established that exchange rates movement has significant effect on GDP and the government of Ghana had used monetary policies as a stabilization tool for growth. Therefore eliminating exchange rate and money supply from the model will be at variance with economic reality (Agalega and Antwi, 2013).

Analysis of the Variance Inflation Factor (VIF)

In this study, I performed further test to measure the impact of collonearity among the selected macrocosmic variables through the application of the Variance Inflation Factor (*VIF*). The set a rule for this study is that, the (*VIF*) =1/Tolerance and the *VIF* >=1. The VIF test was performed in order to measure the extent to which the repressors were related to other repressors and to find out how the relationship affected the stability and variance of the regression estimates. The variance of the OLS estimator for typical regression coefficient (say β_i) can be shown as follows:

$$Var\ (\hat{\beta}_i) = \frac{\sigma^2}{s_{ii}(1 - R_i^2)}$$

Where,

$S_{ii} = \sum_{j=1}^{n}(X_{ij} - \bar{X}_i)^2$ and R^2 is the unadjusted R^2 is regressed X_i against all the other explanatory variables in the model, that is, against a constant,X_1, X_2 , X_3

$\ldots, X_{i-1}, X_{i+1}, X_k$. Assuming the absence of a linear relationship between $X_i$and the selected macroeconomic indicators in the regression model, then R_i^2 was expected to have a zero value with a $\hat{\beta}_i$ to be $\sigma^2/_{S_{ii}}$.

Mathematically the expression for Var ($\hat{\beta}_i$), will yield a *VIF* as $VIF(\hat{\beta}_i) = \frac{1}{1-R_i^2}$, Tolerance ($\hat{\beta}_i$), $=1/VIF$, $= 1 - R_i^2$

From Table 5 the results clearly showed that none of the independent variables are highly correlated, except money supply and exchange rate(r=0.966). Hence the relationship between exchange rate and money supply are the most important when it comes to the issue of multicollinearity; the relationships between the other independent variables are not very important when it comes to multicollinearity.

In order to invalidate some of the basic assumptions underlying the estimation in quantitative terms and to determine the extent of collinearity relationship, I performed collinearity diagnostics test and the purpose was to identify the presence of multicollinearity and to further establish the presence of highly intercorrelated predictor variables in the regression models.

The relationship between the VIF and the tolerance index was readily established; a higher VIF or on the flipside a tolerance index which is lower yields a variance which is higher in terms of $\hat{\beta}_i$ Thus a higher possibility of reporting $\hat{\beta}_i$ insignificant. This relationship as established demonstrated the presence and effects of MC. The VIF therefore is an important statistical tool or procedures for the identification of MC. Procedurally, I used the explanatory variables, that is, the selected macroeconomic

variables to establish the existence of MC in the regression model. From these procedures I expected $k - 1$ values for VIF. Additionally if I found any of the explanatory variables to be high then I will indicate the presence of MC.

To assess the MC between the independent variables, I found the tolerance and the VIF as two collinearity diagnostic factors which could help in identifying multicollinearity. The rule of thumb is, a small tolerance value indicates that the variable under consideration is almost a perfect linear combination of the independent variables already in the equation and that it should not be added to the regression equation. All variables involved in the linear relationship will have a small tolerance. Some suggested that a tolerance value less than 0.1 should be investigated further. If a low tolerance value is accompanied by large standard errors and no significance, multicollinearity may be an issue.

Table 5

: Analysis of Variance Inflation Factors(VIFs) of Macroeconomic Variables

	Standardized Coefficients				95% Confidence Interval for B		Collinearity Statistics	
Model	Std. Error	Beta	T	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1 (Constant)	1393.72		0.052	0.959	-2679.747	2824.414		
ExR	1.79	0.058	0.658	0.511	-2.357	4.713	0.489	2.047
IntR	19.393	-0.447	-6.651	.000*	-167.281	-90.692	0.837	1.195
InfR	1769.57	1.407	5.658	.000*	6517.436	13505.893	0.061	16.365*
MS	0.127	-1.687	-7.05	.000*	-1.142	-0.642	0.066	15.154*

Note: The tolerance value and *VIF* significant at 0.05 level and this is computed to measure the impact of collinearity among the variables in a regression model and is computed as (*VIF*) =1/Tolerance.

From Table 5 , it could be observed that tolerance factors for the two independent variables exchange rate(*ExR*) and Money supply(*MS*) are very small (0.061 and 0.066,

respectively). Although their standard errors appear to be low (Std. Error = 1.407 and -1.687, respectively), the values are significant at 0.05 levels respectively ($p=0.000< 0.05$) in both cases. To be able to finally conclude on the presence of multicollinearity between the two variables, the value of the variance inflation factors needed to be further examined; as I have already indicated if the *VIF* is found to be high then multicollinearity and instability of the beta coefficients of the regression model will be concluded to exist.

Looking at Table 5, the VIFs for *ExR* and *MS* are 16.365 and 15.154, respectively, which are very high compared to the "rule of thumb" *VIF* value of 10. This indicates the presence of high multicollinearity between the two variables. However, I also found from Table 6 the adjusted R square shows that the relationship is an actual one and therefore the predictors cannot be declared as redundant.

Table 6

Correlation Matrix Macroeconomic Variables and GSE All Share Index (SMR)

		SMR	ExR	IntR	InfR	MS
SMR	Pearson Correlation	1b				
	Sig. (2-tailed)					
ExR	Pearson Correlation	-0.033	1			
	Sig. (2-tailed)	0.668				
IntR	Pearson Correlation	-.402**	-.335**	1		
	Sig. (2-tailed)	0	0			
InfR	Pearson Correlation	0.09	.694**	-.395**	1	
	Sig. (2-tailed)	0.243	0	0		
MS	Pearson Correlation	-0.146	.966**	-.320**	.664**	1
	Sig. (2-tailed)	0.059	0	0	0	
	N	168	168	168	168	168

**. Correlation is significant at the 0.01 level (2-tailed).

Note: The adjusted R square shows that the relationship is an actual one and not merely due to spurious regression problem.

From Table 7 the R value of 0.384 indicated a moderate correlation between aggregate share price index of the GSE and the four macroeconomic variables. The R square indicated that about 38.4% of fluctuations in aggregate share index on the GSE. This result is attributed and explained by the macroeconomics variables while the 61.6% could be explained by other factors not related to the chosen macroeconomic variables. The adjusted R square showed that the relationship is an actual one and not merely due to spurious regression problem.

Table 7

Regression Statistic Showing the R, R Square and Adjusted R Square

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.620[a]	0.384	0.369	2333.71

Note: a. Predictors: (Constant), *MS, IntR, InfR, ExR*

Analysis of F test and the Durbin Watson Statistic

The ANOVA or F test, shown in Table 8 indicated an F value of 25.426 with significance of 0.00($p < 0.05$) and provided statistical evidence that the macroeconomic variables of exchange rate, interest rate, inflation rate and money supply are simultaneously and jointly affected the GSE All Share Index. But I cannot draw a firm conclusion based on these results because the regression results displayed in Tables 6, 7 and 8 were based on level, nonstationary data series and could represent a spurious problem.

Table 8

ANOVA[b] of Effect: Macroeconomic Predictors on Stock Market Returns

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	5.54E+08	4	1.39E+08	25.426	.000[a]
Residual	8.88E+08	163	5446200		
Total	1.44E+09	167			

a. Predictors: (Constant), MS, IntR, InfR, ExR
b. Dependent Variable: SMR

In this study, I considered the significance of the individual coefficients of the multiple regression results as shown in Table 9 . It could be seen that exchange rate, interest rate and money supply was statistically significant, and beta coefficients($p < 0.05$); only inflation rate had a statistically insignificant coefficient ($p > 0.05$). The findings of this statistical outcome revealed the existence of spurious regression.

Table 9

The Predictive Results of Coefficients of Regression on Stock Market Return

	Unstandardized Coefficients		Standardized Coefficients			Correlations		
Model	B	Std. Error	Beta	T	Sig.	Zero-order	Partial	Part
1 (Constant)	72.334	1393.72		0.052	0.959			
ExR	10011.67	1769.57	1.407	5.658	.000*	-0.033	.405*	0.348
IntR	-128.987	19.393	-0.447	-6.651	.000*	-0.402	-.462*	-0.409
InfR	1.178	1.79	0.058	0.658	0.511	0.09	0.051	0.04
MS	-0.892	0.127	-1.687	-7.05	.000*	-0.146	-.483*	-0.433

a. Dependent Variable: SMR *Significant at 0.05 level

Table 10

Regression Results and Durbin-Watson Statistic

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	72.33359	1393.723	0.0519	0.9587
EX	10011.66	1769.566	5.657694	0
INT	-128.9865	19.39341	-6.651048	0
INF	1.178113	1.790235	0.658077	0.5114
MS	-0.892205	0.126552	-7.050099	0

R-squared	0.384222	Mean dependent var	3901.654
Adjusted R-squared	0.369111	S.D. dependent var	2938.126
S.E. of regression	2333.71	Akaike info criterion	18.37762
Sumsquaredresid	8.88E+08	Schwarz criterion	18.47059
Log likelihood	-1538.72	Hannan-Quinn criter.	18.41535
F-statistic	25.4265		

Note: The Durbin –Watson statistic obtained by running the analysis using the data series at level has a value of ($d = 0.119394 < 1$), providing evidence of high presence of positive serial correlation among residuals, again indicating that successive error terms are, on average, close in value to one another

The Durbin-Watson statistic lies between 0 and 4. If the Durbin–Watson statistic is substantially less than 2, it showed the existence of positive serial correlation. If the Durbin–Watson is less than 1.0, it indicates the case of serious positive serial correlation among regression residuals (Syed and Anwar, (2012). The Durbin –Watson statistic obtained by running the analysis using the data series at level has a value of ($d = 0.119394 < 1$), providing evidence of high presence of positive serial correlation among residuals, again indicating that successive error terms are, on average, close in value to one another (See Table 10). Additionally, the p-value of the observed R-squared value of the Breusch-Godfrey Serial Correlation LM Test is 0.1908, which is greater than 0.05, which leads to my conclusion that the null hypothesis of no serial correlation among the regression variables cannot be rejected (See Table 11). In effect, both the Durbin-Watson test and the Breusch-Godfrey Serial Correlation LM Test indicated presence of high serial correlations in the regression residuals at level, providing further evidence on the non-stationarity of the data series and affirming the need to make them stationary.

Table 11

Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.619531	Prob. F(2,161)	0.2012
Obs*R-squared	3.313234	Prob. Chi-Square(2)	0.1908

Table 12

First Differenced (D1) Regression Results and Durbin-Watson Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.829988	54.41274	0.088766	0.9294
INF_D1_	0.003155	0.406952	0.007753	0.9938
INT_D1_	-1.615853	27.69365	-0.058347	0.9535
EX_D1_	-420.9398	2622.644	-0.160502	0.8727
MS_D1_	-0.00511	0.100535	-0.050831	0.9595

R-squared	0.019722	Mean dependent var	1.29E-14
Adjusted R-squared	-0.01681	S.D. dependent var	584.4505
S.E. of regression	589.3424	Akaike info criterion	15.63667
Sumsquaredresid	55919246	Schwarz criterion	15.76683
Log likelihood	-1306.48	Hannan-Quinn criter.	15.68949
F-statistic	0.539844		

I converted the data series to first differenced and found that the Durbin Watson statistics was 2.008421, which was approximates to 2 (See Table 12). I found that at first differences there was no serial correlation among regression residuals (Table 12). This provided a strong support and justification as to why the regression parameter estimates using the first differenced data series was more reliable than those obtained using the data at level. Hence the parameter estimates of the multiple regression models using first differenced data shown in Table 12 are BLUE estimates of the relationship between stock market returns and the four macroeconomic variables than those obtained in Table 9.

The hypothetical estimations based on empirical evidence is supportive of a positive effect of inflation rate on stock market ($\beta = 0.003155$), a negative effect of exchange rate on stock market return ($\beta = -420.9398$), a negative effect of the interest rate on stock market ($\beta = -1.615853$). Only money supply had a negative effect as opposed to the expected positive effect on stock market return ($\beta = -0.005110$)

From inferential statistics the R-square value indicates that only about 1.972% of total variations in stock market returns on the GSE could be accounted for by changes in exchange rate, interest rate, inflation rate, and money supply. This indicates the probable exclusion of some other macroeconomic variables, which could have better predicted stock price movements on the GSE than the four chosen in this study, for example the GDP though an important variable was not included in the model. The p-value of the F-statistic indicates that the four macroeconomic variables do not significantly affect stock market returns in Ghana (Table 13) and this may also be due to the rapidity to which information on the selected variables impounds into the GSE All Share Index..

