

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**INSTITUTE OF DISTANCE LEARNING**

**THE RELATIONSHIP BETWEEN INTEREST RATE AND PERFORMANCE OF  
THE GHANAIAN STOCK MARKET**

**KNUST**

by

**Abdul-Malik Abdul-Mumin, BA Accounting**

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**COMMONWEALTH EXECUTIVE MASTER OF BUSINESS ADMINISTRATION**

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## DECLARATION

I, **Abdul-Malik Abdul-Mumin** hereby declare that this submission is my own work towards the **CEMBA** and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for award of any other degree of the University except where due acknowledgement has been made in the text.

**A. MALIK A. MUMIN (PG2018108)**

.....  
Student Name & ID

.....  
Signature

.....  
Date

Certified by:

**JONATHAN N. O. WELBECK**

.....  
Supervisor(s) Name

.....  
Signature

.....  
Date

Certified by:

.....

.....  
Head of Department Name

.....

.....  
Signature

.....  
Date

## ACKNOWLEDGEMENT

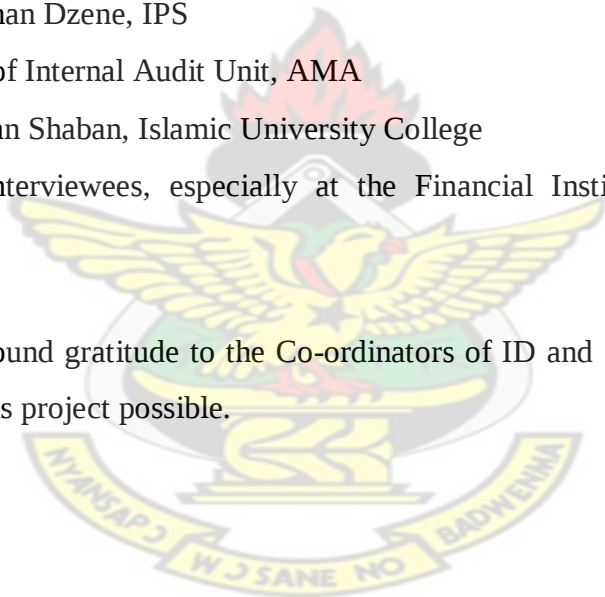
The first copies of this project work generated a number of communications from my supervisor and colleagues. Some were favourable and others critical but all helped in preparing the final edition.

We thank the Gracious and Merciful Allah for making this possible.

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## DEDICATION

To the memory of my late mother, **Hajia Naana Fathimat** and **Madam Rakiya Musah** who supported me throughout the project work.

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## **ABSTRACT**

This study investigates the relationship between interest rate and stock performance using a monthly time series data from the Ghana Stock Exchange for the period 1992 to 2006. Data on stock performance, proxied by the All-Share Index, the interest rates also measured by the Treasury bill rate, were obtained from the Ghana Stock Exchange and Bank of Ghana respectively. The analysis began with a test for the unit root characteristics of the variables, as a regression involving nonstationary series yield spurious outcomes. Using the traditional unit root test procedure, the Augmented Dickey Fuller (ADF) test, the series were found to be integrated of order one (1). Johansen and Julius trace and maximum eigenvalue test for cointegration were carried out to test for the existence of long run relationship among the variables; this was followed by the estimation of the vector error correction model, which estimates the short and long run impact relationship between stock performance and interest rates, after controlling for other exogenous factors including money supply. The study found no cointegrating relationship among the covariates. The study therefore estimated an Ordinary Least Squares (OLS) regression of the impact of interest rates on stock prices using differenced series of all variables. The study found a significant short run impact of interest rates on stock performance. A Granger Causality test was also performed to test the existence of a reverse casual effect of interest rates and stock performance. The findings suggested a bi-causal link between stock performance and interest rates.

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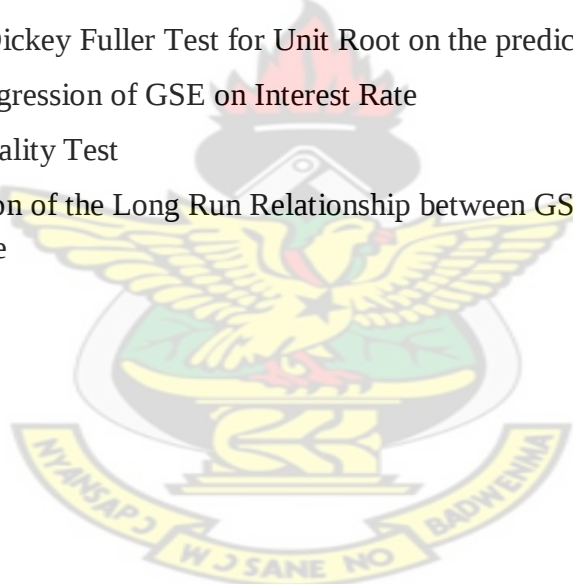
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## CHAPTER ONE

### INTRODUCTION

#### 1.0 Background Information

The role of the stock market in economic development cannot be overemphasized. It is often argued that the strength of the national economy and the private sector was influenced by the size and strength of the capital market led by the stock market. The stock market serve as the means through which private and public sector organizations raise capital for investment. It further acts as leading indicator of the business cycle but it is also a predictor of economic activity, Fama (1991). The provision of funds to finance domestic capital formation is increasingly being recognized as a key factor bearing upon the prospects for long-term economic growth in developing countries. However in the developing countries the facility for raising industrial and commercial capital is either absent or difficult to come realized. Faced with the reality of a much reduced supply of foreign funds from previous sources (such as commercial banks), governments in many developing countries are giving increased attention to capital market development as a way of improving domestic resource mobilization, enhancing the supply of long-term capital and encouraging the efficient use of existing assets, Dailami and Atkin (1990).

Over the past few decades, the interaction of share returns and the macroeconomic variables especially interest rates, growth and industrial production has been a subject of interest among academics and practitioners. It is often argued that stock prices are determined by some fundamental economic variables such as the interest rate, the exchange rate, industrial production, inflation etc and some noneconomic variables such as natural disaster and managerial incompetence. An empirical evidence from the financial press indicates that investors generally believe that monetary policy and macroeconomic events have a large influence on the volatility

(standard deviation of the returns of the stock price) of the stock price. This implies that macroeconomic variables can influence investors' investment decision and motivates many researchers to investigate the relationships between share returns and macroeconomic variables.

Interest rates movement is critical in influencing the performance of capital markets and hence the extent to which the market may be able to play its role. For example, most developing economies have embarked simultaneously on revitalizing their stock markets as well as implementing financial liberalization policy programmes, including *interest rate* and exchange rate liberalization. Monetary policy affects stock returns by influencing **interest rates** through credit position and investment level of the firm. Tight monetary policy (the central bank reducing the supply of money into the economy) increases interest rates, worsening the cash flow, net of interest, and therefore the balance sheet position of the firm. As a result, creditworthiness of the firm is reduced, creating a credit constraint and reducing investment. Consequently, the firm's value goes down and stocks are no longer attractive, Thorbecke (1997).

The Ghanaian stock market is the largest unit of the Capital market; the latter which is made of the stock market and the bond market. It consists of the primary market, where new issues are distributed to investors, and the secondary market, where existing securities are traded. The Ghanaian economy has over the last seven (7) years witnessed relative macroeconomic stability in terms of GDP growth, significant reduction of interest rates, stability of the cedi/dollar exchange rate and inflation rates below 20%. This relative stability has been attributed to the growth of major sectors of the economy including the money market (financial institutions) and capital markets (debt and equity market). The drop of interest rates following declines in inflation and prime rates has shifted the attention of investors to the stock market as the better means of investment. Empirical evidence from the Ghana Stock Exchange (GSE) indicates that the relative stability of interest rates

and other macroeconomic variables have being the main reason for the growth of the stock market in recent years.

### **1.1 Problem Statement**

It is often argued that stock prices are determined by some fundamental macroeconomic variables such as the interest rate, the exchange rate and money supply and further argued that, the influence of interest rates on stock market was indeterminate and was rather empirical.

A rise in interest rates (lending rate) will cause a shift in capital structure from debt capital to equity capital; increased use of equity capital ultimately lead to the growth of the stock market.

The impact of interest rates induced by monetary policy, on the GSE index can be explained by the following factors: the money supply in Ghana is influenced mainly by foreign investors. In an open economy, if the domestic interest rate is high relative to other countries, the foreign investors are likely to leave their money in the bank rather than invest in the risky stock market. If the interest rate is low the investors might prefer to invest in other markets. It is further argued that short term interest rates appear with a positive coefficient while long term interest rates show a negative influence on share prices.

Given the above background, the study provides answers to the following issues;

1. What is the explicit relationship between interest rates and stock performance?
2. Is there a bi-causal relationship between interest rates and stock performance?
3. What is the short and long run relationship between interest rates and stock prices?

## 1.2

### Objectives

The general objective of this study is to assess the influence of interest rates on stock market development or performance.

The following are the main objectives of the research.

- to evaluate the existence of the bi-causal relationship between interest rates and stock performance
- to evaluate the existence of a long run relationship between interest rates and stock performance
- and to evaluate the influence of control variables including M2 and the exchange rate on stock performance.

Where  $M2 = C + D + T + MMF$

C = Currency in circulation

D = Checkable deposits

T = Time and saving deposits

MMF = Primary money market, mutual funds, money market deposit accounts plus overnight repurchase agreements.

## 1.3 Rationale

Essentially, studies into the relationship between Interest rates and stock market development will help in two directions: policy formulation and development of existing literature on the subject. Policy makers may understand the interest rate and stock market development dynamics and will inform the portfolio choice or diversification by investors in the period of lower (higher) interest

rates. In order to boost the growth of the capital market, government may pursue appropriate interest rate policies that will redirect funds to capital market.

## **1.4 Methodology**

Using a monthly time series data of stock market performance indicator, GSE-All share index, interest rate and the control variables from 1993 to 2006, the paper investigates the relationship between stock market performance and interest rates. The choice of a monthly data over annual is simply that higher frequency data increases efficiency of estimates and eliminates potential biases resulting from the use of lower frequency information.

This paper employs the Engel Granger 2 step approach test and Granger-causality test to determine whether interest rates are cointegrated (hence possibly causally related) with GSE index in the Ghanaian stock exchange. The Augmented Dickey-Fuller (ADF) approach is used to pre-test the order of integration for all time series variables. The lag length for the time series analysis is determined by choosing the lag length given by the minimum Akaike Information Criteria and Schwarz Information Criteria. Lagrange Multiplier tests are run to ensure that the residuals from the chosen lag length are serially uncorrelated.

### **1.4.1 Unit Root Test**

Time series data are generally non-stationary implying that the mean and variances of the series are time dependent or are not constant and the covariance is not zero. The non-stationary series usually depicts a stochastic or deterministic trend when plotted over time but a visual inspection of the time series plot of the variables do not provide an accurate picture of the existence of a unit root, it is therefore prudent to employ a statistical procedure. As indicated above a formal test, using ADF is carried out to assess if the series do have unit root.

#### **1.4.2 Engel Granger 2 step Procedure**

To investigate the long-run relationship of the GSE index and interest rates, we employed the Engel Granger 2 step Procedure cointegration test. The Engel Granger 2 step Procedure is usually used in a bi-variate model

#### **1.4.3 Granger Causality Test**

In order to examine whether there are lead-lag relationships between GSE returns and interest rates, we run the Granger-causality test. If the time series of a variable is nonstationary,  $I(1)$  and causality test can be is not cointegrated, the variable is converted into  $I(0)$  by first differencing and the Granger-applied.

### **1.5 Chapter Organization**

The paper is organized as follows: chapter one is on introduction chapter two undertakes a brief review of empirical literature and chapters three and four provides the methodology and data analysis, presentation and discussion. The last chapter, five presents a summary and policy recommendation to the paper.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter presents the empirical review literature on works done by some researchers, of various disciplines in developed and developing countries to look at the strong influence of the macroeconomic variables which include interest rate, money supply, inflation, exchange rate and the stock performance and the existence of a long-term equilibrium relationship between the selected macroeconomic variables.

#### 2.1 Theoretical Literature

##### ***Arbitrage Pricing Model (APT)***

From Maysami et al(2004), “concentrating primarily on the US stock exchanges, such early studies attempted to capture the effects of economic forces in a theoretical framework based on the Arbitrage Pricing Theory (APT) developed by Ross (1976). The APT essentially seeks to measure the risk premia attached to various factors that influence the returns on assets, whether they are significant, and whether they are “priced” into stock market returns. Accordingly, Chen, Roll, and Ross (1980), having first illustrated that economic forces affect discount rates, the ability of firms to generate cash flows, and future dividend payout, provided the basis for the believe that a long-term equilibrium existed between stock prices and macroeconomic variables”.

Similarly, Granger (1986) and Johansen and Juselius (1990) researched into the existence of a long-term equilibrium relationship among selected variables through cointegration analysis, which paved the way for a preferred approach to examining the economic variables-stock market relationship.

The research further explained that, a set of time-series variables are cointegrated if they are integrated of the same order and a linear combination of them is stationary. Such linear combinations would then point to the existence of a long-term relationship between the variables. An advantage of cointegration analysis is that though building an error-correction model (ECM), the dynamic co-movement among variables and the adjustment process toward long-term equilibrium can be examined.

Employing this methodology, there has been a growing literature showing strong influence of microeconomic variables and stock markets, mostly for industrialised countries. Additionally, researchers have begun to turn their attention to examining similar relationships in developing countries, particularly those in the growth engines of Asia (Malaysia, Thailand, Japan and Korea).

Other research works focused on the impact of interest rate, inflation, money supply, exchange rate and real activity on the 1997 Asian financial crisis, which also confirmed the influence of macroeconomic variables on the stock market indices in six other countries with different economic structures.

The cointegration analysis through error correction mechanism (ECM) indicated significant long-run and short-run relationships between the variable, real interest rate on the performance of the Egyptian stock market, implying that real interest rates had an impact upon stock market performance. This paper aims to complement the literature in this area.

Change in the money supply provides information on money demand, which is caused by future output expectations. If the money supply increases, it means that money demand is increasing which in effect, signals an increase in economic activity. Higher economic activity implies higher cash flows, which causes stock prices to rise.

Accordingly, the price of a stock is a function of its monetary value and the perceived risk is high. Tightening the money supply raises the real interest rate, which raises the discount rate and reduces the value of the stock as argued by the real activity theorists.

As discussed above, the literature reveals differential causal pattern between key macroeconomic variables and stock prices. This relationship varies in a number of different stock markets and time horizon in the literature. This paper will add to the existing literature by providing adequate results, which is based on more than one technique about causal links for the nine year- monthly data.

### ***Capital Asset Pricing Model (CAPM)***

The modern portfolio theory was first developed by Markowitz, who constructed the mean-variance model. The model was designed to construct the optimal portfolio based on idea that between risk and return there is a positive relation. For his work, Markowitz received Nobel Prize in 1990. He proved that investors should create their portfolio in order to offer them a maximum level of return for a given level of risk or, a minimum level of risk for a given level of return.

Markowitz shown in his theory that stocks are related to each other and that the risk can be decreased through diversification. The proof is very simple: if one takes 2 stocks and he will calculate the correlation coefficient, the value of this coefficient would be less than one and if the respective stocks are included in a portfolio, the overall risk of this portfolio would decrease.

Even though the theory of Markowitz was spectacular and useful in this field, it had some inconveniences. For instance, it is done taking into account a very abstract concept in Economics, i.e. utility. The economical practice has shown that the models constructed based on the idea of utility are very difficult or even impossible to be applied. Also, the mathematics beyond of the Mean-

Variance is very sophisticated, which makes the application to be very difficult when portfolio consist of a great number of shares. Specifically, to estimate the benefits of diversification would require that practitioners calculate the covariance of returns between every pair of assets, which is very difficult. Finally, the critics of the model said that it's a static one, which makes the results to be biased.

In 1964 (Sharpe) and in 1965 (Lintner) continued the work of Markowitz and constructed the famous Capital Asset Pricing Model (CAPM). Basically, the model was developed to explain the differences in risk premium across assets. The CAPM shows clearly that these differences are generated by the differences in the riskiness of assets, i.e. the higher the risk of an asset the higher the risk premium demanded by investors.

The general equation of the model is:

$$\bar{r}_i = r_f + \beta_i (\bar{r}_m - r_f)$$

where:

$\bar{r}_i$  - expected return of stock i

$\beta_i$  - relative risk of share i

$\bar{r}_m$  - expected return of the market portfolio

$r_f$  - risk-free interest rate

What CAPM says is that the equilibrium in the capital markets is characterized by only 2 numbers:

The return for waiting, i.e.  $r_f$ ;

The extra return, i.e.  $\overline{r_M} - r_f$ .

A very important consequence of this model is the separation theorem, which says that in the capital markets the risk has two components: diversifiable (or non-systematic) risk and non-diversifiable (systematic) risk. When pricing, the only significant risk is the systematic one, since investors can just get rid of the non-systematic risk through diversification. Sharpe & Lintner show that the true measure of risk is the well-known coefficient beta.

Generally, the model became extremely famous in the modern portfolio theory. Things were clear: stocks with beta lower than 1 were considered passive stocks and stocks with beta higher than 1 were considered aggressive and risky. Depending on their appetite toward risk, investors would choose the stocks in their portfolio according to the value of beta.

Empirical tests on the CAPM have produced varying results. Roll (1977) cast a serious doubt on the testability of the CAPM by arguing that the only testable implication of the CAPM is the mean-variance efficiency of the market portfolio. Roll and Ross (1994) suggested that the lack of relationship between sample mean returns and estimated betas found in a number of studies is because market portfolio proxies are mean-variance inefficient. The number of studies is voluminous and some studies have presented empirical evidence consistent with the CAPM while others have shown that there is no evidence to reject the CAPM. One of the latest studies by Cheo (1995) defended the CAPM by providing explanations for any missing variable in any empirical test of the CAPM.

Though, some criticisms of CAPM appeared. One very known critic in literature belongs to Fama and French. In 1992, they discovered a negative relationship *between risk and return*. Fama and French came up with the conclusion that a more realistic approach of the risk in the market is the multi-index models. They argued that size of the firm and the book to market value have a significant influence on the performance of a stock.

However, Sharpe defended his model. In fact, even the multi-index model realized by Fama&French in 1993 does not eliminate beta, but it just adds some other variables. Sharpe suggested that to think that stocks' returns are not related to market portfolio's returns is a mistake and misleading. He agrees that CAPM does not reflect the whole reality of the market, but it is very important as a guide for investors. In an interview appeared in "Dow Jones Asset Manager" (May/June, 1998) Sharpe answered at this question by saying that "The CAPM is not dead. Anyone who believes markets are so screwy that expected returns are not related to the risk of having a bad time, which is what beta represents, must have a very harsh view of reality". He continues: ""Is beta dead?" is really focused on whether or not individual stocks have higher expected returns if they have higher betas relative to the market. It would be irresponsible to assume that is not true. That doesn't mean we can confirm the data. We don't see expected returns; we see realized returns. We don't see ex-ante measures of beta; we see realized beta. What makes investments interesting and exciting is that you have lots of noise in the data. So it's hard to definitively answer these questions." Sharpe believes that CAPM is relevant, but it needs revising.

In favour of CAPM other opinions came. These opinions are against of the study realized by Fama and French in 1992. It is said that beta has no role to explain the cross-sectional variation in returns. Also, the results of their study were criticized (see Kothari, Shanken and Sloan - 1995).

## 2.2 Empirical Evidence

An efficient capital market is one in which security prices adjust rapidly to the arrival of new information. In this case, the current prices of securities reflect all information about the security. What this means is that no investor should be able to employ readily available information in order to predict stock price movements quickly enough so as to make a profit through trading shares, thus no arbitrage.

The efficient market hypothesis (EMH), in particular semi-strong form efficiency, which states that stock prices must contain all relevant information including publicly available information, which has important implications for policy-makers and the stock-broking industry alike. Policy makers, for example, should feel free to initiate national macro-economic policies without fear of influencing capital formation and stock trade process.

Moreover economic theory suggests that stock prices should reflect expectations about future corporate performance, and corporate profits generally reflect the level of economic activities. If stock prices accurately reflect the underlying fundamentals, then the stock prices should be employed as leading indicators of future economic activities, and not the other way round.

Considering the effect of macroeconomic variables such as money supply and interest rate on stock prices, the efficient market hypothesis suggests that competition among the profit-maximizing investors in an efficient market will ensure that all the relevant information currently known about changes in macroeconomic variables are fully reflected in current stock prices. In this case investors will not be able to earn abnormal profit through prediction of the future stock market movements.

## Macroeconomic Impact of Stock Market Indexes

The dynamic relationships between macroeconomic variables and share returns have been widely discussed and debated. The basis of these studies has been the use of models which state that share prices can be written as expected discounted cash flow. Thus, the determinants of share prices are the required rate of return and expected cash flows (Elton and Gruber, 1991). Economic variables which impact future cash flows and required returns can therefore be expected to influence share prices.

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Fama and Gibbon (1982) examine the relationship between inflation, real returns and capital investment. Their results support Mundell (1963) and Tobin (1965) findings that expected real returns on bills and expected inflation rates are negatively correlated. The authors suggest that this relationship arises with share returns due to a positive relationship between expected real returns on financial assets and real activity. Fama (1991) argues early empirical work showing that expected inflation is negatively related to share prices implied the measured relationship between inflation and share returns is a spurious one. Geske and Roll (1983) found that the US stock price is negatively related to the inflation rate and positively related to the real economic activity. The second relationship is consistent with Fama (1981), and Lee (1992) findings.

Lee (1992) argues that share returns signal changes in expected inflation due to a link between money supply and expected real activity. Darrat (1990) examines the effects of monetary and fiscal policy on share returns in the Canadian share market and concludes that budget deficits, long-term bond rates, interest rate volatility and industrial production determine share returns. In testing the validity of the Arbitrage Pricing Theory, Chen, Roll and Ross (1986) conclude macroeconomic variables are causally related to share returns. Najand and Rahman (1991) applied the Schwert

(1989) volatility measure and found evidence of the existence of a causal relationship between share returns and inflation. An increase in interest rate would increase the required rate of return and the share price would decrease with the increase in the interest rate. An increase in interest rate would raise the opportunity costs of holding cash, and the trades off to holding other interest bearing securities would lead to a decrease in share price. French et al. (1987) documented theoretically, that stock returns responded negatively to both the long term and short term interest rates. However, Allen and Jagtianti (1997) pointed out that the interest rate sensitivity to stock returns has decreased dramatically since the late 80's and the early 90's because of the invention of interest rate derivative contracts used for hedging purposes. Furthermore, Bulmash and Trivoli (1991) found that the US current stock price is positively correlated with the previous month's stock price, money supply, recent federal debt, recent tax-exempt government debt, long-term unemployment, the broad money supply and the federal rate. However, there was a negative relationship between stock prices and the Treasury bill rate, the intermediate lagged Treasury bond rate, the longer lagged federal debt, and the recent monetary base.

When the domestic currency depreciates against foreign currencies, export product prices will decrease and, consequently, the volume of the country's exports will increase, assuming that the demand for this product is elastic. Mukherjee and Naka (1995), Achsani and Strohe (2002) confirmed this positive relationship existed in Japan and Indonesia both two large export countries. Ajayi and Mougoue (1996) also showed that an increase in stock price has a negative short-term effect on domestic currency values but in the long term this effect is positive, while currency depreciation has a negative short and long-term effect on the stock market.

Chen (1991) studied the relationship between changes in financial investment opportunities and changes in the macroeconomy in the U.S pointed out that the market excess returns can be

forecasted using macroeconomic variables such as the lagged production growth rate, the term structure, the T-bill rate, the default spread and the dividend yield. The market excess on returns is negatively related to the economic growth variables (such as the T-bill rate, lagged production growth rate, the default spread and term structure) and positively related to expected future economic growth factors (such as the market dividend price ratio and unexpected future GNP growth). Chen, Roll and Ross (1986) suggested the following macroeconomic variables were systematically affecting asset returns: the spread between long and short-term interest rates; expected and unexpected inflation; industrial production growth and the spread between high and low-grade bonds. Industrial production growth is suggested to proxy for real cash flows, inflation affects returns as nominal cash flow growth rates are not equivalent to expected inflation rates, whilst the spread between long and short-term interest rates and the high or low grade bond spread affect the choice of discount rate.

Similar to Chen, Roll and Ross (1986), Hamoa (1988) determines whether the observed relationships between macroeconomic variables and share returns are still applicable when the analysis is conducted in the Japanese market. The author also includes international trade variables. Apart from industrial production appearing insignificant in asset pricing, Hamao's findings are consistent with Chen, Roll and Ross (1986) study. Poon and Taylor (1991) parallel the Chen, Roll and Ross (1986) study on the United Kingdom market. Their results show that macroeconomic variables do not appear to affect share returns in the United Kingdom as they do in the U.S. Poon and Taylor (1991) suggest that either different macroeconomic factors have an influence on share returns in the United Kingdom or the methodology employed by Chen, Roll and Ross (1986) is inefficient. The authors reemphasize the importance of representing only the unexpected component of share returns and macroeconomic variables in the model and argue Chen, Roll and Ross (1986) findings may be an example of a spurious regression. The authors use an ARIMA model to test their data and use the residuals from the model as innovations.

Theoretically, the money supply has a negative impact on stock prices because, as money growth rate increases, the inflation rate is also expected to increase; consequently the stock price should decrease. However, an increase in the money supply would also stimulate the economy and corporate earnings would increase. This would likely result in an increase in future cash flows and stock prices. Mukherjee and Naka (1995), Maysami and Koh (2000), and Kwon and Shin (1999) found that there is a positive relationship between money supply and stock returns.

During the past decade, researchers have extended the study of interaction between macroeconomic variables and share returns to countries other than the U.S. For example, Kwon and Shin (1999) examined the Korean market and found the Korean stock markets are cointegrated with the production index, exchange rate, trade balance and money supply. The authors did not find the stock price index to be a leading indicator for macroeconomic variables. Leigh (1997) studied the Singapore stock exchange (SSE) and found the Singapore stock index to be positively related to money demand but with no relationship to macroeconomic fundamentals. Similar results have been identified by Fung and Lie (1990) in Taiwan. Gjerde and Sættem (1999), Achsani and Strohe (2002) examined small regional markets such as Norway and Indonesia and conclude that stock returns respond negatively to changes in interest rate, but positively to oil prices (Norway being a net oil exporting country), and real economic activity. However, the relationship between stock price and inflation rate is ambiguous. Achsani and Strohe's (2002) study showed negative relationships between stock price and inflation rate as well as call money rates. However, a positive relationship was identified between the stock price and gross domestic product, money supply and exchange rate. Furthermore, the authors failed to find any significant relationship between stock price and export or long-term interest rates. Increases in oil price will be beneficial to those countries whose export products are derived from crude oil or refined oil products. Thus, there should be a positive

relationship between the oil price and stock prices in those oil-exporting countries. But there should be a negative relationship in oil importer countries. Increases in oil price would increase the cost of production and, consequently, the expected cash flow would decrease. However, Chen et al. (1986) failed to find any relationship between the stock index and the oil price in US.

Ayadi (1991) investigated the relationship that existed between aggregate stock prices in Nigeria and macroeconomic factors. Like Chen et al, he used changes in the growth of macroeconomic variables to generate unanticipated factors. His tests included real money supply, consumer price index, industrial production, nominal long-term interest rate, and nominal short-term interest rate and dividend payments. His findings were not far from those of Chen et al. (1986) that macroeconomic factors have significant explanatory power in stock price determination in Nigeria. Ekpenyong and Obieke (1994) also investigated the functional relationship between macroeconomic factors and stock prices in the Nigeria market. Their test involved ten macro-variables: money supply, exchange rate, minimum rediscount rate, inflation rate, and savings deposit rate. The rest are lending rate, manufacturing production, the number of industrial securities, the industrial production, and the value of industrial securities. Contrary of Ayadi's (1991) findings their results showed at the time that seven of the variables employed in their tests did not have any significant explanatory power in the pricing of Nigerian stock. These are: money supply, exchange rate, inflation rate, rediscount rate, deposit rate, lending rate, manufacturing and industrial production.