Table 13

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.548686	Prob. F(4,163)	0.7002
Obs*R-squared	2.232014	Prob. Chi-Square(4)	0.6932
Scaled explained SS	80.58720	Prob. Chi-Square(4)	0.0000

The chi-squared probability value of the Breusch-Pagan-Godfrey Heteroskedasticity test is 0.6932, which is greater than 0.05, means the null hypothesis that residuals are not heteroskedastic (i.e. they are homoscedastic) cannot be rejected

(i.e., it is accepted). Therefore, the alternative hypothesis, that the residuals are heteroskedastic is rejected.

The Whites' Heteroskedasticity test further indicated that the residuals were not heteroskedastic ($p < 0.05$). This implies that the null hypothesis that residuals are not heteroskedastic (i.e. they are homoscedastic) can be accepted, meaning that the alternative hypothesis that residuals are heteroskedastic (i.e. they are not homoscedastic) is rejected. Hence, it is concluded based on Breusch-Pagan-Godfrey Heteroskedasticity and Whites' General Heteroskedasticity tests that there is no heteroskedasticity in the above model, meaning that the error terms of all variables have equal variances after first differencing of data series.

Table 14

Whites General Heteroskedasticity Test: White

F-statistic	25.75638	Prob. F(14,153)	0.0000
Obs*R-squared	117.9522	Prob. Chi-Square(14)	0.0000
Scaled explained SS	181.5984	Prob. Chi-Square(14)	0.0000

Table 15

Associated Analysis On Whites Heteroskedasticity Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.27E+08	25524251	-4.992480	0.0000
EX	2.91E+08	61099011	4.759671	0.0000
EX^2	-1.90E+08	75168077	-2.524694	0.0126
EX*INT	-2991785.	1215658.	-2.461041	0.0150
EX*INF	-352672.7	334081.5	-1.055649	0.2928
EX*MS	33322.68	6072.016	5.487912	0.0000
INT	2807304.	951432.0	2.950610	0.0037
INT^2	-33199.10	9850.843	-3.370179	0.0010
INT*INF	17969.00	3641.621	4.934341	0.0000
INT*MS	-104.2915	77.82514	-1.340075	0.1822
INF	24149.90	284431.7	0.084906	0.9324

INF^2	3.011883	11.27339	0.267167	0.7897
INF*MS	13.49709	21.79986	0.619136	0.5367
MS	-11576.09	3517.755	-3.290762	0.0012

R-squared	0.702097	Mean dependent var	5284111.
Adjusted R-squared	0.674837	S.D. dependent var	9585348.
S.E. of regression	5465856.	Akaike info criterion	33.95098
Sumsquaredresid	4.57E+15	Schwarz criterion	34.22991
Log likelihood	-2836.883	Hannan-Quinn criter.	34.06419
F-statistic	25.75638	Durbin-Watson stat	0.341979
Prob(F-statistic)	0.000000		

The p-values of the 1-tailed bivariate correlations shown in Table 16 indicate, that, whereas the relationship of stock market returns with interest rate and money supply are significant ($p < 0.05$), exchange rate and inflation rate are not significantly related to stock market returns ($p > 0.05$).

Table 16

Correlation Matrix

		SMR	ExR	IntR	InfR	MS
Pearson Correlation	SMR		-0.033	-0.402	0.09	-0.146
	ExR	-0.033		-0.335	0.694	0.966
	IntR	-0.402	-0.335		-0.395	-0.32
	InfR	0.09	0.694	-0.395		0.664
	MS	-0.146	0.966	-0.32	0.664	
Sig. (1-tailed)	SMR	.	0.334	.000*	0.122	.029*
	ExR	0.334	.	0	0	0
	IntR	0	0	.	0	0
	InfR	0.122	0	0	.	0
	MS	0.029	0	0	0	.

**Correlation significant at 0.05 significance*

Table 17

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.620[a]	0.384	0.369	2333.71

a. Predictors: (Constant), MS, IntR, InfR, ExR

The R-square and Adjusted R-square values shown in Table 17 indicate that the linear combination of macroeconomic indicators accounted for 38.4% or 36.9%, respectively of variations in stock market returns. This relationship between the macroeconomic indicators and stock market returns are statistically significant, F (4,163) $= 25.426, p < 0.05$ (See Table 16 below). This finding was obtained using nonstationary data series at level. And given that the residuals diagnostic tests indicated the violation of some of the OLS assumptions required for parameter estimates to be BLUE, the parameter estimates obtained in the above finding cannot be trusted. Yet the analysis still points out the fact that macroeconomic variables are important predictors of stock market returns.

Table 18

ANOVA[b]

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	5.54E+08	4	1.39E+08	25.426	.000[a]
Residual	8.88E+08	163	5446200		
Total	1.44E+09	167			

a. Predictors: (Constant), MS, IntR, InfR, ExR
b. Dependent Variable: SMR

Substituted Equation and Inferential Interpretations of Joint Regressors

The unstand**a**rdized B coefficients shown in Table 17 below leads to the following regression equation:

$Predicted\ SMR$:

$$= 72.334 + 10011.665Exr - 128.987IntR + 1.178InfR - 0.892MS \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.4)$$

The model equation obtained above suggests that one unit increases in exchange rate and inflation rates could cause stock market returns to increase by 10011.665 and 1.178 units, respectively. On the contrary, one unit increases in interest rates and money supply could result in decreases in stock market returns by 128.987 and 0.892 units, respectively.

Table 19

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients			Correlations		
Model	B	Std. Error	Beta	T	Sig.	Zero-order	Partial	Part
1								
(Constant)	72.334	1393.723		0.052	0.959			
ExR	10011.665	1769.566	1.407	5.658	.000*	-0.033	.405*	0.348
IntR	-128.987	19.393	-0.447	-6.651	.000*	-0.402	-.462*	-0.409
InfR	1.178	1.79	0.058	0.658	0.511	0.09	0.051	0.04
MS	-0.892	0.127	-1.687	-7.05	.000*	-0.146	-.483*	-0.433

a. Dependent Variable: SMR **Significant at 0.05 level*

**Signifiant at 0.05 level*

Although equation 4.3 above yields predicted stock market return scores, the weights are not useful for understanding the relative importance of the macroeconomic indicators. Weights are interpretable if the independent and dependent variables are standardized to have a mean of 0 and a standard deviation of 1(z scores). The standardized weights indicated at the Beta coefficients in Table 5 lead to the following equation:

$$Z_{Predicted\ SMR} = 1.41Z_{ExR} - 0.45Z_{IntR} + 0.06Z_{InfR} - 1.69Z_{MS} \ldots\ldots\ldots\ldots\ldots\ (4.5)$$

The p-values of the t statistic indicate that with the exception of inflation rate, both the B and Beta weights of the remaining macroeconomic variables of exchange rate, interest rate, and money supply were all statistically significant ($p < 0.05$). However, the effects of interest rate and money supply are negative, whereas that of exchange rate is positive. The Partial column under Correlations shown in Table 19, lists the partial correlations for each predictor as it was evaluated for its weighting in the model (the correlation between the predictor and the dependent variable when the other predictors are treated as covariates).

The results shown in Table 18 indicated that whereas money supply and interest rates both exerted negative and statistically significant influences on stock market returns($p < 0.05$), the effect of exchange rate, though also statistically significant was positive. Inflation rate, however, did not have a statistically significant effect on stock market returns. Furthermore, the part column under Correlations also shown in Table 19, lists the semi partial correlations for each predictor once the model is finalized; squaring these values revealed a percentage of variance each predictor uniquely explained.

In this study, I found that exchange rate (*ExR*) alone accounted for about 12.1% (i.e.,$0.348 * 0.348 = 012.1\%$) of variations in stock market returns (*SMR*). Interest rate and inflation rates account for 16.7% (-0.409*-0.409= 16.7) and 0.16% ($0.04 * 0.04 = 0.16$), respectively of variations in stock market returns, whereas money supply (*MS*) accounts for 18.7% (-0.4333 $* -0.433 = 18.7\%$ of total variations in *SMR*. Money supply (18.7%), followed by interest rate (16.7%), followed by exchange rate (12.1%)

accounted for the greater variations in stock market returns whereas inflation rate (0.16%), contributed very little to total variations in *SMR*.

From the foregoing, I concluded that the macroeconomic indicators of money supply, interest rate, and exchange rate are the most significant predictors of changes in stock market returns in Ghana during the specified period, however; changes in inflation rate do not significantly predict variations in stock market returns.

Testing of Hypothesis

The above analysis provided evidence for the rejection of the null hypothesis, H_0 that Macroeconomic variables have no significant effect on stock market returns in Ghana during the period January 2000 to December 2013, in favor of the alternative, H_1 that Macroeconomic variables have significant effect on stock market returns in Ghana during the period January 2000 to December 2013.

Diagnostic Test Statistics and Interpretations

In this study, I performed various diagnostic tests to ensure that the data series was consistent with all the OLS assumptions, These includes the ADF stationarity tests; Heteroskedasticity Test; Breusch-Godfrey Serial Correlation LM Test; Johansen-Juselius Co-integration Test Results, VECM and Engle-Granger Causality Test Results. The rationale behind performing all the above tests is because time series data by nature are nonstationary and as a result there is the need to perform a number of diagnostic tests to eliminate stationarity, establish long-run and short-run cointegrating relationships, ensure the conditional variance of residuals for all independent variable are the same, and establish the direction of causality among variables.

To test for the stationarity of the series of this study, I carried out the Unit root tests. The Augmented Dickey Fuller Test was used. There are three models of the ADF test specified as follows:

$$\Delta Y_t = \beta_1 + \varphi Y_{t-1} + \alpha_i + \epsilon_t \quad \ldots \ldots (4.6)$$

$$\Delta Y_t = \beta_1 + \beta_2 t + \varphi Y_{t-1} + \alpha_i + \epsilon_t \quad \ldots \ldots (4.7)$$

$$\Delta Y_t = \varphi Y_{t-1} + \alpha_i + \epsilon_t \quad \ldots \ldots (4.8)$$

ADF test results from all three scenarios represented in equations 4.6, 4.7, and 4.8 above, given that there are sufficient number of observations should give the same results.

In this study, I carried out the ADF test based on the assumption of intercept only, implying that the differenced values of the dependent variables are related only to a constant(β_1) in one period lagged values(Y_{t-1}) and the constants, α_i and ϵ_t .

Table 20

Results of Augmented Dickey- Fuller (ADF) Stationarity Tests at Level

Variables	ADF test statistic	Test Critical Values at 5%	*P-value
ASI	-1.460804	-2.878723	0.5511
INF	-2.600786	-2.878937	0.0948
INT	-2.267946	-2.879045	0.1837
EX	0.501059	-2.878829	0.9863
MS	2.833022	-2.880088	1

**MacKinnon (1996) one-sided p-values.*

Table 20 presents the summary of unit root test for all the dependent and predictor variables using ADF test. The ADF test was conducted with constant intercept only scenario and assumed the same null hypothesis of no unit root in the data series.

Because the ADF test is sensitive to the lag length of the series, first the optimal VAR lag length was determined by performing a test. A maximum lag order of 2 was selected based on the Schwarz information criterion (See Table 21).

Table 21

VAR Lag Order Selection Criterial Endogenous Variables: ASI INF INT EX MS Exogenous Variables: C.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4461.717	NA	1.22e+18	55.83396	55.93006	55.87298
1	-3262.678	2308.150	5.16e+11	41.15847	41.73507	41.39261
2	-3138.535	231.2157	1.50e+11	39.91919	40.97628*	40.34843
3	-3086.301	94.02077	1.07e+11	39.57876	41.11635	40.20313*
4	-3069.005	30.05153	1.18e+11	39.67507	41.69315	40.49454
5	-3042.853	43.80597	1.17e+11	39.66066	42.15924	40.67524
6	-3008.566	55.28743	1.05e+11	39.54457	42.52365	40.75427
7	-2982.156	40.93435	1.05e+11	39.52696	42.98653	40.93177
8	-2941.483	60.50169*	8.80e+10*	39.33104*	43.27111	40.93096

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

After determining the optimal lag length, I performed the ADF test in order to test for the stationarity or otherwise of all the variables in the series at level. The results are indicated in Table 21. Comparing test statistic value with that of test critical value at 5 percent (0.05) significance and considering p-value, I found that all five variables (*ASI, INF, INT, EX* and MS) have unit roots. This is because the absolute values of the ADF test statistic for each of these variables were lesser than the absolute variables of the test critical values at 5%. Additionally, the p-values corresponding to each of the ADF test

statistics for all variables *ASI, INF, INT, EX* and *MS* were greater than 5% (55.11%, 9.48%, 18.37%, 98.63% and 100%), respectively, hence the null hypothesis of no unit roots in the data series could not be rejected. All the variables having unit roots were then transformed into first difference to bring stationarity in these data. After then the modified data was used in the multivariate regression model.

Cointegration Test

A preliminary or casual assessment of cointegrating relationship among variables was performed using the trend diagram shown in the Figure 2.