Another empirical study related to the APT in emerging markets in a paper by Diacoginnis et al. (2001). They analyse the multi-factor risk-return relationship for the Greek Stock Market. By generating the underlying factors from observable macroeconomic variables, they estimated systematic risks (beta coefficients) for each stock. The procedure involved the performance of 140 time series regression (70 for each period) using 28 quarterly observations with OLS. They

performed stationarity tests for the variables involved and time series regressions using the Augmented Dickey-Fuller (ADF) tests. They find that for the sub-period 1980-86 three factors, namely; inflation, current account balance and unemployment have significant explanatory power for the Greek market returns. This is in total contract with the sub-period 1986-92, for which the tests show that security returns are not affected by those three factors. This confirms the changing significance of macroeconomic variables phenomenon.

Ozcam (1997) empirically tests APT on the Istanbul Stock Exchange. His test involves a sample population of 54 stocks for the period January 1989 to July 1995. He used the two stage regression technique employed by Chen et al. (1986) to separate seven macroeconomic variables into expected and unexpected series and performs a two-phase test on them. Beta coefficients of expected factors are found significant for asset returns.

The first test involves the application of factor analysis method on daily returns for each year during the period. The second test employs multivariate regression process in order to examine the significance of macroeconomic variables on asset returns. His results state unstable findings, i.e. pricing of a factor may appear to be significant in one multivariate analysis but not in another when different combinations of macroeconomic factors are included. He therefore concludes that only expected Treasury bill interest rate beta is found significant for explaining asset returns.

Using the APT framework, Fifield et al (2002) investigated the extent to which global and local economic factors explain return in 13 emerging stock markets (ESMs) namely: Greece, Korea, Mexico, Portugal, Singapore, Thailand, India, Turkey, Chile, Hong Kong, Malaysia, the Philippines and South Africa from 1987-1996. Their test involved six domestic factors; inflation, foreign exchange rates, short term interest rates, gross domestic products, the money supply and the trade balance and six global factors: world market return, world inflation, commodity prices; world industrial

production, oil prices and US interest rates. They applied principal component analysis technique in order to reduce the dimensionality in the economic data set to a limited number of core factors and the dominant principal components are extracted and used as inputs into a regression analysis to explain index returns. They find four domestic factors (gross domestic product, inflation, money supply and short term interest rates) to be priced while, for the global variables; world industrial production and world inflation hold significant explanatory power of stock returns. Additionally, the regression analysis indicates that the importance of global variables in explaining returns differs from one country to another. Furthermore, the combination of the local variables with the world information variable set significantly increases the proportion of variation in return explained in four markets (Greece, Mexico, Portugal and Thailand). By contrast, neither world nor local factors are significant in five countries (Chile, Hong Kong, Malaysia, the Philippines and South Africa).

In a study of the Indian stock market, Bhattacharya and Mukherjee (2003) investigate the nature of the causal relationship between stock prices and macroeconomic aggregates India. By applying the techniques of unit-root tests, co-integration and the long-run Granger non-causality test recently proposed by Toda and Yamamoto (1995), they test the causal relationships between the BSE Sensitive Index and the five macroeconomic variables, viz., money supply, index of industrial production, national income, interest rate and rate of inflation using monthly data for the period 1992-93 to 2000-01. Their major findings are (i) there is no causal linkage between stock prices and money supply, stock prices and national income and stock prices and interest rate, (ii) index of industrial production leads the stock price, and (iii) there exists a two-way causation between stock price and rate of inflation.

In sum, several studies have been undertaken on the link between macroeconomic activity and stock performance in but not much exist on the links using data from the Ghanaian economy. This study

therefore seeks to investigate the link between interest rates and stock performance using monthly time series data from the Ghanaian stock market.

# KNUST



## **CHAPTER THREE**

### **OVERVIEW OF THE GHANAIAN ECONOMY**

#### **3.0 Introduction**

Since the inception of Economic Recovery Programme (ERP) in 1983, the economic development agenda has focussed on achieving accelerated economic growth. Between 1984 and 2004, the Ghanaian economy has achieved a sustained average growth rate of about 4.8% yearly with the agricultural sector continuing to be the backbone. Notwithstanding the paradigm shift in policy towards promoting agro-based industrialisation, the structure of the Ghanaian economy has not changed much particularly the industrial sector which at best can be described as stagnated sector. The services sector however over the decade, 1995-2005, has become the fastest growing sector in Ghana with an average growth rate of about 5.1% compared to the agricultural (4.8%) and industrial (4.1%) sectors. Although the impressive performance of the service sector is seen to be a step in the right direction, some economist still maintain the manufacturing sub-sector and for that matter the industrial sector holds the key to Ghana's attainment of the middle income status. To achieve this dream, it is necessary to grow the manufacturing sub-sector and the industrial sector as a whole through a mix of integrated policy interventions aimed at developing the agro-based industry (ISSER, 2006).

#### **3.1 Economic Performance**

As a small open economy, Ghana's economic performance continues to be largely influenced by the outcome of the global economy. The decade preceding 2005 has generally impressive for the Ghanaian economy. The country over this period has maintained a relatively high average growth rate of about 4.5%. In the midst of upsurges in crude oil price and prices of other petroleum

products coupled with other disasters that befell some industrial countries, the country achieved a growth rate of 5.8% in 2005. Building on this momentum and taking advantage of the favourable world economic conditions and market opportunities presented especially by new emerging markets of china and India, an all-time high growth rate of 6.2% in a decade was recorded resulting in a per capita GDP growth rate of about 2.8%. Notwithstanding the inflationary pressures emanating from the challenges of oil price hikes, implementation of the policy to shift cost to consumers by the National Petroleum Authority and the energy crisis, the country was able to slash inflation close to the single-digit target (10.9%) in 2006. This was made possible largely as a result of the external support and other external developments.

**Table 3.1: Some Selected Key Macroeconomic Indicators, 2001-2006**

| <b>Economic Indicator/Year</b>           | <b>2001</b> | <b>2002</b> | <b>2003</b> | <b>2004</b> | <b>2005</b> | <b>2006</b> |
|------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>National Output</b>                   |             |             |             |             |             |             |
| Nominal GDP (billion cedis)              | 38,071      | 48,862      | 66,158      | 79904       | 97018       | 114,903     |
| Real GDP Growth rate                     | 4.2         | 4.5         | 5.2         | 5.8         | 5.8         | 6.2         |
| Real GDP Per Capita growth rate          | 2.3         | 2           | 2.2         | 1.9         | 2.1         | 2.8         |
| <b>Fiscal Indicators (%of GDP)</b>       |             |             |             |             |             |             |
| Total Revenue                            | 18.10       | 18.00       | 20.80       | 23.80       | 24.10       | 22.25       |
| Grant                                    | 6.90        | 3.10        | 4.7         | 6.20        | 4.90        | 5.52        |
| Total Expenditure                        | 32.10       | 26.10       | 29.00       | 32.90       | 30.20       | 35.33       |
| Domestic Primary Balance                 | 3.8         | 2.00        | 2.20        | 0.70        | 2.70        |             |
| Overall Budget Balance                   | -9.0        | -6.80       | 2.40        | -3.20       | -2.40       | -3.62       |
| <b>Inflation Rate (%)</b>                |             |             |             |             |             |             |
| Inflation rate (year-on-year)            | 21.3        | 15.2        | 23.6        | 11.8        | 14.8        | 10.5        |
| Inflation (yearly average)               | 32.9        | 14.8        | 26.7        | 12.6        | 15.2        | 10.9        |
| <b>Monetary/Financial Indicators (%)</b> |             |             |             |             |             |             |
| Broad Money Supply (M2+) growth          |             |             |             |             |             |             |
| Reserve Money growth                     | 41.39       | 49.96       | 37.78       | 25.94       | 14.06       | 39.07       |

|                                  |         |         |         |              |              |              |
|----------------------------------|---------|---------|---------|--------------|--------------|--------------|
| M2+/GDP                          | 27.0    | 32.2    | 32.4    | 18.8<br>33.9 | 11.2<br>31.4 | 23.5<br>32.5 |
| <b>Balance of Payment (BOP)</b>  |         |         |         |              |              |              |
| Exports (US\$'m)                 | 2398.80 | 2570.10 | 3192.40 | 3486.90      | 4211.15      | 3680         |
| Imports (US\$'m)                 | 3574.50 | 3327.90 | 4132.60 | 5355.70      | 6295.43      | 6620.2       |
| Trade balance (US\$'m)           | -1175.7 | -757.80 | -940.2  | -1868.8      | -2084.3      | -2940.2      |
| Current Account Balance (US\$'m) | -324.6  | -31.90  | 302.30  | -151.20      | -382.24      | -730         |
| Overall BOP (US\$'m)             | 8.60    | 39.80   | 558.3   | -123.40      | 110.04       | 415.10       |

Source: Budget Statements

### 3.2 Sources of Growth in GDP

Accounting for growth in an economy is done invariably using the production sectors of that economy. In the case of Ghana, the economy is running on a tripod: the agriculture, Industry and Services. Of these sectors, the agricultural sector is the dominant one and continues to be the mainstay of the Ghanaian economy contributing on average about 40% to national output. Historically, the agricultural sector has been the lead driver of the Ghanaian economy growing from year to year. However, from 2004 to 2006 the trend has reversed with the sector now experiencing in its relative importance while the services sector is increasing its share in the national output.

**Table 3.2: Sectoral Contribution to GDP**

| Sector/Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|-------------|------|------|------|------|------|------|------|
| Services    | 27.7 | 27.4 | 27.5 | 27.4 | 27.2 | 27.6 | 27.8 |
| Industry    | 32.7 | 33   | 33   | 32.8 | 32.6 | 32.9 | 32.9 |
| Agriculture | 39.6 | 39.6 | 39.5 | 39.8 | 40.3 | 39.5 | 39.3 |

### 3.2.1 Agriculture

As the dominant sector in the Ghanaian economy, the agricultural sector employs a significant proportion of the active labour force. The agricultural sector until 2005 has seen sustained increases in the sector's contribution to GDP. In 2005 the sector recorded a decline in its output growth rate of about 1 percentage points. This down turn continued its trend into 2006 when sector further lost 0.8 percentage points in its growth rate. The decline in the sector's growth is largely due to the decline in the growth rate of cocoa production and marketing in recent times. In addition, forestry and logging also recorded a low growth rate of 2.6% in 2006 compared to 5.6% and 5.8% in 2005 and 2004 respectively. The other sub-sectors –crops and livestock and fishing- maintained their growth rates of 6% and 3.6% respectively.

**Table 3.3: Agricultural sector and its sub-sectors growth rates (%), 2000-2006**

|                                       | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---------------------------------------|------|------|------|------|------|------|------|
| <b>Agriculture</b>                    | 2.1  | 4    | 4.4  | 6.1  | 7.5  | 6.5  | 5.7  |
| <b>Crops and Livestock</b>            | 1.1  | 5    | 5.2  | 5.3  | 5.3  | 6    | 6    |
| <b>Cocoa Production and Marketing</b> | 6.2  | -1   | -0.5 | 16.4 | 29.9 | 13.2 | 8.7  |
| <b>Forestry and Logging</b>           | 11.1 | 4.8  | 5    | 6.1  | 5.8  | 5.6  | 2.6  |
| <b>Fishing</b>                        | -1.6 | 2    | 2.8  | 3    | 3.5  | 3.6  | 3.6  |

### 3.2.2 Industry

The industrial sector on the side has put up and impressive performance during the past three years recording the highest growth rate of 7.3% to exceed its target of 6.4% in 2006. Apart from the mining and quarrying and construction, all other sub sectors experienced an increase in their growth rates with the growth in electricity and water being outstanding. The exponential growth in electricity and water reflects the increased industrial spending on plants and generators to cope with the energy crisis the country had to contend itself with in the latter part of 2006 and most part of

2007. Indeed the energy crisis did not only boost spending on electricity as observed but also contracted the growth rate of the manufacturing as a result of the shut-down of some factories. Confronting the energy crisis, the mining and quarrying sectors was able to maintain its previous year's growth rate of 3.0%

**Table 3.4: Industrial sector and its sub-sectors growth rates, 2000-2006**

|                       | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|-----------------------|------|------|------|------|------|------|------|
| Industry              | 3.8  | 2.9  | 4.7  | 5.1  | 5.1  | 5.6  | 7.3  |
| Mining and Quarrying  | 1.5  | -1.6 | 4.5  | 4.7  | 4.5  | 3.0  | 3.0  |
| Manufacturing         | 3.8  | 3.7  | 4.8  | 4.6  | 4.6  | 5.5  | 4.2  |
| Electricity and Water | 4.5  | 4.2  | 4.1  | 4.2  | 3.7  | 6.6  | 23.0 |
| Construction          | 5.1  | 4.8  | 5    | 6.1  | 6.6  | 7.0  | 8.2  |

### 3.2.3 Services

As a complimentary sector to all the other sectors, the services sector is expected to facilitate the smooth function of the primary and secondary sectors of the economy by creating an enabling environment for the other sectors to thrive on. Over the years, the government has pursued policies and programmes in the areas of education, health, security, sanitation and housing to further this course. The sector has responded positively to these initiatives by churning out high growth rates in recent times. In 2005, the services sector assumed the lead position in terms of growth to oust both the agriculture and industry but could not sustain this position in 2006. The growth rate of this sector in 2006 went up by 1.1 percentage point compared to the previous year. Again the target growth rate of 5.5% was exceeded by 1 percentage. All the sub sectors apart from community, social and personal services contributed positively towards the growth of the services sector. The highest growth of 7.6% was recorded by the Finance, Insurance, Real Estate and Business services sector which could be as a result of increased competition in the said sector.