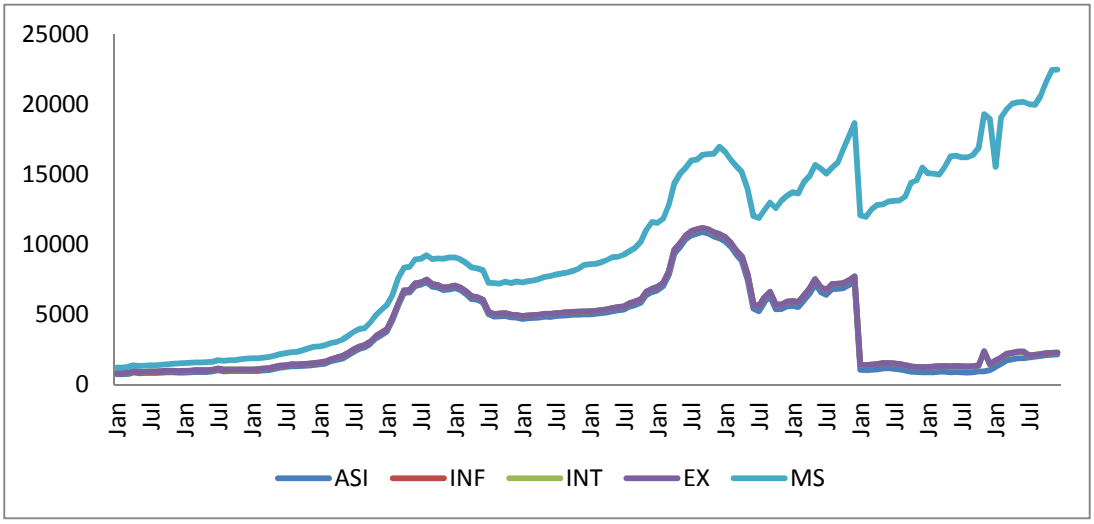

Figure 2. Cointegration relationship between variables. Long run association between predictive variables with money supply. Variables are cointegrated for confirmation of findings

The diagram in Figure 2 revealed long run association between *ASI,INF, INT, EX* and *MS*. It appeared that the cointegration relationship was stronger among *ASI, INF* and *EX* and less strong with *MS*. This implied that the variables were cointegrated, but there was the need to run a cointegration test to confirm this finding. Hence the data series

were first converted to first differenced and the ADF test was run. The results are shown in the Table 22.

Table 22

Results of Augmented Dickey- Fuller (ADF) Stationarity Tests at 1st Difference

Variables	ADF test statistic	Test Critical Values at 5%	*P-value
ASI	-10.97896	-2.878829	0.0000
INF	-11.82857	-2.8789045	0.0000
INT	-8.767147	-2.878829	0.0000
EX	-6.843981	-2.878829	0.0000
MS	-17.05770	-2.878829	0.0000

* *MacKinnon (1996) one-sided p-values.*

The theory behind ARIMA estimation is based on stationary time series. A series is said to be (weakly or covariance) stationary if the mean and auto covariances of the series do not depend on time. Any series that is not stationary is said to be nonstationary. A common example of a non-stationary series is the random walk:

$$Y_t \quad = Y_{t-1} \quad + \epsilon_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . \ldots \ldots . (4.9)$$

In this case ϵ_t is a stationary random disturbance term. The series has a constant forecast value, conditional on Y_{t-1} and the variance is increasing over time. The random walk is a difference stationary series since at first difference it is stationary:

$$Y_t - Y_{t-1}(1 - L)Y_t = \epsilon_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . . (4.10)$$

A difference stationary series is said to be integrated and is denoted as I (d) where d is the order of integration. The order of integration is the number of unit roots contained in the series, or the number of differencing operations it takes to make the series

stationary. For the random walk above, there is one unit root, so it is an I(1) series. Similarly, a stationary series is I (0).

In order to ascertain whether or not the variables were integrated or not, the ADF test was again carried out at first difference. The results shown in Table 21 above indicates that all the variables; *ASI, INF, INT, EX* and *MS* were stationary at first difference, meaning that they all had one unit root and represented a stable I (0) series. This is because the p-values of all variables are less than 5%, the absolute values of the ADF test statistics for all of *ASI, INF, INT, EX*, and *MS,* were greater than their corresponding test critical values at 5%. This implies that the null hypothesis of *ASI, INF, INT, EX* and *MS,* each having unit roots at first difference could not be accepted at 5% significance level. Hence, it was concluded that at first difference all variables, i.e., *ASI, INF, INT, EX* and *MS* represented a stationary series integrated of first order, I (0).

Testing for Cointegration using Johansen Test of Cointegration and Vector Error Correction Model

The ADF test conducted above showed that all five variables, *ASI, INF, INT, EX* and *MS,* are integrated of same order, meaning that at level they are non-stationary but when converted to first differenced, they become stationary. When variables are integrated of same order, we can run the Johansen test of cointegration. The results of the Johansen test of cointegration are shown in Table 23:

Table 23

Trend Assumption: Linear Deterministic Trend Series: ASI INF INT EX MS

Lags Interval (in first differences): 1 to 4 Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.261040	95.99169	69.81889	0.0001
At most 1	0.153804	46.68238	47.85613	0.0642
At most 2	0.074934	19.46077	29.79707	0.4602
At most 3	0.033963	6.764709	15.49471	0.6051
At most 4	0.006924	1.132496	3.841466	0.2872

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 24

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.261040	49.30931	33.87687	0.0004
At most 1	0.153804	27.22161	27.58434	0.0556
At most 2	0.074934	12.69606	21.13162	0.4806
At most 3	0.033963	5.632213	14.26460	0.6607
At most 4	0.006924	1.132496	3.841466	0.2872

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The p-value of the trace statistics for the null hypothesis of no cointegrating relationship in Table 5, is less than 0.05, meaning that the null hypothesis can be rejected. In addition, the value trace statistic (95.99169) is greater than the 0.05 critical value of 69.81889, affirming that the null hypothesis that there is no cointegrating relationship among the variables cannot be accepted.

However, the p-value of the trace statistic corresponding to ‘At most 1” is 0.0642, which is greater than 0.05, meaning that the null hypothesis that there is at most one cointegrated equation or cointegrating relationship between the variables cannot be rejected (meaning it can be accepted). Furthermore, the value of the trace statistic corresponding to tt most 1, is 46.68238 which is lesser than the 0.05 critical value at that point (47.85613), indicating that the null hypothesis that “At most 1” cointegrating relationship exists between the variables could not be rejected (i.e. it can be accepted). In effect, there exists at most 1 cointegrating relationship among the variables *ASI, INF, INT, EX and MS.*

Table 25

Long-run Cointegrating Relationship

1 Cointegrating Equation(s): Log likelihood -3135.96

Normalized cointegrating coefficients (standard error in parentheses)

ASI	INF	INT	EX	MS
1.000000	-186.0238	-1136.958	-55352.87	38.66782
	(324.603)	(1886.61)	(199202.)	(14.3718)

Adjustment coefficients (standard error in parentheses)

D(ASI)	0.000979
	-0.00042
D(INF)	-0.000123
	-7.00E-05
D(INT)	1.44E-06
	-1.20E-06
D(EX)	-6.29E-09
	-1.00E-08
D(MS)	0.000783
	-0.00016

Looking at Table 24 it could be seen that the Max-eigen value test indicates the presence of “At most 1” cointegrating equations. This is because the p-value of the Max-Eigen statistic at the 0.05 level corresponding to the “At most 1” scenario, is 0.0556, which is greater than 0.05, meaning that the Null hypothesis that at most one cointegrating equations exists among variables could not be rejected (i.e. it can be accepted). Hence, the alternative hypothesis that “At most 1” cointegrating equations existed among the variables was accepted.

Table 25 also shows the long-run relationship between the variables. The normalized cointegrating coefficients, for inflation rate, interest rate and exchange rates are all negative with values of -186.0238 -1136.958 and -55352.87, respectively. Only money supply had a long run positive relationship with the GSE All share Index. Thus, in the long run, inflation rate, interest rates, and exchange rates are expected to increase as stock prices decrease and vice-versa. Money supply on the other hand is expected to increase with increase in stock prices and vice versa in the long run. As all the variables are cointegrated, we can run the VECM. But before there is the need to perform some residual diagnostic tests.

Residual Diagnostic Tests: Testing for Serial Correlation in Residuals

The Durbin Watson statistic associated with of the multiple regression results obtained from the first differenced data series is 1.731325, which is close to 2 and might indicate the absence of serial correlation in regression residuals. However, there was still the need to perform other serial correlation tests to confirm this. The rationale behind testing for serial correlation among residuals is that times series data by nature have the

potential of breaking all the standard assumptions of OLS estimation. Hence in carrying out time series analysis, there is the need to ensure the residuals conform to all the OLS assumptions**.**

Table 26

Long-run Cointegrating Relationship Breusch-Godfrey Serial Correlation LT Test

F-statistic	1.619531	Prob. F(2,161)	0.2012
Obs*R-squared	3.313234	Prob. Chi-Square(2)	0.1908

Test Equation: Dependent Variable: RESID

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.829988	54.41274	0.088766	0.9294
INF_D1_	0.003155	0.406952	0.007753	0.9938
INT_D1_	-1.615853	27.69365	-0.058347	0.9535
EX_D1_	-420.9398	2622.644	-0.160502	0.8727
MS_D1_	-0.005110	0.100535	-0.050831	0.9595
RESID(-1)	0.130767	0.079159	1.651949	0.1005
RESID(-2)	0.039008	0.079249	0.492227	0.6232

R-squared	0.019722	Mean dependent var	1.29E-14
Adjusted R-squared	-0.016810	S.D. dependent var	584.4505
S.E. of regression	589.3424	Akaike info criterion	15.63667
Sumsquaredresid	55919246	Schwarz criterion	15.76683
Log likelihood	-1306.480	Hannan-Quinn criter.	15.68949
F-statistic	0.539844	Durbin-Watson stat	2.008421
Prob(F-statistic)	0.777331		0.777331

The p-value of the observed R-squared value of the Breusch-Godfrey Serial Correlation LM Test is 0.1908, which is greater than 0.05, meaning the null hypothesis of no serial correlation among the regression variables cannot be rejected. In other words, it could be accepted that there is no serial correlation in the regression residuals. The Durbin Watson Statistic is 2.008421 ≈ 2.0 and provides further evidence of no serial correlation. The actual, fitted and residuals graph shown in Figure 3 further confirms the absence of serial correlation in regression residuals.

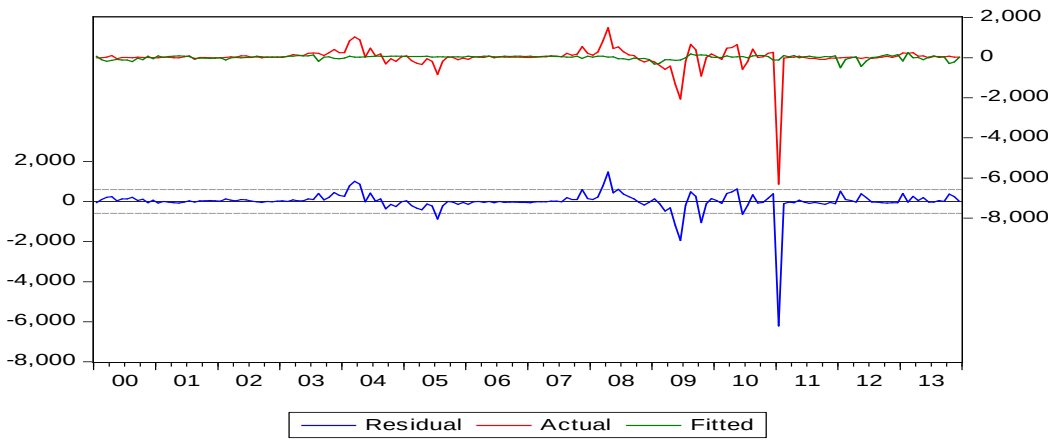

Figure 3. Actual, fitted and residuals graph. Showing the serial correlation of fluctuating values aggregating at 0 equilibrium level for the period January 2000 to December 2013.

Test for Heteroskedasticity in Residuals

Further, I performed a heteroskedasticity test to ascertain whether the conditional variances among all regression residuals were equal (homoscedastic) or different (heteroskedastic). The results are shown in Table 27:

Table 27

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.548686	Prob. F(4,163)	0.7002
Obs*R-squared	2.232014	Prob. Chi-Square(4)	0.6932
Scaled explained SS	80.58720	Prob. Chi-Square(4)	0.0000

The chi-squared probability value of the Breusch-Pagan-Godfrey Heteroskedasticity test is 0.6932,which is greater than 0.05, meaning the null hypothesis that Residuals are not heteroskedastic (i.e. they are homoscedastic) cannot be rejected, that is it can be accepted. Therefore, the alternative hypothesis, that the residuals are heteroskedastic is rejected.