**Table 3.5: Services sector and its sub-sectors growth rates, 2000-2006**

|                                                       | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|-------------------------------------------------------|------|------|------|------|------|------|------|
| Services                                              | 5.4  | 5.1  | 4.7  | 4.7  | 4.7  | 6.9  | 6.5  |
| Transport, Storage and Communication                  | 6.0  | 5.5  | 5.7  | 5.8  | 5.6  | 6.0  | 7.2  |
| Wholesale and Retail Trade, Restaurants and Hotels    | 4    | 5.5  | 5.6  | 5    | 4.9  | 6.1  | 7.5  |
| Finance, Insurance, Real Estate and Business services | 5    | 4.5  | 5.5  | 5.2  | 4.8  | 5.6  | 7.6  |
| Government services                                   | 6    | 5    | 3.6  | 4    | 4.4  | 5.0  | 5.7  |
| Community, Social and Personal services               | 6.9  | 6.5  | 4.4  | 4.1  | 4.2  | 4.3  | 4.2  |
| Producers of Private Non-Profit Services              | 3.1  | 3.2  | 3.1  | 3.2  | 3.2  | 3.8  | 4.5  |

### 3.2.4 Fiscal Development

The core objective of government's fiscal policy for 2005 was geared towards creating the conditions for sustained and accelerated growth after almost two decades of stable growth. In pursuance of this objective the governments through fiscal policy sought to decrease the domestic debt stock. To further advance this course, the 2006 fiscal agenda concentrated on promoting private investment (crowding in) through sound fiscal consolidation. Specifically, the government's fiscal policy for 2006 targeted among other things: a reduction in domestic debt-to-GDP ratio from 10.8% (in 2005) to 8.7%, a net repayment on domestic debt of about 1% of GDP, an overall budget deficit of about 2.1% of GDP and a 2.0% of GDP surplus in the primary balance. Fiscal consolidation, aimed at reducing the net domestic financing needs of the budget through effective expenditure management and enhanced revenue mobilisation played a significant role in the fiscal success of 2006. The reduction in interest rate in deed was a result of the reduction in total debt stock by virtue of the Multilateral Debt Relief Initiative (MDRI)(MDRI for 2006 stood at ₦1846.4 billion) and the enhanced Highly Indebted Poor Countries (HIPC) initiative in addition to the fiscal consolidation measures of the year.

### 3.2.5 Total Revenue and Grants

Over the past six years, government receipts as a percent of GDP has increased generally. As a percent of GDP, government revenue increased marginally from 36.01% in 2004 to 36.77% in 2005. Provisional data (from beginning of 2006 to end of September) available indicated that the ratio of government receipts to GDP declined by 0.78 percentage points. For the same period, total receipts were €31,929 billion which was 34.6% more than what was realized in 2005 for the same period. The out-turn for total revenue and grants amounted to €32,650.1 billion as against the budgeted estimate of €34,135.6 billion. Consistent with the historical figures, taxes constituted the major source of revenue to the government with indirect taxes being the dominant class and direct taxes and international trade taxes following in that manner. Since 2002 the composition of tax revenue in total revenue has decreased continuously to end 2005 at 71.29% compared to 82.71% in 2002. Despite governments steps or efforts at improving tax administration and increased vigilance to reduce revenue leakages caused by smuggling and under-invoicing, the revenue and grants raised in 2005 fell short of its target by approximately €1,101 billion. This was attributed to the inability of Customs, Excise and Preventive Services (CEPS) to meet its collection targets. Provisional tax revenue amounted to €23,302.8 billion which was 3.69% lower than the projected budget estimate of 2006. Indirect taxes rose by 9.28% of GDP over the 2005 out-turn yet it was still lower than the budget estimate of €10,897 billion. Direct taxes on the other hand were short of the target level only by 6.31% of GDP. International trade taxes rose from 4.24% of GDP to 4.72% offsetting partially the decline in direct taxes inflows.

### 3.2.6 Total Expenditure

In 2005, total expenditure as a percentage of GDP dropped from 32.63% in 2004 to 30.6%. The decline in the expenditure was consistent with the overall stabilization policies for the year. Non-

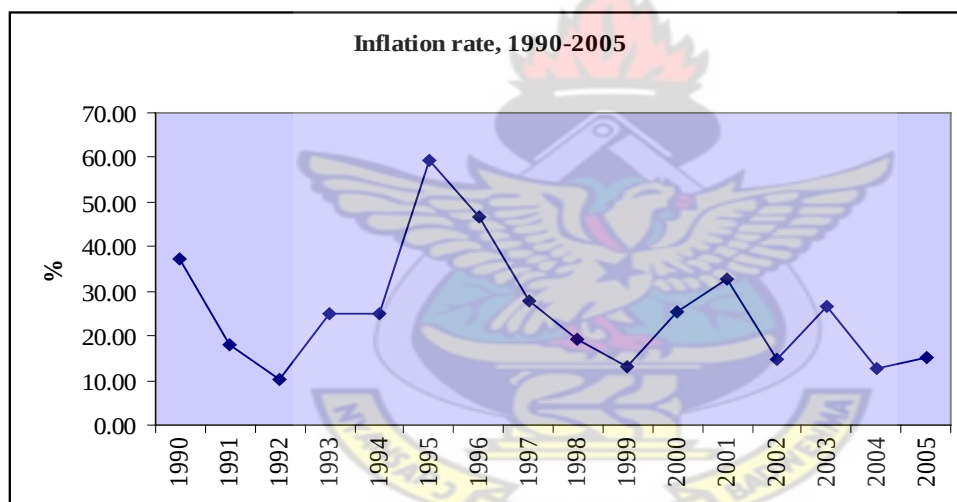
interest recurrent expenditure, consisting of wage bill (about 52%) showed an increase. The rise in this category of expenditure was as a result of a rise in the expenditure on wages and salaries due to the increase in minimum wages and also of the government's efforts to integrate all public sector employees in the Ghana Universal Salary Structure (GUSS) (ISSER, 2006). The provisional figure on government expenditure comprising statutory and discretionary payments in 2006 rose marginally to 35.99% of GDP from the previous year's level of 35.28%. Discretionary expenditure of ₵28,062.7 billion accounted for the lion's share in the total government expenditure. In line with the emerging trend since 2004, the increase in discretionary expenditure followed a decrease in total government expenditure as a share of GDP. All other expenditure such as spending on personal emolument, administration and services followed suit by increasing. Transfers by government to households consisting of social security, pension gratuities and national health insurance also went up by 70.5% in 2006. The Road Fund and Petroleum-related Fund in 2006 also recorded an increase of about 17.2% over the corresponding period in 2005. In 2006, the composition of external debt (64.3% due World Bank in the form of multilateral debt, 28% bilateral debt and the remaining constituting commercial debt stock) remained the same as in 2005. However the country's external debt to GDP went up by 7.5% (lower than the rate in 2005) compared to the previous year. This achievement was partly as a result of the 66% debt reduction under the auspices of the Multilateral Debt Relief Initiative (MDRI). The Ministry of Finance and Economic Planning (MOFEP) put in measures to build capacity for improved debt management. Prominent among these is the rescheduling or length of the maturity profile of domestic debt, making the sale of debt securities more efficient through public auctions and lowering of cost of borrowing.

### **3.2.7 Monetary Policy**

Monetary policy in Ghana is conducted by the central bank (Bank of Ghana) with the basic aim of achieving price stability and creating an enabling environment that will bring about sustainable development and growth in general. Over the last one and half decade, inflation has generally

remained low except in some few years. The highest inflation recorded over this period is 59.5% (1995). A closer examination of the inflationary trends in Ghana reveals that the pattern of inflation is consistent with the rational political business cycle models. Inflation rate has generally been high in the year preceding the election year as spending by the ruling government on infrastructure and other social amenities tend to go up in order to win political favours. The Monetary Policy Committee (MPC) of Ghana which is responsible for the conduct of monetary is committed to reversing this evolving trend. Recent trends in inflation (see fig 1) shows that a somewhat success is being made in reversing this trend.

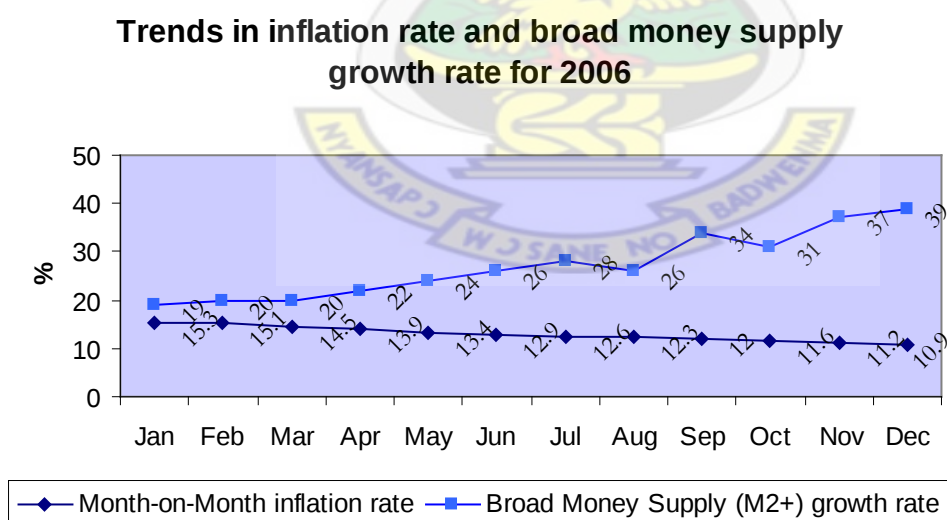
**Fig 3.1: Inflation Trends, 1990 - 2005**



Achieving macroeconomic stability continues to be the primary focus of government monetary policy. For 2005, the government set for itself the realization of end of year average inflation rate of 13.5% but missed the target by 1.7 percentage points. For the entire 2005, the highest inflation figures were recorded in February and March due to the late January petroleum price increase announced by the government. Acting on its commitment to achieve single-digit inflation by end of 2006 to meet the convergence criteria set in the West African Monetary Zone (WAMZ) and to reduce exchange rate volatility, the government embarked sound monetary policies in 2006 to give

meaning to these targets in spite of the high crude oil prices. In line with this objective, the monetary policy for the year under review emphasized tight credit and open market operation as means to mopping up excess liquidity and to restrain inflationary pressures arising from debt monetization. These efforts contributed to narrowing of the gap between the projected inflation and the actual inflation as well as the lowering of interest rate in the country. The year-on-year inflation in 2005 declined from 14.8% to settle at 10.5% in 2006 missing the single-digit target. Throughout the year, the month-on-month inflation rate showed a downward trend from a high of 15.3% in the month of January to a low of 10.9% in the month of December (fig 2 below). The average annual inflation rate was also down by 4.6 percentage points over the same period. The success chalked in the monetary sector was largely due to the steady growth (fig 2 below) in the broad money supply accounted for by increases in time deposits (from 7.75% in 2005 to 8.0% in 2006) and in foreign currency deposits. The financial deepening ratio increased marginal to 32.5% in 2006 compared to 31.4% in 2005.

**Fig. 3.2: Trends in Inflation Rate and Broad Money Supply Growth Rates**

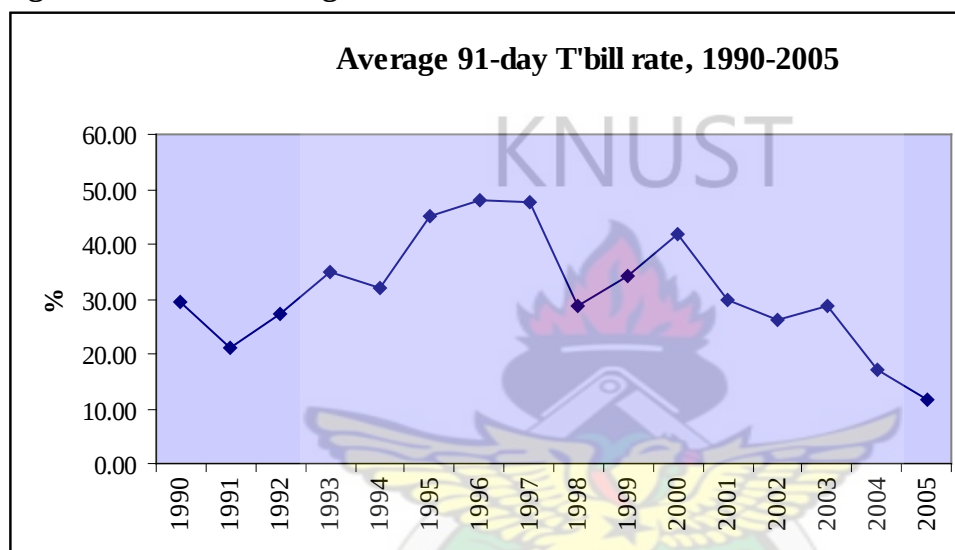


### 3.2.8 Interest Rates

Interest rate that is directly under the control of monetary authorities is the Bank rate (now called the Prime Rate). This is the interest at which banks borrow from the Bank of Ghana).

Traditionally, this rate has been used to influence the operations of the bank as regards giving out loans and the amount interest that they charge. The prime rate since its inception has declined continuously from 24.5% in 2002 to 12.5% in 2006 p.a. The reduction in the prime rate has also affected interest rates on Treasury bills, Bank of Ghana bills, notes and bonds. As can be seen, the 91-day Treasury bill rate has from 2002 declined continuously to the end 2006 at 10.19%.

**Fig 3.3: Trend of Average Interest Rate**



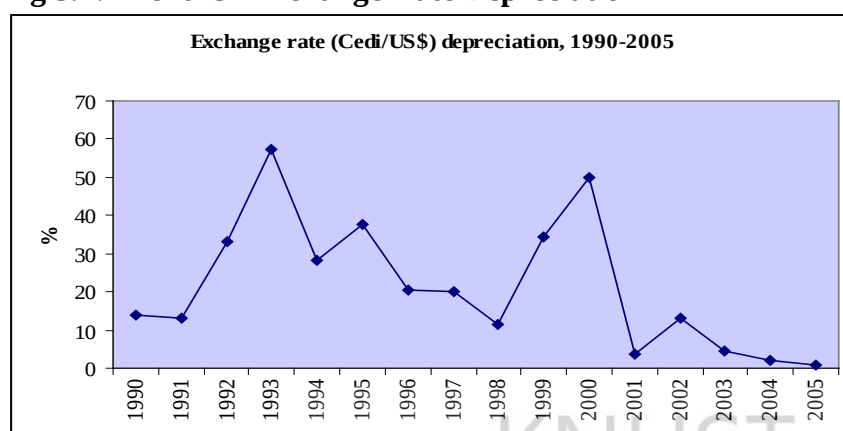
Over this same period although interest rates on most financial instruments remained low, the rates have generally remained sticky downward prompting sceptics to doubt the efficacy of the prime rate as it were. One reason that has been offered as an explanation to sticky nature of lending rate on the part of bank is the riskiness of doing business in a typical Ghanaian banking environment where there is a high information asymmetry.