Normality Test

A normality test was carried out to assess whether or not the residuals represented a normal distribution N (0, σ^2) using the Jarque-Bera test statistic. As could be seen in Figure 4, the p-value of the Jarque-Bera test statistic is lesser that the 0.05 critical value. This showed that the Residuals are normally distributed and therefore the null hypothesis can be rejected and the alternative and the alternative hypothesis, that Residuals are not normally distributed is accepted.

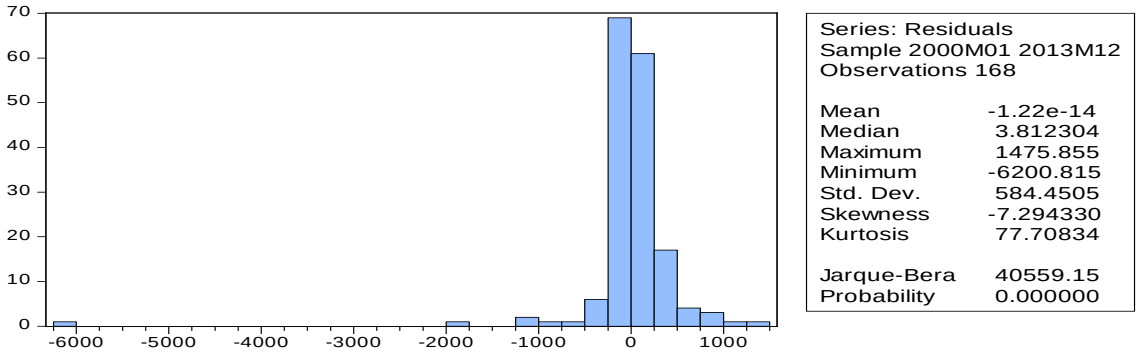

Figure.4. Histogram and Jarque Bera statistics. Jarque Bera Statistics a 0.05 critical value showing the normality of distribution emphasizing the rejection of the null hypothesis.

Residual Diagnostic Tests and Inferences drawn for Level Multiple Regression Analysis

The results of level multiple regression analysis indicates that R-squared and adjusted R-squared values are very low and the F-statistic is not statistically significant. This might indicate the exclusion of other significant macroeconomic variables that may affect stock price movements. This is tenable because this study made use of only four macroeconomic variables and could account for the low values of R-squared and insignificant F-statistic.

In addition, the Breusch-Godfrey Serial Correlation LM Test and the Durbin–Watson (d) statistics at level indicated the presence of positive serial correlation among regression residuals with the data at level but no serial correlation at first differenced. This implies that the first differenced data series have no autocorrelation among its residuals at all lags, indicating that the observed effects of the macroeconomic variables on aggregate stock price movements is an actual relationship. In addition, the chi-squared probability value of the Breusch-Pagan-Godfrey Heteroskedasticity test statistic showed that the residuals are not heteroskedastic, meaning they have the constant variance in their error terms.

Finally, the p-value of the Jarque-Bera test statistic clearly illustrated that residuals do not follow the normal probability distribution, indicating the highly volatile and unpredictable nature of stock prices on the GSE. It may also point to the presence of high information asymmetry of the GSE and provide partial evidence of stock market inefficiency.

The first differenced values of all variables were used to carry out a simple multivariate regression analysis based on OLS estimation. A good multiple regression model based on OLS estimation is expected to possess a high R-squared and adjusted R-squared values, have a significant F statistic, have no serial correlation and heterskedasticty in residuals, and the residuals are normally distributed. In estimating the multivariate model using OLS, I sought to further hypothesize and test the residuals as follows:

Hypothesis 8

$\boldsymbol{H_0}$ *Residuals are not serially correlated*

$\boldsymbol{H_1}$ *Residuals are serially correlated*

Hypothesis 9

$\boldsymbol{H_0}$ *Residuals are not heteroskedastic (i.e. they are homoscedastic).*

$\boldsymbol{H_1}$ *Residuals are heteroskedastic (i.e. they are not homoscedastic).*

Hypothesis 10

$\boldsymbol{H_0}$ *Residuals are normally distributed.*

$\boldsymbol{H_1}$ *Residuals are not normally distributed.*

However the results from the stationary and residuals diagnostic tests indicated that the data series at level was non-stationary, had positive serial correlation in residuals, and had heteroskedasticity in residuals and the entire data series at level did not represent a normal probability distribution. Hence it was necessary to perform another regression analysis using the first differenced data series as this would yield more robust OLS parameter estimates.

The basic multivariate regression model being estimated in order to analyze the effect of macroeconomic variables of inflation rate, interest rate, exchange rate, and money supply on stock prices is given below:

$$D1(ASI_t) = \beta_0 + \beta_1 D_1 Inf_t + \beta_2 D_1 Int_t + \beta_3 D_1 Ex_t + \beta_4 D_1 MS_t + e_t \dots\dots\dots\dots\dots (4.11)$$

The ADF unit roots test indicated that the data was highly volatile and non-stationary; hence there was the need to perform first differencing of the raw values of the data. The term " D1" attached to each of the variables only indicates that the regression analysis was performed using the first differenced data series, as that had been found to

be stationary based on the ADF test at first differenced. The results of the OLS multiple regression analysis using the first differenced data series are shown in Table 28:

Table 28

*Results of Multiple Regression Analysis at First Differenced Dependent Variable: ASI_D1_*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	61.49835	54.55257	1.127323	0.2613
INF_D1_	-0.069115	0.408482	-0.169199	0.8658
INT_D1_	22.81896	27.76959	0.821725	0.4124
EX_D1_	-5642.865	2620.837	-2.153077	0.0328
MS_D1_	0.058333	0.100534	0.580229	0.5626
R-squared	0.029291	Mean dependent var		8.354161
Adjusted R-squared	0.005470	S.D. dependent var		593.2027
S.E. of regression	591.5782	Akaike info criterion		15.63277
Sumsquaredresid	57044251	Schwarz criterion		15.72575
Log likelihood	-1308.153	Hannan-Quinn criter.		15.67051
F-statistic	1.229609	Durbin-Watson stat		1.731325
Prob(F-statistic)	0.300338			

Both the R-squared and adjusted R-squared values are relatively very low (2.9291% and 0.547%), implying a low predictive power of our multivariate model and likely the exclusion of other important macroeconomic predictor variables which might significantly influence GSE all share index.

The F-statistic is also very low and its p-value is 30.0338%, which is greater than 5% meaning that *INF, INT,EX* and *MS* jointly do not exert significant effect on *ASI*. From table 8 above, inflation rate and exchange rate have negative significant effects on stock market returns whereas interest rates and money supply have positive significant effect.

Only exchange rate appears o significantly influence the Ghana stock exchange all share index ($p=0.0328<0.05$).

Results of the Empirical Error Correction Model

To establish the clear effect of macroeconomic variables on the GSE All Share Index I estimated the empirical VECM in order to ascertain whether the short term (immediate) and long run impacts of *INF*, *INT*, *EX* and *MS* on the GSE All Share Index, and to further determine the speed with which changes in *INF*, *INT*, *EX* and *MS* makes further adjustment to the GSE All Share Index to equilibrium through an error correction mechanism.

There are two kinds of vector autoregressive models; the unrestricted VAR, which assumes that the independent and dependent variables only a have short-run relationship and the VECM which assumes that the variables have a long-run cointegrating relationship. In this study I used the VECM because the results of the cointegration test indicated the presence of long run association between the variables. Results of the VECM are shown in the Table 29:

Table 29

Vector Error Correction Estimates Standard Errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
ASI_D1_(-1)	1.000000
EX_D1_(-1)	-224.6414
	(15419.1)
	[-0.01457]
INT_D1_(-1)	-137.789
	(175.708)
	[-0.78419]
INF_D1_(-1)	57.99855
	(6.64059)
	[8.73395]

MS_D1_(-1)	6.201780
	(1.22788)
	[5.05082]

Error Correction:	D(ASI_D1_)	D(EX_D1_)	D(INT_D1_)	D(INF_D1_)	D(MS_D1_)
CointEq1	-0.035441	1.25E-06	7.64E-05	-0.028171	-0.074528
	(0.02244)	(5.5E-07)	(6.1E-05)	(0.00347)	(0.00826)
	[-1.57949]	[2.29012]	[1.25402]	[-8.12604]	[-9.02113]
D(ASI_D1_(-1))	-0.576896	-4.98E-07	-5.03E-05	0.016044	0.072099
	(0.07987)			(0.01234)	(0.02941)
	[-7.22316]	(1.9E-06)	(0.00022)	[1.30021]	[2.45183]
		[-0.25565]	[-0.23222]		
D(ASI_D1_(-2))	-0.300048	-1.45E-06	-8.88E-05	0.007361	0.011306
	(0.07782)	(1.9E-06)	(0.00021)	(0.01202)	(0.02865)
	[-3.85566]	[-0.76252]	[-0.42051]	[0.61219]	[0.39460]
D(EX_D1_(-1))	-8126.161	-0.346957	13.38275	467.1923	-1915.766
	(3343.53)	(0.08162)	(9.07327)	(516.587)	(1231.05)
	[-2.43041]	[-4.25108]	[1.47496]	[0.90438]	[-1.55620]
D(EX_D1_(-2))	-2797.933	-0.238433	-1.157014	560.9430	-3792.309
	(3363.01)	(0.08209)	(9.12614)	(519.597)	(1238.23)
	[-0.83197]	[-2.90446]	[-0.12678]	[1.07957]	[-3.06270]
D(INT_D1_(-1))	31.19593	0.000333	-0.49292	-3.257653	1.850562
	(28.7274)	(0.00070)	(0.07796)	(4.43848)	(10.5771)
	[1.08593]	[0.47519]	[-6.32297]	[-0.73396]	[0.17496]
D(INT_D1_(-2))	22.15827	0.000405	-0.337361	-1.435485	-3.744508
	(28.5946)	(0.00070)	(0.07760)	(4.41797)	(10.5282)
	[0.77491]	[0.58054]	[-4.34762]	[-0.32492]	[-0.35566]
D(INF_D1_(-1))	1.744853	-7.58E-05	-0.003635	0.106840	4.281189
	(1.19489)	(2.9E-05)	(0.00324)	(0.18462)	(0.43995)
	[1.46026]	[-2.59813]	[-1.12107]	[0.57872]	[9.73114]
D(INF_D1_(-2))	1.278034	-7.20E-05	-0.002755	-0.022653	0.082833
	(1.04709)	(2.6E-05)	(0.00284)	(0.16178)	(0.38553)
	[1.22056]	[-2.81728]	[-0.96964]	[-0.14002]	[0.21486]
D(MS_D1_(-1))	-0.008207	1.10E-05	8.74E-06	0.137066	-0.219742
	(0.17305)	(4.2E-06)	(0.00047)	(0.02674)	(0.06372)
	[-0.04742]	[2.60414]	[0.01861]	[5.12638]	[-3.44873]
D(MS_D1_(-2))	0.065694	2.02E-06	-0.000154	0.061605	-0.031493
	(0.11292)	(2.8E-06)	(0.00031)	(0.01745)	(0.04158)
	[0.58177]	[0.73196]	[-0.50217]	[3.53101]	[-0.75747]
C	2.601073	-0.000135	-0.006429	-1.384691	3.053333
	(51.7079)	(0.00126)	(0.14032)	(7.98904)	(19.0383)

	[0.05030]	[-0.10721]	[-0.04582]	[-0.17332]	[0.16038]
R-squared	0.323574	0.207722	0.249323	0.743142	0.897792
Adj. R-squared	0.274942	0.150761	0.195353	0.724675	0.890444
Sum sq. resids	67356880	0.040135	496.0205	1607898.	9131135.
S.E. equation	663.5066	0.016196	1.800545	102.5141	244.2962
F-statistic	6.653525	3.646730	4.619644	40.24170	122.1777
Log likelihood	-1299.989	452.3944	-324.9303	-991.8455	-1135.128
Akaike AIC	15.90290	-5.338113	4.084003	12.16782	13.90459
Schwarz SC	16.12879	-5.112226	4.309890	12.39371	14.13047
Mean dependent	-0.011839	-0.000226	-5.38E-18	-0.009394	-0.078788
S.D. dependent	779.2178	0.017575	2.007250	195.3711	738.0725
R-squared	0.323574	0.207722	0.249323	0.743142	0.897792
Adj. R-squared	0.274942	0.150761	0.195353	0.724675	0.890444
Sum sq. resids	67356880	0.040135	496.0205	1607898.	9131135.
S.E. equation	663.5066	0.016196	1.800545	102.5141	244.2962
F-statistic	6.653525	3.646730	4.619644	40.24170	122.1777
Log likelihood	-1299.989	452.3944	-324.9303	-991.8455	-1135.128
Akaike AIC	15.90290	-5.338113	4.084003	12.16782	13.90459
Schwarz SC	16.12879	-5.112226	4.309890	12.39371	14.13047
Mean dependent	-0.011839	-0.000226	-5.38E-18	-0.009394	-0.078788
S.D. dependent	779.2178	0.017575	2.007250	195.3711	738.0725

Determinant resid covariance (dof adj.)	2.01E+11
Determinant resid covariance	1.38E+11
Log likelihood	-3286.52
Akaike information criterion	40.62448
Schwarz criterion	41.84803
Determinant resid covariance (dof adj.)	2.01E+11
Determinant resid covariance	1.38E+11
Log likelihood	-3286.52

From Table 29, the empirical VECM was estimated as follows:

$$\Delta ASI_t = -783.3564 - 224.6414\Delta Ex_t - 137.7890\Delta Int_t + 57.99855\Delta Inf_t + 6.201780\Delta MS_t - 0.035441 ASI_{t-1} - 0.00003527 Ex_{t-1} - 0.002156 Int_{t-1} - 0.7949 Inf_{t-1} - 2.1029 MS_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.12)$$

The estimated equation (4.12) above, indicates that changes in macroeconomic variables; exchange rate, interest rate , inflation rate and broad money supply have both an immediate and long-term effects on aggregate stock prices on the GSE All Share Index. When the error correction term, that is, the portion of the equation in parentheses =

0, macroeconomic dynamics and aggregate stock prices are in equilibrium. That is when $-0.035441(ASI_{t-1} - 0.00003527Ex_{t-1} - 0.002156Int_{t-1} - 0.7949Inf_{t-1} - 2.1029Ms_{t-1}) = 0$ changes in macroeconomic indicators exert no influence on aggregate stock price movements. However, as the error correction term is not equal to zero there must be a short run and long run dynamic relationship between macroeconomic variables and aggregate stock price movements. Specifically, increases in lagged values of the macroeconomic variables will create disequilibrium in aggregate stock price movements, causing current or future values of stock prices reduce. The stock market will respond to this disequilibrium created by the macroeconomic by increasing in terms of aggregate stock prices in order to correct this disequilibrium, with 3.5441% of the (remaining) deviation corrected in each subsequent time.