### 3.2.9 Exchange Rate

Ghana operates a flexible exchange rate regime where the exchange rate is determined independently through the use of an inter-bank market and licensed private Forex Bureaux. Prior to the 2000, the exchange rate has been highly volatile as exemplified by the cedi to the

US dollar rate (see fig 3 below). In 1993 for instance, the cedi lost almost 57.4% in value to the US dollars. In 2000, the cedi again depreciate by 50% before stabilising.

**Fig 3.4: Trend Of Exchange Rate Depreciation**



In an inflation targeting regime, it is believed that the inflation targeting has an impact on the volatility in the exchange rate and vice versa (Edwards, 2006). This is reflected in the statistic on the exchange rates. Since 2001 when Ghana started inflation targeting, the local currency has gained some stability. In deed the statistics presented in table 6 below indicate that the nominal exchange rate of the cedi to the dollar has been relatively stable over the past three years compared to other major trading currencies have been quite stable. Despite the escalation in oil prices in 2005 that affected economic activities around the world, the cedi was relatively stable against the major international currencies gaining value against the Pound Sterling and the Euro. HIPC resources alongside private remittances and other official and private capital inflows in that year also helped to reduce the pressure on the exchange rate by counteracting the effect of the increase in the total import bill.

**Table 3.6: Nominal Exchange rate 2000-2006**

| Currency/Year       | 2000   | 2001   | 2002   | 2003   | 2004   | 2005   | 2006   |
|---------------------|--------|--------|--------|--------|--------|--------|--------|
| cedi/dollar         | 7047.7 | 7321.9 | 8438.8 | 8852.3 | 9051.3 | 9130.8 | 9235.3 |
| cedi/Pound Sterling | 10190  | 10597  | 13305  | 15296  | 17412  | 15673  | 18103  |
| cedi/Euro           | 6343.5 | 6500.5 | 8511.6 | 10986  | 12309  | 10815  | 12145  |

### 3.2.10 External Sector

Over the years Ghana pursued and continues to pursue the export-led growth strategy. The outcome of this strategy in recent times has been the upsurge the country's total import bill by more than 90% from 2000 to 2005. Over the same period, exports rose by approximately 41% resulting in the widening of trade imbalance of more than 200%. With these developments, the external sector cannot be regarded as that stable. Provisional figures available for the end of third quarter showed an overall balance of payments surplus of \$217.64 million. By the end of the year, the figure had risen to \$415.1 million. Compared to 2005, this figure represents almost a 400% increase. The impressive performance in the external sector is largely attributed to the positive export performance driven by high commodity prices and strong inward remittances as well as donor inflow and debt relief.

Over the past two (2) decades, the economic development paradigm in Ghana has increasingly drifted toward private sector approach for achieving Sustainable Economic Growth, Stabilising Business Cycle, Reduction in Unemployment, Keeping Inflation Low and Keeping Fiscal Deficits Low. The economy of Ghana has experienced a checkered history as a result of unstable political regimes. Macro economic variables like inflation, Gross Domestic Product (GDP) Money Supply, Exchange Rates, Interest Rates etc. were volatile, making it difficult to stabilise business cycles. However, as a result of some prudent fiscal and monetary policy measures put in place by the government, the economy of Ghana has moved from a high inflation environment to a path of disinflation and macroeconomic stability, with reduced fiscal deficits and **net government repayment of debt**, increasing external reserves, and relative exchange rate stability.

## **CHAPTER FOUR**

### **THE GHANA STOCK EXCHANGE**

#### **4.0 Overview of the Ghana Stock Exchange**

The Ghana Stock Exchange is a company limited by guarantee and duly incorporated under the Companies Code 1963 Act 179. The market was established in July 1989 in response to Government's private sector development initiatives, which necessitated the divesting of Government's interest in some public institutions. The Ghana Stock Exchange is governed by a thirteen (13)-member council representing:

- ❖ Licensed Dealing Members (LDM's)
- ❖ Listed Companies
- ❖ Banks
- ❖ Non-Bank Financial Institutions
- ❖ Insurance Companies
- ❖ General Public

The council is imbued with all the powers and functions of a board under the Companies Code 1963 Act 179, and is headed by a Council Chairman.

The GSE is regulated by the Securities and Exchange Commission (SEC) under the Securities industry Law, PNDC Law 333 as amended by ACT 2000, Act 590. The membership of the exchange is in three categories. They are:

- ❖ Licensed dealing Members (LDM's)- Corporate body licensed by Exchange to deal in listed securities
- ❖ Associate Member- Individual or Corporate body, which has satisfied membership requirement of Exchange, but is not licensed to deal in listed securities
- ❖ Government Securities Dealers (GSD)- Corporate body approved by Bank of Ghana and registered by Exchange to deal in Government securities

#### 4.1 The Stock Market Development in Ghana

The Ghana Stock Exchange (GSE) since its inception has undergone different stages in its evolution.

Some major developments on the market are shown in the table below.

**Table 4.1: some major development in the stock market, 1990 to date**

|                       | Inception        | Current                            | Future                              |
|-----------------------|------------------|------------------------------------|-------------------------------------|
| Trading Platform      | Call Over system | Continuous Auction Trading (CAT)   | Full Automation                     |
| Trading Days          | 2 times a week   | Daily (9.00am –12 noon)            | Daily                               |
| Settlement Time       | T+10             | T+3 (Trading day +3 business days) | T+1                                 |
| Settlement Platform   | Manual           | Manual-Delivery versus Payment     | Central Securities Depository (CSD) |
| Equity Listing        | 11               | 32                                 |                                     |
| Depository Shares     |                  | 1                                  |                                     |
| Preference Shares     | -                | 1                                  |                                     |
| Bonds:                | -                |                                    |                                     |
| Corporate             |                  | 3                                  |                                     |
| Government:           |                  |                                    |                                     |
| 2year fixed rate      |                  | 58 (GH¢422.81m)                    |                                     |
| 3-year Fixed Rate     |                  | 49 (GH¢309.61m)                    |                                     |
| 5-year                |                  | 2 (GH¢218.04m)                     |                                     |
| Market Capitalization | ¢30.46bn         | GH¢11,504.50                       |                                     |
| All Share Index       | 77.65 points     | 5,341.76 points                    |                                     |
| Brokerage firms       | 3                | 16                                 |                                     |

## 4.2 Growth of the Ghana Stock Exchange

The GSE, which was established 17 years ago, has emerged as a powerful regional market to be reckoned within Africa. It started with Eleven (11) listed companies in 1990 and by the end of 1993, the number of listed companies had increased to Fifteen (15). Within the three-year span (1990-1993), many privately owned companies had been converted into publicly owned entities and listed on the GSE. The number of listed companies continued to grow and as at December 2006, the number of listed equities stood at Thirty two (32). The Bond Market in Ghana which was in the past mainly private placement issues and had no secondary trading activity received recognition in 1991 on the Ghana Stock Market when the Government of Ghana issued and listed ₵5.0 billion Bond, the GSE Commemorative Registered Stock. Since then a number of corporate and Government bonds have been issued and listed on the GSE. As at December 2006, 13 bonds had been issued and listed on the Ghana Stock Exchange.

In 1992, the Exchange recorded its first merger and acquisition between Lever Brothers and UAC resulting in Unilever Ghana Ltd. Subsequently the exchange has witnessed other mergers and acquisitions. These include

- ❖ British American Tobacco Company and Meridian Tobacco Company Ltd
- ❖ Kumasi Brewery Ltd and Achimota Brewery Company resulting in Ghana Breweries Ltd.
- ❖ AngloGold Ltd and Ashanti Goldfields Ltd resulting in AngloGold Ashanti
- ❖ Guinness Ghana Ltd and Ghana Breweries Ltd resulting in Guinness Ghana Breweries Ltd
- ❖ Acquisition of SSB Bank Limited by Société Générale

In the history of the GSE, the year 2004 was an exceptional year. The Exchange grew significantly as it records the listing of Benso Oil Palm Plantation (BOPP), CAL Bank Limited, CAL), Starwin Products

Limited (SPL), Clydstone Limited (CLYD). The GSE also took on board the listing of AngloGold Ashanti Merger, the take over by Guinness Ghana Limited of Ghana Breweries Limited, two rights issues by Mechanical Lloyd Company Ltd and Accra Brewery Ltd. There were also two bonus share issues by Enterprise Insurance Limited and Mobil Oil Ghana Limited.

#### **4.3 Performance of the Ghana Stock Exchange**

For the past one and half decade of its existence, the Ghana Stock Exchange has put up an impressive performance as a new emerging market. On two occasions, 1994 and 1998, it was voted as the best performing market amongst all emerging markets by the Birinyi Associates (a research Group in the USA) and the best performer among all stock markets in Africa by the Standard Chartered Bank in London respectively. In Ghana, the broad market indicator of the stock market is the GSE All-share Index which measures the overall performance of the stock market. Since 1990, the GSE All-Share index has increased from 70.08 point to 5,294.58 points as at the end of June 2007 representing a growth of 7455% whilst market Capitalization has increased from ₵30.46 billion to ₵114,744.04 billion a growth of 376,604%. The Index reached a record level of 7469.04 points on August 25, 2004 with market capitalization of ₵19,145.076 billion. The market until 1993 recorded negative returns. The years 1993 and 1994 saw a turnaround of the market, with the GSE All Shares Index recording a growth of 113.74% and 124.34% respectively. A total of 37.95 million and 93.04 million shares were traded valued at ₵3.18 billion and ₵73.09 billion respectively. Since then, the Exchange has witness remarkable growth of the index, market capitalization, volume traded and value traded.

In the years 1995 and 1996 the stock market operated in a difficult macroeconomic environment, with high rates of inflation, high yields on the competing money market and continued depreciation

of the domestic currency. Despite these difficulties, the Ghana Stock Exchange (GSE) showed a modest growth of 6.33% and 13.82% respectively. The year 1996 also saw improved activity on the Exchange with the listing of two (2) companies namely, Ghana Commercial Bank Limited and Aluworks Limited. The Home Finance Company Limited (Now HFC Bank Limited-HFC) in that same year floated the first ever dollar-denominated bonds on the Exchange to raise over US\$2.5 million. Total market capitalization of the GSE increased by 19.3%, from ₵2,348.1 billion at the end of 1995 to ₵2,862.0 billion at the end of 1996. However, turnover on the market was low compared to 1994. A total of 55.84 million and 35.75 million shares, valued at ₵27.09 billion and ₵27.88 billion, were sold in 1995 and 1996 respectively.

In 1997, trading activities on the market increased with significant share price appreciations. A total of 125.63 million shares valued at ₵93.35 billion were traded. The high volume of shares traded was the result of a number of large trades which included the purchase of 52% of Social Security Bank's (SSB's) shares by a strategic investor and the purchase of 68.8% of shares of UTC Estates of Ghana. The Ghana Stock Exchange (GSE) All-Share Index increased from a level of 360.76 points at the end of 1996 to 511.74 points indicating an increase of 41.9%. The increase in the index was due to 19 out of the 21 listed companies recording significant increases in their share prices. Although the All-Share Index went up, the total market capitalisation decreased to ₵2,552.78 billion by the end of 1997. This was due mainly to a fall in the share price of then Ashanti Goldfields Company (AGC) which accounted for 75% of the total market capitalisation (Ashanti Goldfields Corporation weight in the All-Share Index is about 9% though it accounts for 75% of total market capitalization). The first half of 1998 saw a bullish market on the GSE with seven out of the twenty-one listed companies outperforming the GSE All-Share Index during the year. This was due primarily to substantial increases in the prices of shares on the market as a result of the high demand for equity shares. The

Index recorded a impressive gain of 69.69% in 1998 with a market capitalization of ₵3,245.61 billion, making the Exchange the best performing market among all stock markets in Africa in that year. The All-Share index however, decreased from the end-of period value of 868.35 points in 1998 to 736.16 at the end of 1999, a drop of 15.22%. The Exchange recovered from this bearish trend in 2000.

In 2001, the introduction of prudent Fiscal and Monetary measures by the Government of Ghana to stabilize the economy resulted in Yearly Average Inflation dropping from 25.2% in 2000 to 14.8% in December 2004 and the 91-day Treasury bill rate dropping from 41.9% to 17.10 % within the same period. As a result of these developments, the stock market reacted positively with the GSE All Share Index moving from 858.35 points at the end of 2000 to 6798.59 points at the end of 2004 whilst Market Capitalization moved from ₵3,655.04 billion to ₵ 97,614.82 billion within the same period, a change of 692 % and 2,571% respectively. The continuous reaction of investors to these market developments created bullish sentiments, which finally resulted in most share prices being over valued in 2004. In 2005, investors responded to the overpriced situation of the market by shying away from active trading. This finally created the bearish situation experienced on the market that year. As a reflection of the investor apathy and the sluggish market activity of 2005, the GSE All share Index registered an annual yield of –29.85% compared to a gain of 91.33% in 2004. The low market activity witnessed in 2005 coupled with price declines resulted in a market correction and subsequently stabilizing the market in 2006 with some improvements in volumes and value of shares traded. Fundamental performance of most listed companies at the end of 2006 showed improved financial results whilst earnings per share of most companies also increased considerably resulting in attractive price earning (P/E) ratios. The GSE All Share Index and the Market Capitalization gained 4.97% and 22.47% respectively in 2006. In 2007, half-year financial performance of most listed companies was impressive,

demonstrating a potential for strong market recovery. The market has thus reacted positively to these signals. The statistics below depicts the market performance from 2005 to June 2007.

**Table 4.2: Some selected Stock Market Performance Indicators: 2005-mid 2007**

|                        | 2005      | 2006       | 2007 June  |
|------------------------|-----------|------------|------------|
| GSE Index              | 4,769.02  | 5,006.02   | 5,224.47   |
| Market Capt.(¢'bn)     | 91.857.28 | 112.496.01 | 111,317.01 |
| Volume Traded (m)      | 81.4      | 98.29      | 116.73     |
| Value Traded (¢'bn)    | 464.36    | 475.99     | 660.48     |
| GSE Index (returns)    | -29.85%   | 4.97%      | 5.76%      |
| Market Capt. (returns) | -5.90%    | 22.47%     |            |

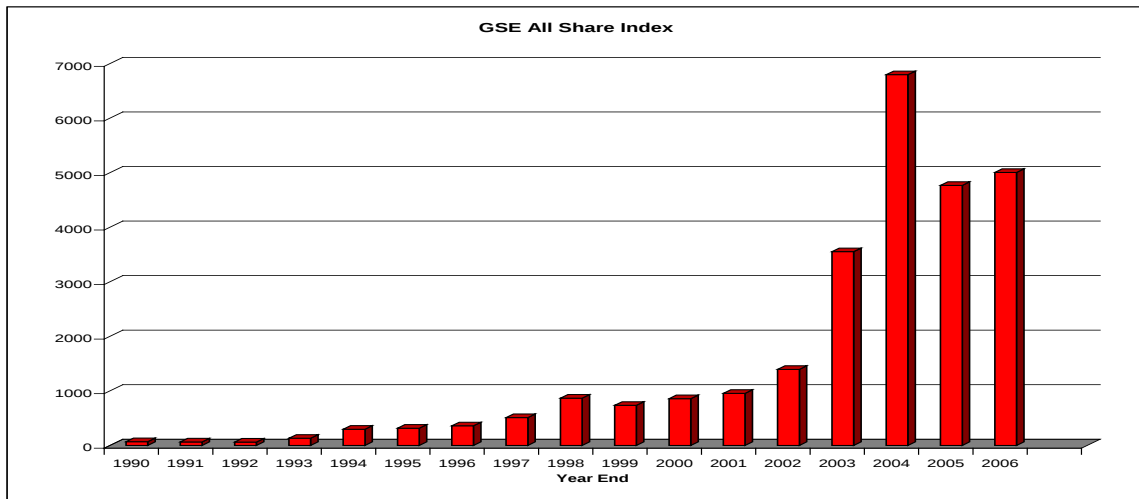
The secondary Bond Market, which received attention in 1991 after the listing of the GSE Commemorative Registered Stock, witnessed low trading activity until the late 1990s. Currently, there are 3 Corporate Bonds (the HFC Dollar Index Housbonds) and 81 series of Government of Ghana 2 year, 3 year and 5 year fixed rate Bonds with various maturities listed on the GSE.

**Table 4.3: Some selected GSE Market Statistics 1990-2006**

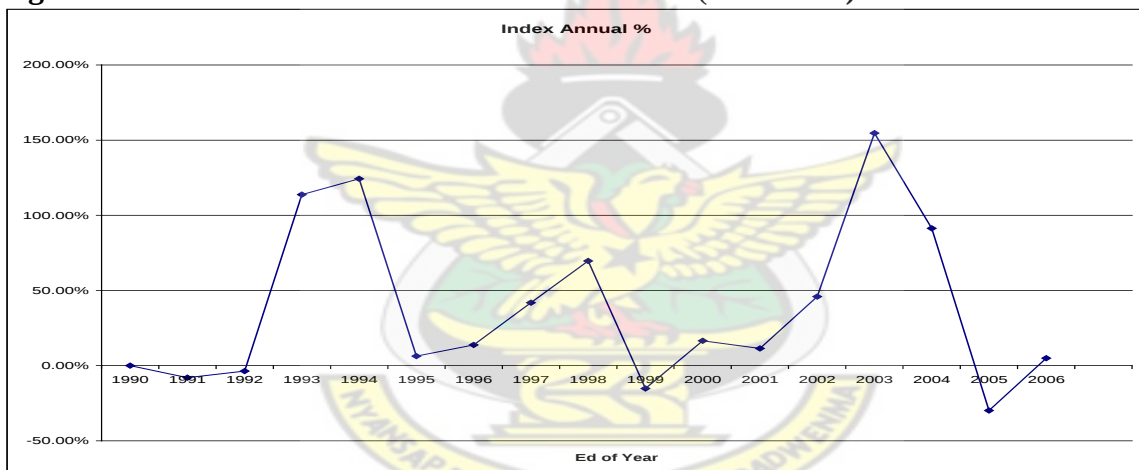
| Period | GSE All Share Index( End of Period) | Index Annual % Change | Market Capitalizati1n (¢ Billions) | Volume Traded (million) | Value Traded (¢billion) | Government Bonds (¢billion) | Corporate Bonds (US\$million ) |
|--------|-------------------------------------|-----------------------|------------------------------------|-------------------------|-------------------------|-----------------------------|--------------------------------|
| 1990   | 70.08                               | -                     | 30.46                              | 0.22                    | 0.06                    | 5.00                        | -                              |

|      |          |        |            |          |        |          |       |
|------|----------|--------|------------|----------|--------|----------|-------|
| 1991 | 64.51    | -7.95  | 29.62      | 1.83     | 0.10   | 5.00     | -     |
| 1992 | 62.17    | -3.63  | 43.75      | 2.04     | 0.17   | 5.00     | -     |
| 1993 | 132.88   | 113.74 | 96.51      | 37.95    | 3.18   | 5.00     | -     |
| 1994 | 298.1    | 124.34 | 1,968.43   | 93.04    | 73.09  | 5.00     | -     |
| 1995 | 316.97   | 6.33   | 2,399.02   | 55.84    | 27.09  | -        | -     |
| 1996 | 360.76   | 13.82  | 2,862.72   | 35.75    | 27.88  | -        | 2.55  |
| 1997 | 511.74   | 41.85  | 2,552.78   | 125.63   | 93.35  | -        | 4.8   |
| 1998 | 868.35   | 69.69  | 3,245.61   | 91.45    | 134.01 | -        | 6.8   |
| 1999 | 736.16   | -15.22 | 3,025.39   | 49.57    | 69.01  | -        | 9.5   |
| 2000 | 857.98   | 16.55  | 3,655.04   | 30.72    | 50.62  | -        | 11.01 |
| 2001 | 955.95   | 11.42  | 3,904.03   | 55.30    | 92.28  | 1,002.72 | 10.2  |
| 2002 | 1,395.31 | 45.96  | 6,183.84   | 44.12    | 89.41  | 1,326.94 | 10.89 |
| 2003 | 3,553.42 | 154.67 | 12,616.80  | 96.33    | 389.30 | 1,442.44 | 8.98  |
| 2004 | 6,798.59 | 91.33  | 97,614.82  | 104.35   | 655.90 | 516.27   | 6.28  |
| 2005 | 4,769.02 | -29.85 | 91,857.26  | 81.40    | 464.36 | 225.04   | 7.27  |
| 2006 | 5,006.02 | 4.97   | 112,496.01 | 2,354.00 | 149.11 | 3,261.50 | 2.50  |

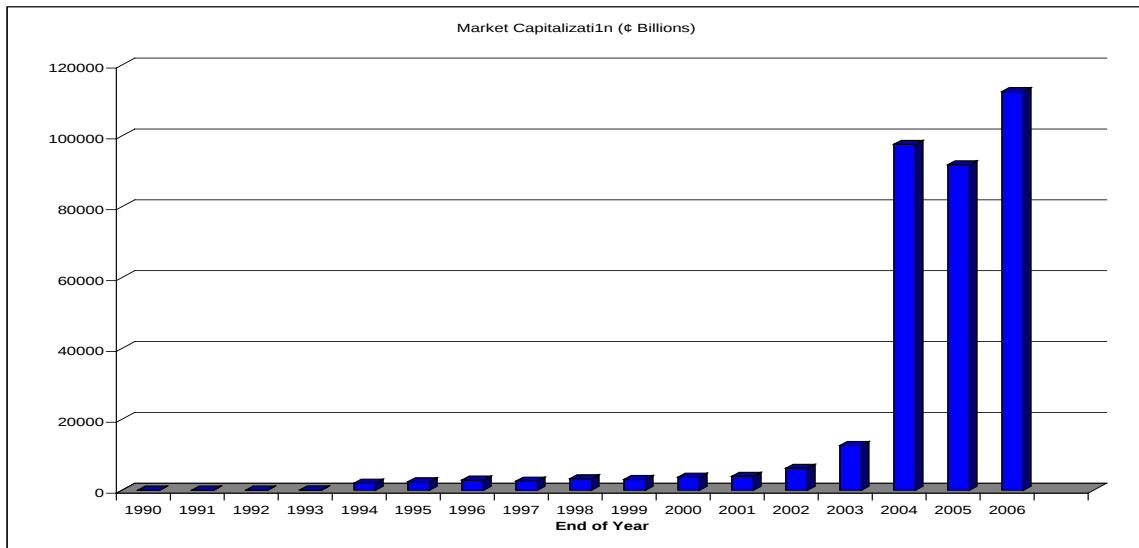
**Fig 4.1: GSE ALL SHARES INDEX (1990-2006)**



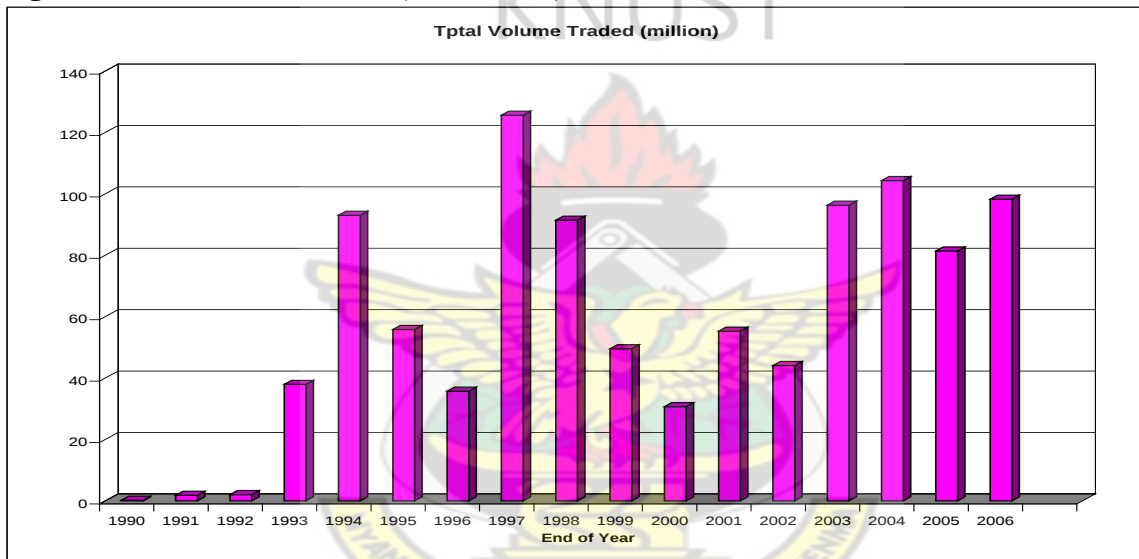
**Fig 4.2:** Annual Return of the GSE All Share INDEX (1990-2006)



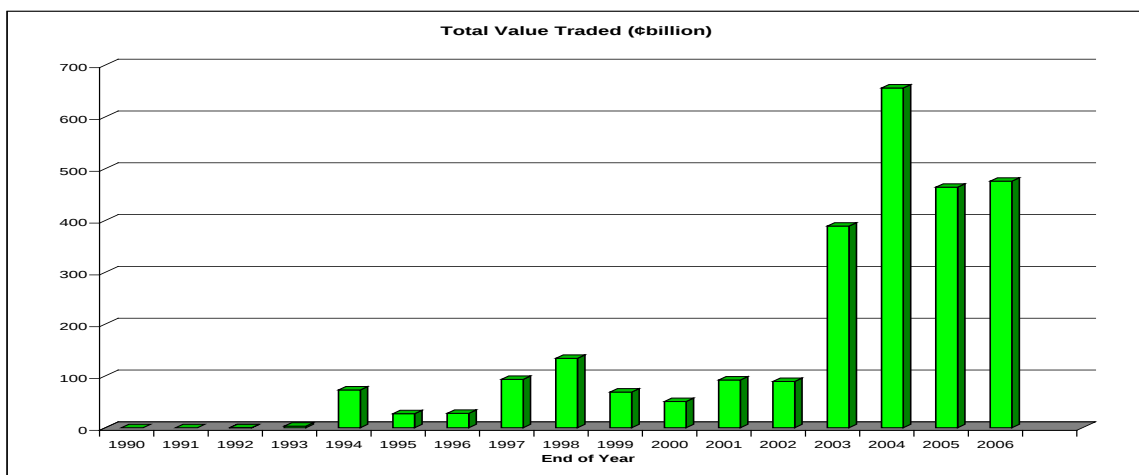
**Fig 4.3:** Market Capitalization (1990-2006)



**Fig 4.4: Total Volume Traded (1990- 2006)**



**Fig 4.5: Total Value Traded (1990-2006)**



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## CHAPTER FIVE

### METHODOLOGY

#### MODEL FORMULATION, ESTIMATION, DATA AND VARIABLES

##### 5.0 Introduction

The study investigates the relationship between interest rates and stock market indicator using monthly time series data for Ghana. This chapter provides brief description of model specification, estimation technique and the data gathering processes. This paper employs the Engel Granger 2 step approach test and Granger-causality test to determine whether interest rates are cointegrated (hence possibly causally related) with GSE index in the Ghanaian stock exchange. The Augmented Dickey-Fuller (ADF) approach is used to pre-test the order of integration for all time series variables. The lag length for the time series analysis is determined by choosing the lag length given by the minimum Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC).

## 5.1 Model Formulation

Following Ross (1976), Maysami and Sims (2002), the study formulates a linear regression model of the log of the GSE All Share index, a measure of stock performance on interest rates and a vector of control variables as follows:

$$\log y_t = \beta_0 + \beta_1 r_t + \sum_{i=1}^k \psi_i x_{it} + \varepsilon_t \quad 3.1$$

Where  $y$  represents GSE All-Share Index,  $r_t$  represents interest rates and  $x$  is a vector of control variables.  $\beta$ s and  $\psi$  represent parameters and  $\varepsilon$  is the stochastic error term with classical OLS assumptions.