Firstly, a one unit increase in exchange rate will immediately produces a 224.6414 unit decrease in aggregate stock prices. In other words if the Ghana cedis- U.S. dollar exchange rate increases by just one unit, the stock market responds immediately with aggregate prices of all corporate stocks increasing swiftly.

Secondly, a 1unit increase in interest rate immediately caused the aggregate stock prices to reduce by 137.7890. This suggests that when average monthly inter-bank lending rates increase by 1unit, stock prices respond by registering a 137.7890 aggregate decrease.

A 1 unit change in inflation rate on the other hand causes stock prices to increase by 57.99855. This implies that when the general prices of goods in the consumer basket,

i.e., the CPI increases, stock prices immediately respond by increasing in aggregate terms by an amount of 57.99855 to increase.

Also when broad money supply increases by 1 unit, aggregate stock prices increase by6.201780. this also reveals that when the quantum of M1, and cash in hand, cash at bank and other easily marketable securities available to investors increase within the economy, stock prices respond by increasing in aggregate terms by a factor of 6.201780 .

In effect increases in values of macroeconomic indicators of exchange rate, interest rate, inflation rate and money supply disrupt the long-term equilibrium relationship between these two variables, causing stock market returns to decrease both swiftly and gradually. In responding gradually, that is in the long-run, stock market responds to increases in values of these macroeconomic indicators by increasing by amounts of 0.00003527, 0.002156, 0.7949 and 2.1029 spread over future time periods (at least 14 year-period) at a rate of 3.5441% per time period until the changes in past values of macroeconomic variables of exchange rate, interest rate, inflation rate and money supply have virtually no effect on aggregate stock prices.

The analysis indicates in general that;

$ASI_{t-1} > 0.0000352Ex_{t-1}, -0.002156Int_{t-1}, -0.7949Inf_{t-1} and -2.1029MS_{t-1}$This suggests that stock prices index in previous period has overshot the equilibrium. Moreover, because the speed of adjustment, $\beta_1 = -0.035441 < 0$, the error correction term works to push back previous stock price indexes towards the equilibrium. It implies that stock prices and the macroeconomic variables of exchange rate, interest rate,

inflation rate and money supply are cointegrated and there is a long -run relationship towards which they always come back. In other words, aggregate stock prices cannot increase in perpetuity with no tendency to return to zero and the error rarely drifts from zero. In effect stock market prices can only move to a certain limit after which negative $\beta_1 = -0.035441$, the co-efficient of the error correction model causes it to speedily adjust and return to its mean or equilibrium value.

In effect, macroeconomic variables of exchange rate, interest rate, inflation rate and money supply all have both long-run and short-run relationship with aggregate stock prices on the GSE.

Results of the Pairwise Granger Causality Tests

The Granger Causality test was conducted to ascertain the direction of relationship between the variables in the study. The results are shown in the Table 30:

Table 30

Pairwise Granger Causality Tests Lags:2

Null Hypothesis:	Obs	F-Statistic	Prob.
INT_D1_ does not Granger Cause ASI_D1_	166	0.24867	0.7801
ASI_D1_ does not Granger Cause INT_D1_		0.15102	0.86
EX_D1_ does not Granger Cause ASI_D1_	166	2.95034	0.0552*
ASI_D1_ does not Granger Cause EX_D1_		1.44256	0.2394
INF_D1_ does not Granger Cause ASI_D1_	166	0.01803	0.9821
ASI_D1_ does not Granger Cause INF_D1_		0.01181	0.9883
MS_D1_ does not Granger Cause ASI_D1_	166	1.26576	0.2848
ASI_D1_ does not Granger Cause MS_D1_		0.22321	0.8002
EX_D1_ does not Granger Cause INT_D1_	166	3.02766	0.0512*
INT_D1_ does not Granger Cause EX_D1_		0.17488	0.8397
INF_D1_ does not Granger Cause INT_D1_	166	0.19673	0.8216
INT_D1_ does not Granger Cause INF_D1_		0.00872	0.9913
MS_D1_ does not Granger Cause INT_D1_	166	0.00719	0.9928
INT_D1_ does not Granger Cause MS_D1_		0.09381	0.9105
INF_D1_ does not Granger Cause EX_D1_	166	0.02554	0.9748
EX_D1_ does not Granger Cause INF_D1_		0.01230	0.9878
MS_D1_ does not Granger Cause EX_D1_	166	4.22350	0.0163*

*Significant at 0 .05 level

The results of the pairwise Granger Causality tests as seen from the Table 30 above indicate a unidirectional causality from exchange rate to aggregate stock prices. This is interpreted to mean past values of the cedi-dollar exchange rates could be used to predict future stock market returns. Thus on the basis of this evidence, if for example the Ghana cedi is depreciating at faster rate against the U.S dollar, meaning that exchange rate is increasing, we could predict that future stock prices will increase all other things being equal.

Again, the results indicated a unidirectional causality from broad money supply to exchange rate, suggesting that past values of broad money circulating in the Ghanaian economy could be used forecast or predict future stock prices behavior on the GSE. In other words, given that Ghana's broad money supply has increased over the past few years, we could predict on the basis of this evidence that stock prices will continue to increase in the future, ceteris paribus. Finally, a bidirectional causality relationship was found between broad money supply and inflation rate.

Following the tests and analysis I found that the past values of broad money circulating in the Ghanaian economy could be used to predict future values of inflation rate, as measured by the CPI and past values of CPI could predict future values of broad money supply. In other words, if the inflation rate in Ghana maintains a persistent rise, policy planners could on the basis of this evidence predict that broad money supply in the economy will increase in the future. Conversely, if broad money supply increased in the past, policy makers and households could predict, using this evidence that future prices of

goods in the consumer basket (CPI) will increase in the future. This demonstrates the predictive ability of my study based on the statistical evidence demonstrated so far.

Confirmation: The Eigen System Analysis Multicollinearity Test

Finally, to confirm the presence of multicollinearity, the Eigen system Analysis needs to be carried out. The characteristic roots or eigenvalues of any two independent variables, say λ_1 and λ_2 can be used to measure the extent of the multicollinearity in the data. If there are one or more near-linear dependences in the data, then one or more characteristic roots will be small. Some analysts prefer to examine the condition number of the independent variables, defined as $K= (\lambda_{max}/\lambda_{min})$. This is just a measure of the spread in the eigenvalues spectrum of the two variables. Generally, if the condition number is less than 100, there is no serious problem with multicollinearity. Condition number between 100 and 1000 imply moderate to strong multicollinearity if it exceeds 1000, severe multicollinearity is indicated.

The eigenvalues of for the above data are $\lambda_1= 4.244$, $\lambda_2=0.552$, $\lambda_3=0.138$, $\lambda_4= 0.061$ and $\lambda_5=0.005$.

There are two extremely small eigenvalues, $\lambda_4= 0.061$ and $\lambda_5=0.005$, a symptom of seriously ill conditioned data . In addition, the condition number, $K= (\lambda_{max}/\lambda_{min}) = (4.244/0.005) =848.8$ which is greater than 100 lesser than 1000. This indicates that the observed multicollinearity between the independent variables of exchange rate and money supply is moderate; it is not so severe as to influence the values of the B and beta regression estimates. Hence, the observed moderate multicollinearity between *ExR* and Ms could be ignored (See Table 31).

Table 31

Collinearity Diagnostic of Macroeconomic Variables

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	InfR	IntR	ExR	MS
1	1	4.244	1	0	0.01	0.01	0	0
	2	0.552	2.772	0	0.02	0.13	0	0.02
	3	0.138	5.548	0	0.57	0.09	0	0.08
	4	0.061	8.349	0.11	0.38	0.76	0.01	0.01
	5	0.005	30.415	0.88	0.03	0.02	0.99	0.89
1	1	4.244	1	0	0.01	0.01	0	0

a. Dependent Variable: SMR

In view of the earlier assumptions that time series data were non-stationary I performed a pretest to ensure there is a stationary co-integration relationship among all my selected macroeconomic variables. This was to enable me investigate the time series properties of the variables by utilizing unit root test before proceeding with the OLS estimations. The ADF test was performed with constant intercept only scenario and assumed the same null hypothesis of no unit root in the data series. However, because the ADF test is sensitive to the lag length of the series an optimal lag length was determined and this was done by maximum lag order of 2 and this was selected based on the Schwarz information criterion test. After determining the optimal lag length, the ADF test was carried to test for the stationarity or otherwise of all the variables in the series at level. The results indicated that all the variables hence had no unit roots in the data series, meaning that they were non-stationary. The non-stationary data series was then transformed into first difference to bring stationarity in these data and the first differenced data was used in the Multivariate Regression Model.

I ascertained whether or not the variables were integrated. I carried out the ADF test at first difference and the results indicated that all the variables, that is, *ASI*, *INF*, *INT*, *EX* and MS were stationary at first difference. The multicollinearity test was conducted on the sample data based on one of the basic assumptions underlying OLS estimation, that regressors should not be mutually correlated. The results indicated no serious multicollinearity problems amongst independent variables.

Summary of Answers to Research Questions

In this study, I concluded that monthly changes in the exchange rate have a significant positive effect on stock market returns in Ghana. Impliedly, increases in the month ending inter-bank exchange rates between the Ghana Cedi and the US dollar resulted in increases in aggregate stock prices. This might suggest a decline in FDI in Ghana coupled with an excess of monthly importing over exporting activities between Ghanaian businesspersons and investors on the international trade market.

I also found that interest rate volatilities exert a significant negative effect on stock market returns in Ghana. My finding suggested that increases in the government of Ghana 91 Day Treasury Bill rates could cause aggregate stock prices to move down. This brought to light the evidence that Ghanaian investors may have low risk appetite yet a desire to increase their returns on investment. In this regard, slight monthly increases in government of Ghana T-bill rates, (which are relatively less risky than corporate stocks, but with implied lower returns than corporate stocks) could cause stock market investors to probably sell their stocks in order to purchase the government of Ghana treasury bills. Thus, the increase in the treasury bill rates could be seen as an increase in demand for T-

bills and the reduction in stock prices. This could also be construed as decreases in demand for corporate stocks.

I also found that inflation rate does not significantly affect stock market returns in Ghana, meaning that aggregate stock price movements are generally not very sensitive to general changes in the prices of goods, as measured by the CPI This suggest that though Ghanaian investors might not like inflation rate(general prices of goods in the consumer basket) to increase, their investments in corporate stocks are not influenced by the general rate of inflation in the macroeconomy; investors are not only interested in their present consumption but also investments for their future.

Finally I found that money supply exerted a significant negative effect on stock market returns. This is an indication that increases in money supply (M2) could cause aggregate stock prices to move down. In other words as cash, checking deposits (M1) and “Near money" (i.e., savings deposits, money market mutual funds and other time deposits) in the general economy increases, stock prices are expected to decrease. This finding is an indication of the fact that as investors accumulate excess money (cash plus other liquid and easily cashable money instruments) in their hands or bank accounts, they become less likely to invest in corporate stocks. This again implies that investors are not only interested in long-term investments (on the stock market) but also short-term investments in cash and other liquid and easily marketable securities. These results and inferences sets the base for discussions, conclusions and recommendations in Chapter 5.