## 5.2 Estimation Technique

### 5.2.1 Unit root test

Many economic and financial time series exhibit trending behavior or nonstationarity. Running an OLS on these series normally yields spurious regression. A test for unit root is carried out to assess the stationarity or otherwise of the series. The test begins with a times series plot and correlogram plot which largely provide some indication of the presence of trend or drift in the series.

### Dickey-Fuller Unit Root Tests

Nelson and Plosser (1982) argue that almost all macroeconomic time series typically have a unit root. The presence of unit roots helps to identify some features of the underlying data, when generating process of a series. In the absence of unit root (stationary), the series fluctuates around a

constant long-run mean and implies that the series has a finite variance which does not depend on time. On the other hand, non-stationary series have no tendency to return to long-run deterministic path and the variance of the series is time dependent. Non-stationary series suffer permanent effects from random shocks and thus the series follow a random walk. If the series is non-stationary and the first difference of the series is stationary, the series contains a unit root. The commonly used methods to test for the presence of unit roots are the Augmented Dickey-Fuller (ADF) tests (Dickey and Fuller, 1979 and 1981). The main thrust of the unit root literature concentrates on whether time series are affected by transitory or permanent shocks. This can be tested by the ADF model, which is primarily concerned with the estimate of  $\alpha$ . In the following equation, we test the null hypothesis of  $\alpha = 0$  against the alternative hypothesis of  $\alpha \neq 0$

$$\Delta y_t = \mu + \beta_t + \alpha y_{t-1} + \sum_{i=1}^k c_i \Delta y_{t-i} + \varepsilon_t \quad 3.2$$

where  $\Delta$  denotes the first difference,  $y_t$  is the time series being tested,  $t$  is the time trend variable, and  $k$  is the number of lags which are added to the model to ensure that the residuals,  $\varepsilon_t$  are white noise.

$H_0 : \alpha = 0$  against an alternative hypothesis of stationary series

$H_1 : \alpha \neq 0$  are tested

### Choosing the Lag Length

Schwarz Bayesian Criterion (SBIC) and Akaike Information Criterion (AIC) are used to determine the optimal lag length ( $k$ .) Non-rejection of the null hypothesis implies that the series is non-stationary; whereas the rejection of the null indicates the time series is stationary.

## Test for Cointegration

When time series are non stationary an appropriate differencing takes away the existence of a long run property; in other to establish the long run property a cointegration test is performed. Moreover, economic and finance theory often suggests the existence of long-run equilibrium relationships among nonstationary time series variables. If these variables are  $I(1)$ , then cointegration techniques can be used to model these long-run relations.

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### 5.2.2 Engel Granger 2 step Procedure

To investigate the long-run relationship of the GSE index and interest rates, we employed the Engel Granger 2 step Procedure cointegration test. The Engel Granger 2 step Procedure is usually used in a bi-variate model. The relationships among the variables are based on the following model:

$$y_t = \beta_0 + \beta_1 x_t + \omega_t \quad 3.3$$

Where  $y$  represents the GSE index and  $x$  is the interest rate.  $\beta_s$  are parameters and  $\omega$  is a white noise errors. Equation 2 is estimated and the residuals  $\hat{\omega}$  estimated. Augmented Dickey fuller test is then performed on the estimated residuals  $\hat{\omega}$  as follows:

$$\Delta \hat{\omega}_t = \pi + \varphi \hat{\omega}_t + \varepsilon_t \quad 3.4$$

If  $\varphi$  is significantly different from zero (0) then the error term is stationary and the two variables are cointegrated.

### Granger Causality Test

In order to examine whether there are lead-lag relationships between GSE returns and interest rates, we run the Granger-causality test. If the time series of a variable is nonstationary, I(1) and is not cointegrated, the variable is converted into I(0) by first differencing and the Granger-causality test can be applied as follows:

$$\Delta X_t = \alpha_x + \sum_{i=1}^k \beta_{x,i} \Delta X_{t-i} + \sum_{i=1}^k \gamma_{x,i} \Delta Y_{t-i} + \varepsilon_{x,t} \quad 3.5$$

where  $\Delta X_t$  and  $\Delta Y_t$  are the first difference of time series variable while the series is nonstationary. However, if a variable is nonstationary and cointegrated, the Granger-causality test will be run based on the following equations:

$$\Delta X_t = \alpha_x + \sum_{i=1}^k \beta_{x,i} \Delta X_{t-i} + \sum_{i=1}^k \gamma_{x,i} \Delta Y_{t-i} + \phi_x ECT_{x,t-i} + \varepsilon_{x,t} \quad 3.6$$

$$\Delta Y_t = \alpha_y + \sum_{i=1}^k \beta_{y,i} \Delta Y_{t-i} + \sum_{i=1}^k \gamma_{y,i} \Delta X_{t-i} + \phi_y ECT_{y,t-i} + \varepsilon_{y,t} \quad 3.7$$

where  $\phi_x$  and  $\phi_y$  are the parameters of the ECT term, measuring the error correction mechanism that drives the  $X_t$  and  $Y_t$  back to their long run equilibrium relationship. The Granger Causality Test performs the test of possible existence of a bi-causal relationship between stock index and interest rates.

### 5.3 Data and Variables

Monthly time series data collected from the Ghana Stock Exchange, Bank of Ghana and International Financial Statistics are used in providing answers to questions or queries raised in chapter one.

Information is gathered on interest rates, GSE All-Share index, m2+, USD exchange rate, and CPI (consumer price index).

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## CHAPTER SIX

### DATA ANALYSIS, PRESENTATION AND DISCUSSION

#### 6.0 Introduction

The paper investigates the relationship between interest rates and stock performance using a monthly data on stock performance (All Share Index) and interest rates. Theoretically, interest rate is argued to have a negative relationship with stock market performance in that higher interest rates causes investors to diversify their investment portfolio from stock market variables. Economic speculation or the forces of demand and supply therefore causes reduction in the stock prices as demand for money market instruments increased. Others argue that the relationship between interest rate and stock market is rather complementary; in that increases in interest rate will cause higher stock prices as listed financial institutions increases net interest income. The exact relationship could therefore be empirical. This chapter therefore performs analyses of the exact relationship between stock market performance and interest rate. The chapter starts with descriptive statistics in 4.1 and 4.2 performs the test for unit root. Granger causality test and a test for cointegration are carried in 4.3 and 4.4 respectively. The last section performs regression analysis of the relationship between interest rate and stock performance.

#### 6.1 Descriptive Analysis

The table below presents summary statistics of GSE all share index, a measure of stock performance, interest rates proxied by risk free rate and M2+, Ghana's definition of broad money. With 108 observations each, the GSE all share index averaged 1561.86 units between 1996 and 2004. Interest rates averaged 31.7% and broad money averaging ₵8689.83 million.

**Table 6.1 Summary Statistics of Key Variables**

| Variable      | Obs | Mean     |           |           | Std. Dev. |
|---------------|-----|----------|-----------|-----------|-----------|
|               |     | Overall  | 1996-2000 | 2001-2004 |           |
| GSE           | 108 | 1561.86  | 653.5078  | 2697.574  | 1840.376  |
| Interest Rate | 108 | 31.69722 | 36.21883  | 26.04583  | 8.870664  |
| M2            | 108 | 8689.829 | 3664.655  | 14971.30  | 6899.3    |

## 6.2 Unit Root Test

Macroeconomic series arguably possess trending patterns i.e. they have either stochastic or deterministic trends. A regression involving these series yield spurious regression. It is therefore imperative that studies involving macroeconomic series begin with a test for unit root or stationarity. A line plot of log of GSE (see appendix one) indicates the presence of stochastic trend i.e. GSE exhibits random walk and hence may be non-stationary. Treasury bill tends to depict random walk with drifts and may be non stationary at levels (see appendix one). The log of money supply exhibits a deterministic trend (see appendix one) and may possess unit root at level. Similarly, the plot of T'bills and the log of Exchange rate shows a deterministic trend. A plot of all the series at first difference indicates a somewhat absence of unit root as the series indicates a purely random flow (see appendix two). A time series plot may sometimes present misleading or invalid conclusions about the stationarity of macroeconomic series, it is therefore important that formal tests of unit root be done to verify the veracity of the deductions from the line plots. This section performs the **Augmented Dickey-Fuller (ADF)** test for unit root on variables at level and at first difference. Tables 4.2 and 4.3 present results of the ADF test on variables at level and first difference respectively.

**Table 6.2 Unit Root Test of Variables at Level**

| Variable      | N   | Lags | ADF    | Mackinnon P-value |
|---------------|-----|------|--------|-------------------|
| GSE           | 106 | 1    | -1.165 | 0.9175            |
| CPI           | 106 | 1    | -1.006 | 0.7511            |
| Exchange Rate | 106 | 1    | -1.159 | 0.6909            |
| M2            | 106 | 1    | -0.980 | 0.9467            |
| Tbill Rate    | 106 | 1    | -1.094 | 0.7175            |

\*(\*\*(\*\*\*)) indicate 1%(5%(10%)) level of significance

From table 4.2, the null hypothesis of the presence of unit root is accepted at 10% levels of significance; implying that the series are non stationary at levels. It should be noted that the choice of the number of lags is usually informed by AIC and SIC. The series become stationary at first difference (see table 4.3) indicating that GSE, interest rates and money supply were integrated of order 1 i.e.  $X \sim I(1)$ . The result supports the conclusions drawn from the pictorial view of the series.

**Table 6.3 Unit Root Test of Variables at First Difference**

| Variable      | N   | Lags | ADF    | Mackinnon P-value |
|---------------|-----|------|--------|-------------------|
| GSE           | 106 | 1    | -5.633 | 0.0000 *          |
| CPI           | 106 | 1    | -4.819 | 0.0000 *          |
| Exchange Rate | 106 | 1    | -3.934 | 0.0018 *          |
| M2            | 106 | 1    | -6.062 | 0.0000 *          |
| Tbill Rate    | 106 | 1    | -6.119 | 0.0000 *          |

\*(\*\*(\*\*\*)) indicate 1%(5%(10%)) level of significance

### 6.3 Cointegration Test

The unit root test indicates that all the series are integrated of order one i.e. they are non stationary at levels but become stationary when differenced once. Differencing economic series takes away the

essential property of forecasting future values. It therefore become imperative that a test of the long run relationship be carried out to evaluate the existence or otherwise of a long run relationship among the economic series. This section performs the Engel-Granger two step procedures for testing cointegration. The first step involves a regression of GSE on interest rates and broad money, all of which are non stationary. The second step involves performing an Augmented Dickey Fuller test on the generated residuals from the OLS regression in the first step. The result of the ordinary least squares is shown in appendix three. This result also spells out the long run relationship between GSE and the explanatory variables. Table 4.4 shows ADF test on the predicted residuals.

**Table 6.4 Augmented Dickey Fuller Test for Unit Root on the predicted Residuals**

| Augmented Dickey Fuller Test for Unit Root      |                |                   | Number of obs = 105 |                    |
|-------------------------------------------------|----------------|-------------------|---------------------|--------------------|
| ----- Interpolated Dickey-Fuller -----          |                |                   |                     |                    |
|                                                 | Test Statistic | 1% critical Value | 5% Critical Value   | 10% critical Value |
| Z(t)                                            | -1.753         | -3.508            | -2.89               | -2.58              |
| Mackinnon approximate p-value for Z(t) = 0.4041 |                |                   |                     |                    |

The test above indicates that at 10% the residuals were not stationary. At 10%, 5% and 1% the test statistics is less than the critical values and hence the null hypothesis of non stationary residuals. This implies that the variables were not cointegrated or there exist no long run relationship among the variables. This study would only perform a short run assessment of the relationship between GSE and the explanatory variables.

#### **6.4 Short Run Assessment of the Relationship between GSE and Interest Rate**

When variables are not cointegrated or do not possess long run relationship based on a cointegration test, we could only perform a short run assessment of relationship among the variables. Table 4.5 below is the results of the short run relationship between GSE and interest rates with broad money as a control. The result shows that the first lag of the differenced dependent

Fourth lag of differenced broad

| Interest Rate |  |
|---------------|--|
| MS            |  |
| 0.014725      |  |
| 0.003424      |  |
|               |  |
| 0.004753      |  |

|   |           |
|---|-----------|
| t | $P >  t $ |
|---|-----------|

|                  |              |                  |          |                        |                             |          |
|------------------|--------------|------------------|----------|------------------------|-----------------------------|----------|
| Source           | SS           | df               | MS       | Number of obs = 103    |                             |          |
|                  |              |                  |          | F(12, 90) = 4.3        |                             |          |
| Model            | 0.176698     | 12               | 0.014725 | Prob> F = 0.000        |                             |          |
| Residual         | 0.30814      | 90               | 0.003424 | R-squared = 0.3644     |                             |          |
|                  |              |                  |          | Adj R-squared = 0.2797 |                             |          |
| Total            | 0.484838     | 102              | 0.004753 | Root MSE = 0.05851     |                             |          |
|                  |              |                  |          |                        |                             |          |
| <b>D.log GSE</b> | <b>Coef.</b> | <b>Std. Err.</b> | <b>t</b> | <b>P&gt; t </b>        | <b>[95% Conf. Interval]</b> |          |
|                  |              |                  |          |                        |                             |          |
| Log GSE          |              |                  |          |                        |                             |          |
| LD.              | 0.455638     | 0.101165         | 4.5      | 0.000                  | 0.254656                    | 0.656619 |
| L2D.             | -0.11529     | 0.110891         | -1.04    | 0.301                  | -0.3356                     | 0.105011 |
| L3D.             | 0.194769     | 0.111855         | 1.74     | 0.085                  | -0.02745                    | 0.416988 |
| L4D.             | 0.030602     | 0.102299         | 0.3      | 0.766                  | -0.17263                    | 0.233838 |
| Interest Rate    |              |                  |          |                        |                             |          |

|       |          |          |       |       |          |          |
|-------|----------|----------|-------|-------|----------|----------|
| LD.   | -2.9E-05 | 0.0035   | -0.01 | 0.993 | -0.00698 | 0.006925 |
| L2D.  | -0.00309 | 0.00363  | -0.85 | 0.397 | -0.0103  | 0.004119 |
| L3D.  | -0.00294 | 0.003735 | -0.79 | 0.433 | -0.01036 | 0.004475 |
| L4D.  | 0.006073 | 0.003561 | 1.71  | 0.092 | -0.001   | 0.013147 |
| M2    |          |          |       |       |          |          |
| LD.   | -0.07776 | 0.272667 | -0.29 | 0.776 | -0.61946 | 0.463943 |
| L2D.  | 0.171313 | 0.274853 | 0.62  | 0.535 | -0.37473 | 0.717357 |
| L3D.  | 0.190083 | 0.265773 | 0.72  | 0.476 | -0.33792 | 0.718086 |
| L4D.  | 0.669042 | 0.268451 | 2.49  | 0.015 | 0.135718 | 1.202367 |
| _cons | -0.01184 | 0.013245 | -0.89 | 0.374 | -0.03815 | 0.014478 |

### 6.5 Granger Causality Test

In order to establish the direction of causation between stock market indicator, interest rates and the control variables Granger causality is performed. This section performs a test of the direction of causality between stock market variable and macroeconomic indicators. Following a VAR (vector auto regression) specification, it assesses if each of the variables is an omitted or an excluded variable. Specifically it tests the null hypothesis that a variable does not Granger cause the dependent variable as against the alternate hypothesis that the variable Granger causes the dependent variable. Table 4.6 below reports the Granger causality test. In the GSE equation, the null hypothesis that interest rates does not Granger cause stock market is accepted at 10% level of significance, but the hypothesis is rejected in respect of m2. This implies that in the short run money supply rather than interest rate affect stock performance.