Chapter 5: Key Findings, Interpretations, Implications and Recommendations

Introduction

In Chapter 4 of this study, I focused on the analyses, interpretations, and discussions of the empirical tests of specified predictors, namely exchange rate, interest rate, inflation rate, and money supply. I chose the criterion variable to be stock market returns and the proxy applied was the GSE All Share Index during the period January 2000 to December 2013. The datasets covered 168 monthly observations, which yielded a total of 5,040 trading days for the period January 2000 to December 2013.

In Chapter 5, I interpreted study findings based on the research purpose and objectives. The objectives were achieved through the results I obtained from the estimated coefficients of selected predictive variables that were introduced earlier in Chapter 3 and later analyzed in Chapter 4.

After examining literature, I found few studies that have examined the effect of macroeconomic changes on stock returns in Africa, south of the Sahara. However, several studies have been carried out in most developed countries. Nucu (2011) examined the relationship between stock prices and exchange in Romanian stock markets and reported that stock market returns were inversely responsive to the domestic currency depreciation.

In terms of methodological approaches, several econometric models, for example the EGARCH-X, GARCH model, had been used to examine the relationship between stock returns and several selected macroeconomic variables in both developed and developing countries, and in all the studies a two-way relationship between

macroeconomic variables and stock market returns have been found (eg. Beirne, Caporale, & Spagnolo, 2009).

Some researchers such as Jain et al. (2011), focused on sensitivities of stock returns and exchange rate and reported that exchange rate of precision instruments appreciated or increased. Jain et al. used the EGARCH model and both short-term and long-term interest rates and their volatilities to estimate portfolio returns in some selected Australian banks and found evidences of an increase in returns during period of appreciation of the Australian dollar.

In the financial sector in Ghana, there has been limited analysis on how stock returns respond to changes in macroeconomic variables. Evidence of past research demonstrated how various models and the application of statistical tools have been used to investigate the relationships between macroeconomic indicators and changes in stock market dynamics. Some studies have used a Markov-state switching approach to investigate the linkage between exchange rate and stock market prices and returns, while others have used macroeconomic variables on stock returns (eg. Kurov, 2010).

Evidence in line of literature on stock market returns revealed the effect of economic sentiment indicators on stock markets has also been examined. For example, some researchers have attempted to uncover whether investor sentiments are important in the prediction of stock market performance and returns. Emrah et al. (2012) applied a time varying Markov regime-Switching (MS) properties in all shares stock returns in the United States covering some nonmanufacturing business activity index and supply chain management within transitional equation. The study tested for the common factors that

affect both stock returns and business confidence in the selected sectors and the possibility of a common factor effect of stock returns on business confidence.

In this study, the null hypothesis (H_0) was that macroeconomic variables have no effect on stock market returns in Ghana and for the alternative hypothesis (H_1), I hypothesized that macroeconomic variables have an effect on stock market returns in Ghana. The direction of the effect was hypothesized on the strength of past literature as reviewed in Chapter 2.

I carried out the ADF test at first difference, and a test for multicollinearity using the *VIF* test was carried out. In the terminal chapter, Chapter 5, I will concisely interpret and summarize key findings and make appropriate recommendations for policy directions that potentially will impact on positive social change, giving considerations to the stated limitations and dynamics of economic variables' effect on the GSE All Share Index during the period January 2000 to December 2013. On the strength of literature and methodological approach, the ensuing paragraphs state key findings of my study.

Summary of Key Findings

In this study, I emphasized the role of long-term capital in the economic development of Ghana. I found that economic managers must constantly formulate policies to stimulate the capital market because the capital market is crucial for mobilizing both domestic and international capital. To mitigate this capital constraint, therefore, it is imperative on policy makers to ensure that the stock exchanges serve as platforms for raising long-term capital for firms. I also found that the preferences of

Ghanaian lenders and borrowers are harmonized through stock market operations because the stock market also supports reallocation of funds among corporations and sectors.

Consistent with the findings of Olweny and Kimani (2011), macroeconomic variables affect stock returns. The various statistical tests discussed in Chapter 4 revealed that macroeconomic variables were important predictors of stock market returns in Ghana during the period under study. I found that one unit root increases in exchange rate and inflation rate could cause stock market returns to increase by 10011.665 and 1.178 units respectively. Conversely, one unit increase in interest rate and money supply could result in a decrease in stock market returns by 128.987 and 0.892 units respectively. I also found that the effect of exchange rate and inflation rate on the GSE All Share Index was positive whereas interest rates and money supply had an inverse correlation with the GSE All Share Index during the specified period. The multiple regression results I obtained from the stationary first differenced data series established a positive effect of inflation rate on stock market returns, a negative effect of exchange rate on stock market returns, and a negative effect of the interest rate on stock market returns.

In this study, I found a positive correlation between inflation rate and stock market returns ($\beta = 0.003155$), a negative effect of exchange rate on stock market return(β =--420.9398), and a negative effect of the interest on stock market (β =-1.615853). Money supply had a negative effect as opposed to the expected positive effect on stock market return (β =-0.005110). Nucu (2011) examined the relationship between stock prices and exchange rate in the Romanian stock market and reported stock market returns to be inversely related to exchange rate. With respect to inflation rate, Kimani and

Mutuku (2013) and Anokye and Siaw (2010) pointed an inverse relationship between inflation rate and stock prices whereas in this study the test statistics revealed a hypothetical estimations based on empirical evidence that there was a positive effect of inflation rate on stock market returns ($\beta = 0.003155$) in Ghana during the period January 2000 to December 2013.

Interpretations of Key Findings

I converted data series to first differenced and found the Durbin Watson statistics to be 2.00842. My findings revealed that at first differenced, there were no serial correlation among regression residuals. This provided a strong support and justification as to why the regression parameter estimates I used for the first differenced data series were more reliable than those I obtained at data level. In this study my findings showed that, the parameter estimates of the multiple regression models using first differenced data BLUE estimates of the relationship between stock market returns and the four macroeconomic variables than those I obtained in Table 8.

I found that the R-square value indicated that only about 1.972% of total variations in stock market returns on the GSE could be accounted for by changes in exchange rate, interest rate, inflation rate, and money supply. This might indicate the probable exclusion of some other macroeconomic variables, like the GDP, crude oil prices, unemployment rate, fiscal deficit, external debt, industrial production and other external shocks all of which have been reported to have a strong effect stock market returns (Sangmi Mohi-u-Din and Hassan Mohd. Mubasher (2013). The p-value of the F-statistic indicated that the four macroeconomic variables did not significantly affect stock

market returns in Ghana (Table 11) and this may also be due to exclusion of those variables as cited in Sangmi Mohi-u-Din and Hassan Mohd. Mubasher (2013).

In this study, I sought to answer the research questions whether monthly changes in selected macroeconomic variables have effect on stock market returns in Ghana during the period January 2000 to December 2013. Since the hypothesis has multiple parameters, I utilized the F-test to investigate whether there was significant evidence that all the specified independent variables had zero coefficients at a level of significance of 5% ($\alpha = 0.05$). In testing the hypothesis, the null (H_0) and the alternate (H_1) identified the claim that:

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$

H_1 : At least one of the partial slope coefficients is not equal to zero.

In this study, I found that the descriptive statistics of the selected macroeconomic variables and stock market returns are not normally distributed about their mean and variance. Therefore, I found no randomness in data, thus revealing that aggregate stock prices on the GSE and the macroeconomic variables of exchange rate, interest rate, inflation rate, interest rate and money supply were all very sensitive to periodic changes and speculation. My findings interpreted this to mean that an individual investor could earn considerably higher normal rate of profit from the GSE.

In this study, I found that the degree of efficiency of the of GSE is hinged to the extent to which individual investors and corporations could earn higher profits on the basis of knowledge of macroeconomic variables movements. I also found that foreign

companies could earn considerably higher returns in terms of exchange rate fluctuations since the Ghana cedi/US dollar relationship had been constantly volatile.

Empirical Findings and Applications

In this study, I obtained the R square statistic by performing a regression on data series at level. The result was that about, 38.4% of fluctuations in aggregate share index on the GSE could be explained by the macroeconomics variables while the 61.6% could be explained by other factors. The adjusted R square shows that the relationship is an actual one and not merely due to spurious regression problems. I found that the ANOVA or F test provided statistical evidence that the macroeconomic variables of exchange rate, interest rate, inflation rate and money supply jointly affected the GSE aggregate share price index. However, I found such a conclusion was untenable due to nonstationarity in the data series, thus I needed to make further interpretations based on statistical inferences.

The Durbin-Watson and the Breusch-Godfrey Serial Correlation Application

In this study, I performed both the Durbin-Watson and the Breusch-Godfrey Serial Correlation LM Tests on the data series at level. I indicated the presence of high serial correlations in the regression residuals at level to provide further evidence on the nonstationarity of the data series and affirmed the need to make them stationary. However, after I converted the data series to first differenced, I found that the Durbin-Watson statistics was 2.008421, which is approximately equal to 2.

I found that the hypothetical estimations supported a positive effect of inflation rate on stock market ($\beta = 0.003155$), a negative effect of exchange rate on stock market

return (β = -420.9398), a negative effect of the interest on stock market (β =-1.615853). Only money supply had a negative effect as opposed to my expected positive effect on stock market return (β =-0.005110). A study by Ameeta, Paresh.and Thomson (2011) on the relationship between exchange rates, interest rates and Australian bank returns, reported a statistical nexus between interest rate, exchange rates, and stock prices. Increases in interest rate had a significant inverse effect on stock returns, however they reported that an appreciation of the Australian dollar have a direct effect on bank stock returns and this contradicts the inverse relationship as established by my study findings.

To verify exclusions that might have impacted on the selected predictive variables, I obtained the R-square value from the regression of the stationary first differenced data series. The results indicated that only about 1.972% of total variations in stock market returns on the GSE could be accounted for by changes in exchange rate, interest rate, inflation rate, and money supply. This might indicate the probable exclusion of some other macroeconomic variables, which could have better predicted stock price movements on the GSE than the four chosen in my study. For example, macroeconomic variables such as crude oil prices, unemployment rate, fiscal deficit, external debt, industrial production and other external shocks have been found to strongly impact stock market returns, including investor expectations (Sangmi & Mubasher, 2013).

The Breusch-Godfrey Serial Correlation LM Test and the Durbin–Watson (d) statistics at level indicated the presence of positive serial correlation among regression residuals with the data at level but no serial correlation at first differenced. This means the first differenced data series have no autocorrelation among its residuals at all lags.

Additionally the chi-squared probability value of the Breusch-Pagan-Godfrey Heteroskedasticity test statistic showed that the residuals are not heteroskedastic, meaning they have the constant variance in their error terms. This supports my findings that the observed effects of the macroeconomic variables on aggregate stock price movements are an actual relationship.

Empirical VECM and Jarque-Bera Applications

In this study, I found that the p-value of the Jarque-Bera test statistic clearly illustrated that residuals do not follow the normal probability distribution. This pointed to the presence of a highly volatile and unpredictable stock prices on the GSE and further revealed the presence of high information asymmetry of the GSE. Underlying this partial evidence of information asymmetry and stock price volatility is the degree of market efficiency of the Ghana stock market which as I have indicated is outside the scope of this study.

I estimated an empirical VECM in order to ascertain both the short term (immediate) and long-run impact of the macroeconomic variables on stock market returns. The result of my estimation of the model equation revealed that changes in macroeconomic variables of exchange rate, interest rate, inflation rate and broad money supply have both an immediate and long-term effects on aggregate stock prices on the GSE.

I found that increases in lagged values of the macroeconomic variables created a disequilibrium in aggregate stock price movements, and this caused current or potentially future values of stock prices to reduce. The Ghana stock market responded to this

disequilibrium created by the macroeconomic variables by increasing in terms of aggregate stock prices in order to correct this disequilibrium, with only 3.5441% of the (remaining) deviation corrected in each subsequent time. These dynamics revealed that an increase in exchange rate will immediately cause a decrease in aggregate stock prices. In other words, if United States dollar exchange rate increases by just one unit, the stock market responds immediately with aggregate prices of all corporate stocks increasing swiftly.

In this study, I found that interest rates increases had immediate effect on the aggregate stock prices; there was a reduction on aggregate stock prices resulting from increase in the rate of interest. Thus when the monthly interbank lending rates increased, stock prices responded by registering an aggregate decrease. My findings affirmed a negative relationship between interest rate and aggregate stock price movements as I earlier reported. This means as the CPI increases, stock prices immediately respond by increasing in aggregate terms. My study also provided evidence of a positive relationship between inflation rate and aggregate stock price movements a findings that is consistent with Ameeta, Paresh.and Thomson (2011)

From the statistical results, I also found that when broad money supply increased, aggregate stock prices increased in the short-term. This also revealed that when the quantum of M1, and cash in hand, cash at bank and other easily marketable securities available to investors increase within the economy, stock prices respond by increasing in aggregate terms by constant factor.