The second equation, the interest rate equation, indicates that at 5% the hypothesis that the stock market indicator does not Granger cause interest rate, is rejected, but m2 does not granger cause interest rate in the short run. From the above we could establish that in the short run there is a

unidirectional relationship between stock market performance and interest rate flowing from the stock market to the money market i.e. the performance of the stock market affecting the money market variable, interest rate.

The third equation, the m2 equation indicates that interest rates rather than stock market Granger causes changes in broad money supply. The null hypothesis that the stock market variable, GSE, does not Granger cause m2 is accepted at 10%. Thus monetary expansion through open market activity affects stock performance which in turn causes portfolio diversification from money market instruments to stock market instruments and hence reduction in interest rates.

**Table 6.6 Granger Causality Test**

| Equation      | Excluded      | chi2   | df | Prob>chi2 |
|---------------|---------------|--------|----|-----------|
| GSE           | Interest rate | 3.155  | 4  | 0.532     |
| GSE           | M2            | 11.525 | 4  | 0.021     |
| GSE           | ALL           | 14.49  | 8  | 0.070     |
|               |               |        |    |           |
| Interest rate | GSE           | 8.659  | 4  | 0.070     |
| Interest rate | M2            | 1.629  | 4  | 0.804     |
| Interest rate | ALL           | 15.233 | 8  | 0.055     |
| M2            | GSE           | 7.5171 | 4  | 0.111     |
| M2            | Interest rate | 12.925 | 4  | 0.012     |
| M2            | ALL           | 19.542 | 8  | 0.012     |

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## **CHAPTER SEVEN**

### **SUMMARY, CONCLUSION AND RECOMMENDATION**

#### **7.0 Summary and Conclusion**

This paper examined the relationship between interest rate and the All-Share Index of the Ghana Stock Exchange using unit root test, Dickey-fuller Unit Root Test, Cointegration test, Engel Granger 2 step procedure and Granger Causality Test. Using a monthly data on GSE, M2 and interest rate, obtained from the GSE and the BOG, the study performed a unit root tests on the series of level and at first difference. The ADF test indicated the presence of unit root in the series at level but become stationing after taking the first difference. A test for cointegration using the Engle and Granger procedure indicate the absence of cointegrating relationship among the variables i.e. the absence of a long run relationship. A Granger causality test was then performed to assess the existence of a bi-causality flowing from GSE to the other variables and vise verse.

The study finally carried out an OLS regression on the short run variables.

#### **7.1 Recommendation and Policy Implementation**

Policy makers need to be careful too when trying to influence the economy through changes in macroeconomic variables such as interest rates, money supply or the exchange rate. While aiming to correct macroeconomic ills such as inflation or unemployment, they may in adversely depress the stock market and curtail capital formation which itself would lead to further slowdown of the economy.

## 7.2 Suggestion for Future Study

Two points are worth noting and may provide grounds for further research. First, since cointegration refers to long-run relationship between the variables appearing in the cointegration vector(s), short-term relationship between macroeconomic variables and the GSE, All-Share Index discovered in this paper, does not by itself prove similar relations exist in the long run. Second, Johansen's method is known to be sensitive to the choice of lags and the dimensions. However, our study concentrated on examining only the long-term equilibrium relationship between interest rate with money supply as a control variable with the GSE All-Share Index.

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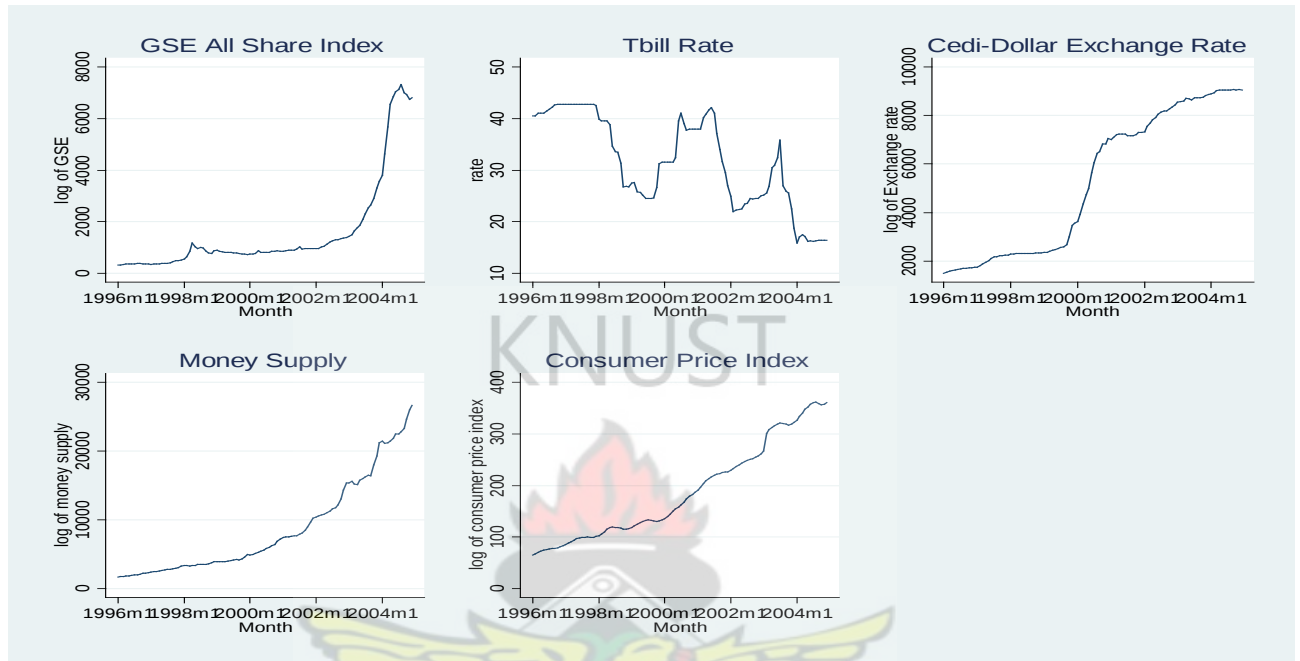
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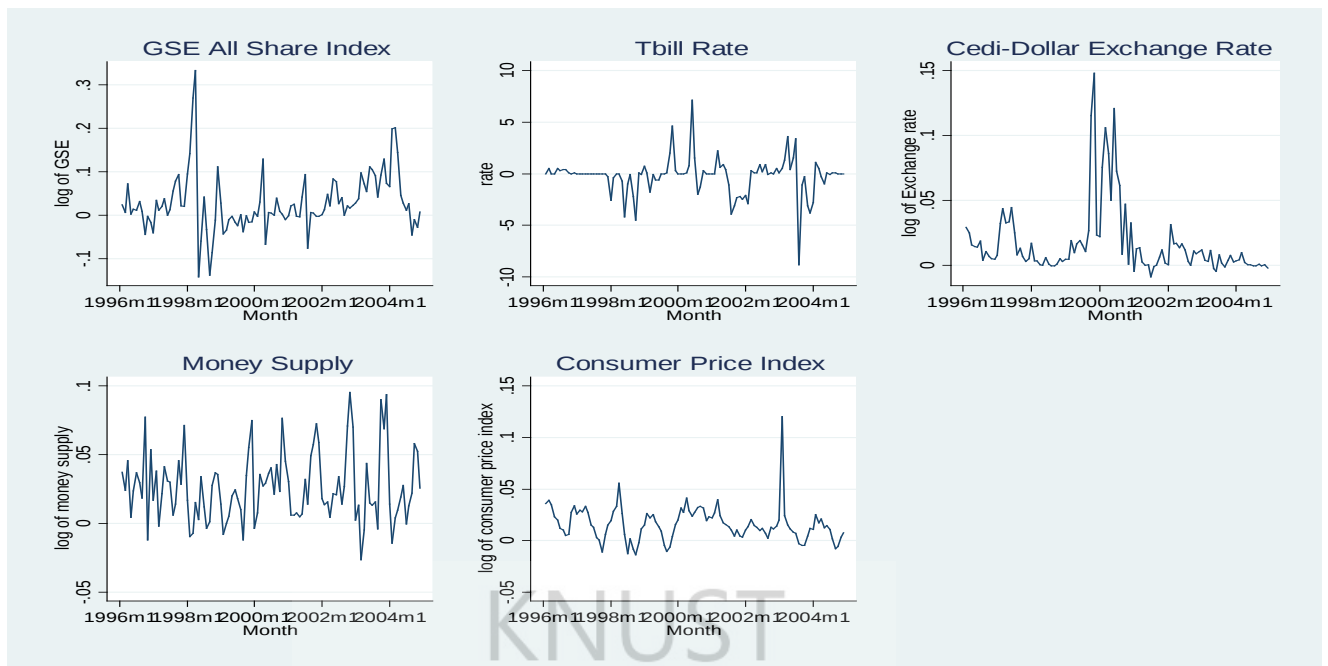
## APPENDIX ONE

Figure 1a: Plot of variables against month at Level



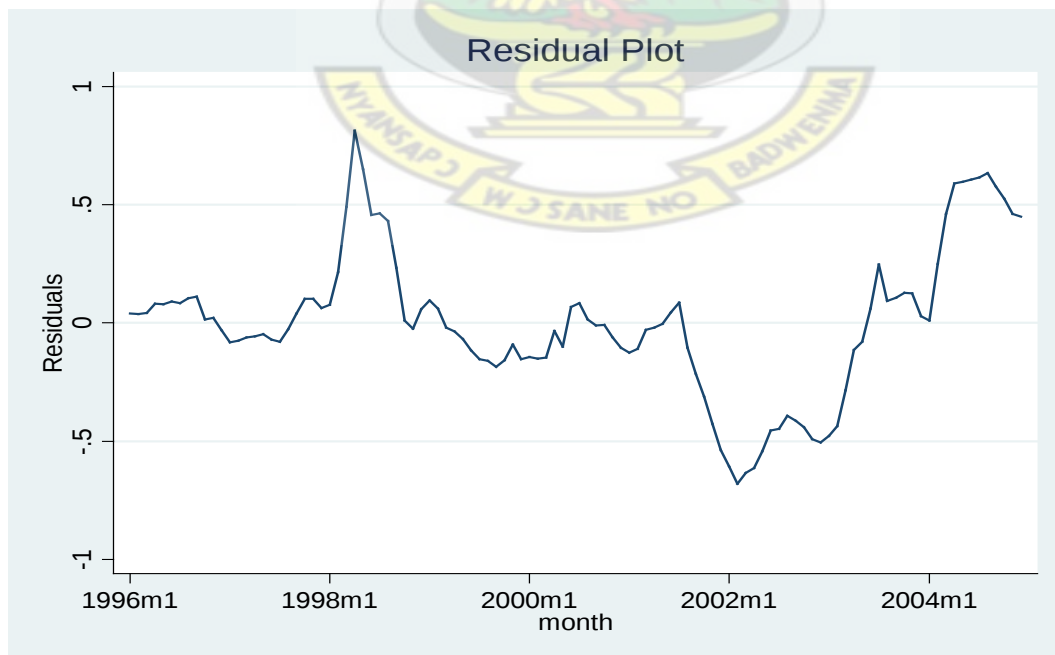
## APPENDIX TWO

Figure 1b: Plot of variables against month at First Difference



### APPENDIX THREE

**Fig 2a: Residual Plot of Variables**



## APPENDIX FOUR

**Table 1a OLS Regression of the Long Run Relationship between GSE and Interest Rate**

| Source        | SS       | df        | MS       | Number of obs = 108    |                      |          |
|---------------|----------|-----------|----------|------------------------|----------------------|----------|
|               |          |           |          | F(2, 105) = 329.29     |                      |          |
| Model         | 64.09639 | 2         | 32.0482  | Prob>F = 0.000         |                      |          |
| Residual      | 10.21905 | 105       | 0.097324 | R-squared = 0.8625     |                      |          |
|               |          |           |          | Adj R-squared = 0.8599 |                      |          |
| Total         | 74.31545 | 107       | 0.694537 | Root MSE = 0.31197     |                      |          |
| KNUST         |          |           |          |                        |                      |          |
| log Gse       | Coef.    | Std. Err. | t        | P> t                   | [95% Conf. Interval] |          |
| Interest rate | -0.02657 | 0.005304  | -5.01    | 0.000                  | -0.03708             | -0.01605 |
| Log m2        | 0.723314 | 0.058858  | 12.29    | 0.000                  | 0.60661              | 0.840018 |
| _cons         | 1.438573 | 0.654229  | 2.2      | 0.030                  | 0.141358             | 2.735788 |