My study finding of a positive relationship between money supply obtained from the VECM contradicts the negative relationship obtained from the multiple regression model obtained from the stationary first differenced data series. However, it only points to the weakness of OLS in contemporaneously estimating long-run and short-run dynamic relationships between time series macroeconomic variables. However, the finding of a positive short-run relationship between broad money supply and aggregate stock prices obtained from the VECM is more reliable and tenable as it also appears agree with several other empirical literature.

Interpretations of VECM and Application

On the basis of the results of the Empirical VECM and Jarque-Bera tests I found that the results of the VECM contained the presence of a long-run relationship between the selected macroeconomic variables and stock market returns. My findings pointed out that increases in values of macroeconomic indicators of exchange rate, interest rate, inflation rate and money supply disrupted the long term equilibrium relationship between these two variables and this caused stock market returns to decrease both swiftly and gradually. In responding gradually, that is in the long-run, stock market responded to increases in values of these macroeconomic indicators by increasing in very small amounts of 0.00003527, 0.002156, 0.7949 and 2.1029 spread over future time periods (at least 14 year-period) at a rate of 3.5441% per time period until the changes in past values of these macroeconomic variables had almost no effect on aggregate stock prices.

Interpretations of the Granger Causality Test and Application

The Granger Causality test I performed revealed that stock prices index in previous period had overshot the equilibrium. My test further revealed that because of the speed of adjustment, $\beta 1 = -0.035441 \square 0$, the error correction term worked to push back previous stock price indexes towards the equilibrium. Therefore the pairwise Granger Causality tests indicated a unidirectional causality from exchange rate to aggregate stock prices.

My result showed that past values of the cedi dollar exchange rate could be used to predict future stock market returns; if for example, the Ghana cedi is depreciating at a faster rate against the U.S dollar, meaning that exchange rate is increasing, investors or policy makers could predict that future stock prices will increase all other things being equal.

Thus, there is a unidirectional causality from broad money supply to exchange rate, suggesting that past values of broad money that circulated in the Ghanaian economy could be used to forecast or predict future stock prices behavior on the Ghana Stock exchange during the period under consideration.

From the foregoing, given that Ghana's broad money supply had increased over the period, policy analysts could predict that stock prices will continue to increase in the future and beyond the period under consideration, *ceteris paribus*. In this study, I found a bidirectional causality relationship between broad money supply and inflation rate. This meant that past values of broad money that circulated in the economy could be used to predict future values of inflation in Ghana. It is important to emphasize that I measured

inflation rate by the movements of the CPI. Thus, past values of the CPI could predict future values of broad money supply. Conversely, if broad money supply has been increasing in the past till now, one could predict, using this evidence that future prices of goods in the consumer basket (CPI) will increase in the future, *ceteris paribus*.

Theoretical Foundations and Study Outcomes

In a similar study by Issahaku et al. (2013), they employed monthly time series data for the period 1995 to December 2010 to ascertain the nature and existence of causality between macroeconomic variables and stock returns in Ghana. They reported a significant long ran nexus between inflation rate, money supply and stock returns. Issahaku et al. (2013), also reported a short run significant relationship between interest rate, inflation rate, and money supply.

In this study I found that the macroeconomic variables jointly have an effect on the GSE All Share Index. Further, the relationship between the macroeconomic indicators and stock market returns are statistically significant. Specifically, exchange rate and inflation rate had a positive effect on stock returns. Fisher (1930) hypothesized a positive correlation between inflation rate and stock returns. Thus, this findings are consistent with the theorized assertion by Fisher (1930). The study also revealed the existence for arbitrage opportunities on the GSE; past values of the cedi dollar exchange rate could be used to predict future stock market returns. This findings runs contrary to the dictates of the Efficient Market Hypothesis (EMH) by Fama.

Conclusions and Empirical Findings

Exchange Rate

In this study, I estimated an empirical vector error correction model in order to ascertain both the short term (immediate) and long-run impact of the macroeconomic variables on stock market returns. The result of the estimation of the model equation revealed that changes in exchange rate have both an immediate and long-term effects on aggregate stock prices on the Ghana Stock Exchange.

The openness of Ghana's economy is recognized as a cause of volatility of its market (Adjasi, Harvey & Adyapong, 2008). I found that increases in lagged values of the macroeconomic variables created disequilibrium in aggregate stock price movements, and this caused current or potentially future values of stock prices to reduce. The Ghana stock market responded to this disequilibrium created by the macroeconomic variables by increasing in terms of aggregate stock prices in order to correct this disequilibrium, with only 3.5441% of the (remaining) deviation corrected in each subsequent time. Also, exchange rate changes have real economic costs, profitability, price stability and even a country's stability (Rehman, 2013).

In Ghana, Adjasi, Harvey and Adyapong (2008) studied the relationship between the foreign exchange market and stock markets to determine whether movements in the foreign exchange market have an effect on the Ghana stock market using the EGARCH model and found an inverse relationship between exchange rate volatility and stock market returns.

In answering the research questions, I conclude that exchange rate changes had a significant negative effect on stock market returns in Ghana. Thus, a depreciation of the Ghanaian currency will result in an increase in stock market returns. This finding is consistent with the findings of Adjasi, Harvey and Adyapong (2008). This implied that decreases in the month ending inter-bank exchange rates between the Ghana Cedi and the US dollar resulted in an increased aggregate stock price. The results suggested a decline in FDI in Ghana on the GSE. Notwithstanding the findings of my study, it is worth noting that investor speculations may significantly explain the effect of foreign exchange changes on asset prices in Ghana. Rehman (2013) observed that not all investors are rational and this has the tendency to limit arbitrage possibilities. This implies that shifts resulting from investor sentiments can cause exchange rate volatility with implications on asset prices or stocks.

Inflation

Rationally investors in Ghana will always expect their returns to hedge against inflation rate; this means in perfect situation excess returns on common equity should keep pace with the inflation rate. This proposition has been extensively tested by financial economists in the context of the Fisher hypothesis (Fisher, 1930), originally explained that the market interest rate includes the expected real interest rate and expected inflation rate. This assertion is far from conclusive particularly considering the Ghanaian situation. In Ghana, Anokye and Siaw (2010) carried out an investigation into how stocks can be hedged against inflation rate on the Ghana stock market in the long run. They explained that in Ghana after the economic restructuring in the 1980s and the

FINSAP, the county has always adhered to strict monetary and fiscal policies which have been reported to be very high and volatile in comparison to the economically developed countries like the USA.

Inflationary trends in Ghana has shown consistently an increasing trend while the market capitalization of the GSE All Share Index has in response appreciated by 116% in 1993 and gained 124.3% in its index level in 1994 (Anokye & Siaw, 2010). The (GSE quarterly bulletin, March 1995 reported that in1995 the index grew only by 6.3% and this very bad performance was partly attributed to high inflation rate and interest rate.

In this study, I found evidence of long run relationship between stock returns and inflation rate and reported that inflation rate does not significantly affect stock market returns in Ghana. This finding will help address the impending problem as to whether the Ghana stock market is a good hedge against inflation rate. I found that aggregate stock price movements are generally not very sensitive to general changes in the prices of goods, as measured by the CPI. This suggest that though Ghanaian investors might not like inflation rate (general prices of goods in the consumer basket) to increase, their investments in corporate stocks are not influenced by the general rate of inflation rate in the macroeconomy; investors are not only interested in their present consumption but also investments for their future. My study findings amplifies the findings of Anokye and Siaw (2010), thus making a further contribution to the literature on the issue of whether the common stocks in developing market offer a hedge against inflation rate.

Interest Rate

In this study, I used changes in the 91 Day Treasury-bill rate as a measure of changes in interest rate in Ghana. This is because Ghanaian investors view the rate as the opportunity cost of holding shares. Therefore, increases in the 91 Day Treasury bill rates will result in the realignment of the investment portfolio of Ghanaian investors in favor of stocks listed on the GSE. This inverse relationship underpins the already hypothesized statement that, an inverse relationship between interest rates and stock returns as measured by the GSE All Share Index is expected for this study. Notwithstanding, when this hypothesis is applied to my earlier findings to the Ghana stock market, I would expect a positive correlations between inflation rate and the GSE All Share Index for the specified period.

In a competitive market, equity stock may serve as a hedge against inflation rate. Issahaku (2013) investigated the causal link between macroeconomic variables and stock market returns and found that in the short run there existed a significant relationship between stock market returns and interest rate and further a causal relationship running from stock returns and interest rate.

In this study, interest rate changes exerted a significant negative effect on stock market returns in Ghana during the period under consideration. My finding suggested that an increase in government of Ghana 91-Day Treasury (T)-Bill rates caused aggregate stock prices to move down. My findings lead to the conclusion that Ghanaian investors may have had low risk appetite, yet a desire to increase their returns on investment. In this regard, slight monthly increases in government of Ghana T-bill rates, (which were

generally less risky than corporate stocks, but with relatively lower returns than corporate stocks) caused stock market investors to probably sell their stocks in order to purchase T-bills. Indicatively, increases in the T-bill rates resulted in an increase in demand for T-bills, additionally, the reduction in stock prices was construed as decrease in demand for corporate stocks in Ghana during the period.

In this study, I found that though insignificant, inflation rate had a positive effect on stock market returns in Ghana during the period; aggregate stock price movements were insensitive to general changes in the prices of goods, as measured by the CPI. It is my conclusion that, though Ghanaian investors might not like inflation rate(general prices of goods in the consumer basket) to increase, their investments in corporate stocks were not influenced by the general rate of inflation in the macro-economy. Thus, investors were not only interested in their present consumption but also investments for their future.

Money Supply

Though the economic impact of money supply changes has been debated, yet few propositions about the stock market have a universal acceptability (Issahaku, 2013). However, most members of the financial community in Ghana probably agree that changes in the BoG monetary policy strongly influence the Ghana stock market. Empirical findings by Badarudin, Ariff, and Khalid (2011), reported the influence of the rate of monetary growth on the stock market. Their findings demonstrates the extent to which money supply movements are now treated as superior indicators of trends in central bank monetary policy and how trends in the money supply can provide

information about future stock price movements. They study by Badarudin, Ariff, and Khalid (2011), found a new evidence of a direct correlation between endogenous money supply and aggregate bank stock return.

In this study, I found that money supply exerted a significant negative effect on stock market returns. This indicated that increases in money supply (M2) during the period caused aggregate stock prices to move down. In other words as cash, checking deposits (M1) and “near money" (i.e., savings deposits, money market mutual funds and other time deposits) in the general economy increased, stock prices were expected to decrease. This finding is an indication of the fact that as investors accumulated excess money (cash plus other liquid and easily cashable money instruments) in their hands or bank accounts, they became less likely to invest in corporate stocks. In this study I found that investors were not only interested in long-term investments (on the stock market) but also short-term investments in cash and other liquid and easily marketable securities during the period under study.

Putting the results of the first differenced multiple regressions (Table 12), the long-run cointegrating relationship between the variables (Table 24) and the estimated empirical error correction model 2, my study concluded that, interest rates, exchange rate, and money supply all have a negative short-run relationship with aggregate stock market returns in contrast with inflation rate that had a positive short-term effect on aggregate stock prices. My study finding further suggested that decreases in interest rates, exchange rate, and money supply resulted in immediate increases in aggregate stock prices and vice versa. Money supply on the other hand had short-term negative or positive effect on stock

price movements, implying, that increases or decreases in money supply could lead to decreases or increases in aggregate stock prices depending, *ceteris paribus.*

The normalized cointegrating coefficients, for inflation rate, interest rate and exchange rates were all negative (Table 23). My results revealed a negative long-run relationship between these variables and aggregate stock prices on the GSE. The long-run coefficients in the error term of the VECM also supported my finding of a negative long-run relationship between macroeconomic variables. Thus, in the long run, inflation rate, interest rates, and exchange rates are expected to increase as stock prices decreased and vice-versa. However, money supply has a long-run negative relationship according to the VECM model but positive long-run relationship with aggregate stock prices based on the normalized cointegrating coefficients of money supply (Table 23). My finding suggested that increases or decreases in money supply could in the long run lead to decreases or increases in aggregate stock prices, all things being equal..

Limitations and External Validity

Probabilistic sampling methods provide technically superior research designs than non-probabilistic ones (Insah,2013). However, in this study I applied a non probabilistic approach. The time frame did not permit me to randomly choose the time interval because the study made use of the GSE All Share Index and not the individual stocks listed on the GSE. Therefore adherence to a random selection will change the sequence of the time series between the periods January 2000 to December 2013 and this would have distorted the order of the time series. Another justification is that using the individual stock returns instead of the GSE All Share Index and selecting the individual stock

randomly will also change the sequence of the time series thus scrambling the data and research objectives will not be achieved.

Without using a non-probabilistic sampling in this study, I found that, considering the time span the underlying population would be representative to eliminate problems associated with reliability and external validity. Given this background, I made use of purposive sampling method and deliberately chose the specific time periods and statistical properties of the sample to address my formulated research questions and hypotheses for the period January 2000 to December 2013.

From inferential statistics the R-square value indicates that only about 1.972% of total variations in stock market returns on the GSE could be accounted for by changes in exchange rate, interest rate, inflation rate, and money supply. This indicates the probable exclusion of some other macroeconomic variables, which could have better predicted stock price movements on the GSE than the four chosen in this study, for example the GDP though an important variable was not included in the model.

In this study, I used the GSE All Share index as a proxy to stock returns, yet the index only factored the capital gains component of stock returns and excluded the dividend aspect of share returns thus limiting the full impact of actual stock returns. Again the p-value of the F-statistic indicated that the four macroeconomic variables did not significantly affect stock market returns in Ghana (Table 11) and this may also be due to the rapidity to which information on the selected variables impounds into the GSE All Share Index.

Recommendations for further Study

Different methodological approaches and macroeconomic variables had been used in prior research to understand the nexus between macroeconomic variables and stock market indices. For example Raja and Kalyanasundaram (2010) calculated bivariate correlations to verify the relationship among macroeconomic variables and studied the relationship between stock market index and economic variables among emerging economies and reported a high direct correlation between GDP and stock market index.

The econometric models I employed in this study assumed that external shocks had no significant effect on stock price movements. If the regression model I used had made room for external shocks such as the 2008-2009 global financial cycle and the 2012 political tension in the country due to the election controversy by introducing appropriate dummy variables, a better picture would have emerged.

In this study, I obtained an R-square value that indicated that only about 1.972% of total variations in stock market returns on the GSE could be accounted for by changes in exchange rate, interest rate, inflation rate, and money supply. The results signaled the probable exclusion of some other macroeconomic variables which could have better predicted stock price movements on the GSE than the four chosen in this study. Also, the p-value of the F-statistic indicates that the four macroeconomic variables do not significantly affect stock market returns in Ghana (Table 13) and this may also be due to the rapidity to which information on the selected variables impounds into the GSE All Share Index. Other macroeconomic variables such as crude oil prices, unemployment rate, fiscal deficit, external debt, industrial production and other external shocks have

been found to strongly impact stock market returns, including investor expectations(Raja and Kalyanasundaram, 2010). It is therefore recommended that future research in Ghana need to expand the macroeconomic variables to include a time series data of Ghana's GDP for a specified period and the effect of events information such as the 2012 political tension in Ghana as additional predictive variables on the GSE All Share Index.

Finally, the *p*-value of the Jarque-Bera test statistic I obtained clearly illustrated that residuals did not follow the normal probability distribution. This revealed the highly volatile nature and unpredictable nature of stock prices on the GSE. Resulting from this, I found the presence of high information asymmetry of the GSE and provide partial evidence of stock market inefficiency.

To avoid erroneous conclusions I recommend further research is carried out on the assertion of information asymmetry and degree of the efficiency of the Ghana stock market. It is only on the basis of scientific inquiry that will permit me to recommend that the GoG and regulatory authorities could take steps to ensure the free flow of information

Implications to Positive Social Change

The essentials of economic progress requires fair and open world trading systems that aims at the elimination of poverty and ensure a safer and more secure world for everyone now and for future generations. The Ghana stock market is one of the social, financial and economic institution that facilitate the rechanneling of financial products through an intermediation process to generate investment and positive social change in the Ghanaian society. The concept of social change has been defined as a comprehensive change in the social institutions and cultural products of a country (Grumer and Pinquart,

2011). The effective functioning and knowledge of macroeconomic effects of the GSE is *sine qua non* to the effective functioning and allocation of capital to the most productive sectors of the Ghanaian economy thus causing economic growth and social prosperity. Therefore knowledge on the nexus between the macroeconomic variables and stock market returns will enhance fair and open trading systems and will further drive institutional policies that ultimately will result in stronger financial market institutions in Ghana.

The find of oil in Ghana has heightened expectations of poverty elimination and investor confidence in the Ghanaian financial systems, particularly the Ghana stock market. The study of the effect of macroeconomic variables on the GSE All Share Index enhances both individual and institutional investment decisions for the allocation of scare financial resources that aims at improving the net worth of the various economic agents, namely: investors, governments, and policy makers all over the world.

Investors

From the descriptive statistics and absence in the randomness in data the aggregate stock prices of the GSE, all the selected macroeconomic variables were sensitive to periodic changes and speculation. Finance theory postulates that the rate of return an investor earns is dependent on the level of risk involved in that investment. Risk is measured by the standard deviation of returns.

The revelation of sensitivity of the descriptive statistics would assist investors in determining their investment time horizon (a waiting period of time which an investor is prepared to wait for his investment to mature) and eliminate the time lag for speculation.

Both institutional and individual investors can therefore earn above average returns from the GSE since the information on the sensitivity will improve the degree of efficiency on the GSE. Foreign firms may earn a higher return in terms of exchange rate pointing to the generally high volatile nature of the US dollar to the Ghanaian cedi and with effective risk management methodologies FDI is likely to be increased into the Ghanaian economy. The higher than expected returns and flows of capital from foreign sources could be reinvested into the Ghanaian economy for expansion and growth and invariably with positive change and implications on the socioeconomic conditions of the Ghanaian people.

The Government

The application of strategies, ideas, and actions, deliberately to promote social systems has characterized the definition of Morgan (2012). Consistent with this definition the study was carried out and revealed that the normalized cointegrating coefficients, for inflation rate, interest rate and exchange rates are all negative with values of -186.0238 -1136.958 and -55352.87, respectively and therefore inversely related to stock market returns in terms of the GSE All Share Index. Only money supply had a long run positive relationship with the GSE All share Index. The social implications are that variables with negative coefficients have the potential of limiting stock market returns and limiting effects on stock market development and growth. Therefore to bring about the desired effect of positive social change, the government of Ghana needs to constantly promote policies that will ensure stability of those macroeconomic variables that have limiting effect on the growth of the GSE.

In this study I found that inflation rate has an inverse relationship with the GSE All Share Index, therefore the government will have to focus more on those micro indicators such as stable prices, sustainable growth, elimination of balance of payments all with the objective of ensuring certainty, confidence and investment in technology and human capital.

The study found that the long run, inflation rate, interest rates, and exchange rates are expected to increase as stock prices decrease and vice-versa. Money supply on the other hand is expected to increase with increase in stock prices and vice versa in the long run. In terms of money supply the government needs build into the broad macroeconomic environment automatic stabilizers and maintain short term stability by altering monetary conditions through either raising or lowering interest rates through the expansion and contraction of money supply whenever necessary. Based on the monthly outcome of the relationship between broad money supply and the GSE All Share index, the study recommends a review of monetary policy to be made on an ongoing monthly basis.

Policy Implications

In this study, I found a linkage between stock markets and macroeconomic variables. Stock markets affect the overall economic development of a country. Also from literature stock markets can give a big boost to economic development through the creation of liquidity. Liquid equity markets make investment less risky and more attractive because they allow savers to acquire an asset and sell it more quickly and cheaply if they need access to their savings or want to alter their portfolios. The selected macroeconomic variables, namely, inflation rate, exchange rate, interest rate, and money

supply are very reliable indicators of future long-term growth, economic prosperity and socioeconomic change implications. Thus, policy direction by the government of Ghana should constantly aim at fostering more liquid stock markets. Within the scope of my study findings the GoG policy framework should be to strengthen the legal, supervisory, tax, and accounting systems of all listed entities to influence market liquidity. This will improve efficiency of the GSE and its trading systems thereby increasing the confidence with which investors trade in shares on the GSE

Conclusions

The May 2014 report by the IMF indicated that Ghana has shown a strong and broadly inclusive growth over the past 20 years as evidenced by significant advances in poverty elimination and improvements in its social systems. These developments have garnered Ghana into transitioning from lower to middle income status. Nevertheless, the report observed that about 25% of the population still subsists under the poverty line.

To sustain the trends in the growth for positive social change, a lot of effort will be required by government and policy makers to complement policy directions with the appropriate macroeconomic framework that will ensure sound macroeconomic policies thus, stimulating private sector lead growth with the intermediation role of the Ghana stock market.

In this study, I conclude that the Ghana stock market should not be viewed as a mere casino where players aggregate to place their bets on any or some of the listed stocks. Rather, individuals, households, policy makers, analysts, and the GoG should constantly strive to ensure that actions and inactions on their part interspersed with

adequate knowledge on how macroeconomic variables facilitates investment, promote the efficient allocation of capital to relevant sectors of the Ghanaian economy, and stimulate long-term investment and socio-economic growth. It is therefore recommended that the central bank of Ghana should have the independence to take actions that will stabilize macroeconomic variables in order create an environment for effective returns forecasts on the Ghana stock market and ensure confidence in financial asset holdings for both Ghanaian investors and foreign investors.

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Curriculum Vitae

Name: Charles Barnor

Personal Vision: I envision a distinctively different 21st-century learning community where knowledge is judged worthy to the degree that it can be applied to the immediate solutions of critical societal challenges, thereby advancing the greater global.

Academic Qualifications:

- PhD. (2014), Walden University, United States of America
- Master of Professional Accountancy (1999-2000), University of Canberra, Australia.
- MBA Finance (1997-1999), University of Canberra, Australia (UCA)
- BSc. Adm. Banking and Finance, (1991-1994), University of Ghana (UG)

Professional Qualifications:

- Australian Society of Certified Practicing Accountants (CPA)
- Fellow, Institute of Professional Financial Managers (IPFM), United Kingdom

Research Interest, Passion, Leadership and Other Interest

- Financial markets development,
- International trade dynamics,
- Firm productivity and foreign direct investment,
- Development Finance,
- Strategy and Financial Forecasting Models (FFMs) that enhances competitive advantage in corporate entities.
- Standardization of corporate systems through well laid out Standard Operation Procedures (SOPs) that are highly responsive to change.
- Strategic Management and Organizational Change

External Research Affiliations

- Researcher, International Journal of Economics and Finance
- Researcher, Journal of Business Research, UPSA
- Researcher, Africagrowth Research Institute
- Researcher, African Economic Research Consortium Network.

Publications

Barnor, C. and Odonkor, A.T. (2012). Capital adequacy and the performance of Ghanaian banks. *Journal of Business Research 6(1&2).* Retrieved from original source document from UPSA library.

Odonkor, A.T., and Barnor, C. (2011). Risk management practices: The Ghanaian firms' perspective. *Journal of Business Research 5(1&2).* Retrieved from original source document from UPSA library.

Nyarko, P.A., Amponsah, N. E. and **Barnor, C.** (2011). Effects of exchange rate regimes on Foreign Direct Investment inflows in Ghana. *International Journal of Economics and Finance. 3(3).* Retrieved from Business Source Complete.www ccsenet.org/ijef.

Dissertation Supervision and Research Applications.

- I have supervised over 150 undergraduate dissertations to date.
- I have constantly liaised with industry to obtain data to support research.

Courses Lectured and Facilitated

Graduate Level

- Accounting and Financial Systems

- Money and Capital Markets
- Strategic Management MBA

Undergraduate Level

- Banking and Investment Analysis
- Business Finance
- Business Policy and Strategy
- Consumer Dynamics and Sales Management
- Financial Information for Marketing
- Marketing Management and Marketing of Financial Services

Academic Appointments

- 2013 – To date: Renewed Appointment: Head, Department of Banking and Finance, UPSA
- 2009 – 2012: Head, Department of Banking and Finance, UPSA.
- 2008 – Lecturer: Department of Banking and Finance, UPSA
- 2007 – To date: ACCA Course Head, UPSA
- 2006 –Lecturer Department of Accounting, UPSA
- 1998 – 2000: Adjunct Lecturer, International Finance, Strategic Management and Corporate Finance, University of Canberra, Australia (UCA).

Ongoing Research

- Barnor C. and Odonkor T. A. The effect of asymmetric information on dividend policy: The Ghanaian Perspective

- Barnor C. and Odonkor T. A. Estimation risk, information, and the conditional CAPM: Theory and evidence in Ghana
- Barnor C. and Adu Twumwaah D. A. Extending the capital asset pricing model: The reward beta approach.
- Barnor C. and Adu Twumwaah D. The Fama French model or the capital Asset pricing model: The Ghanaian Evidence.
- Barnor C. and Adu Twumwaah D. Risk Management of E-Banking activities in Commercial Banking in Ghana.

- Barnor C. A. Determinants of Bank Profitability of Listed Commercial Banks in Ghana.
- Barnor C. A. Corporate analysis of profitability and share performance of listed banks on the Ghana Stock Exchange.

Hobbies

- A Professional Scrabble Player and former Ghana's Scrabble Champion in 1998
- Appointed by the Government of Ghana to be a member of the Ghana Table Tennis Association.
- Playing organ and Classical music
- Helping students to achieve excellence with their career.
- Currently the President of the University Teachers' Association of Ghana (UTAG), UPSA branch.

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