UNIVERSITY OF GHANA

STATISTICAL ASSESSMENT OF THE RELATIONSHIP BETWEEN STOCK PRICES AND ECONOMIC VARIABLES;A CASE STUDY FOR THE GSE

BY

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FUFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MPHIL. STATISTICS DEGREE

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DECLARATION

I hereby declare that this submission is my own work towards the award of the MPhil. degree and that, to the best of my knowledge, it contains no material previously published by another person nor material which had been accepted for the award of any other degree of the university, except where due acknowledgment had been made in the text.

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Supervisors Declaration

We hereby certify that this thesis was prepared from the candidate's own work and supervised in accordance with guidelines on supervision of thesis laid down by the university.

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(Co-supervisor)

DEDICATION

This work is dedicated to Almighty Allah,my mother Hajia Asana Awudu and my siblings Nurudeen Abubakar, Salamatu Abubakar and Ruhamahu Abubakar.

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ABSTRACT

There are several literature on the study of the relationship between macroeconomic variables and stock prices. These studies have focused largely on the developed capital market and carried out in the early 1970s. From literature reviewed,there is no study that have modelled the relationship between stock price and, both macroeconomic and micoeconomic variables in the order to explain their combined effect on stock market returns using Autoregressive Distributed Lag (ARDL) model at the Ghana Stock Exchang. The speed of adjustment also known as the error correction term (EC) of the Conditional Error Correction Model (CECM), was found to be (-0.897198) at 5% alpha level. A negative error correction term indicates convergence among the macroeconomic and microeconomic variables in the long run. The study reveal that only Producer Price Index has a short-run relationship with Ghana Stock Exchange all-share price index in the short-run. It was discovered that Ghana Stock Exchange all-share price index has no causal relationship with the respective macroeconomic and microeconomic variables. From the research findings, Government can therefore use these selected economic variables to forecast cast stock price variations to determine when and how to tap into the stock market industry to raise funds for development.

CONTENTS

LIST OF ABBREVIATION

AC .... Akaike Information Criterion

AMH .... Adaptive Market Hypothesis

APT .... Arbitrage Pricing Theory

ADF .... Augmented Dickey Fuller

ARDL .... Autoregressive Distributed Lag

CAR .... Cumulative Abnormal Return

CECM .... Conditional Error Correctional Model

CNLRMT .... Classical Normal Linear Regreesion Model

CUSUM .... Cumulative Sum of Rrecursive Residuals

DF .... Dickey Fuller

DJIA .... Dow Jones Industrial Average

DPS .... Dividend Per Share

DSM .... Developing Stock Market

ECM .... Error Correction Model

EPS .... Earnings Per Share

EXC .... Exchange rate

FPE .... Final Prediction Error

GDP .... Gross Domestic Product

GNP .... Gross National Product

GNI .... Gross National Income

GSE .... Ghana Stock Exchange

GSI .... GSI All-Share Price Index

HC .... Hannan-Quinn Information Criterion

INF .... Inflation

IPO .... Initial Public Offer

KLCI .... KLSE Composite index

KLSE .... Kuala Lumpur Stock Exchange

KPSS .... Kwiatkowski, Phillips, Schantz and Shin

LA-VAR .... Lag-Augmented VAR

MAC .... Market Capitalization

MARR .... Market Adjusted Abnormal Return

NASDAQ ... National Assotiation of Security Dealers Automated Quotations

P/E .... Price per Earnings

P-P .... Phillips and Perron

PPI .... Producer Price Index

SC .... Schwarz Information Criterion

STII .... Straits Times Industrial Index

UK .... United Kingdom

USA .... United States of America

VAR .... Vector Autoregressive

VAT .... Value Traded

VECM .... Vector Error Correction Model

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CHAPTER 1

INTRODUCTION

1.1 Background

Literature on the study of the relationship between macroeconomic factors and prices of stock goes as far as early 1970s and study dwell on industrialized capital markets. However, multiple variable models fitted and established as a predatory variable to explain the disparity in prices of stock, these research works have largely engrossed on advanced markets. According to Menike (2006) the association among macroeconomic variables and prices of stock was observed in Developing Stock Markets (DSM) late in 1980s. However, Harvey reported that investors' confidence in developing markets have increased greatly in previous decade and that DSM is observed to be associated with a higher risk and returns, comparative to industrialized capital markets (Harvey,1994).

There is growing importance of the function of stock markets as an intermediate between stockholder as a magnate and developing economies due to the fast revolution of financial structure, plan and organization worldwide in the recent past. Ahmed (2000) indicates that due to the presence of dynamic informal financial market, stock markets of developing economies have sometimes failed to provide the needed support for industrialization. Capital markets are not consistent with respect to institutional, functioning, data and characteristics framework (Belgrami; 1998). Also, there are some unique characteristics of stock markets which clearly make industrialized economies capital markets dissimilar from developing economies. These unique characteristics are; economic and organizational, size in relation to features, differences in liquidity, availability of information, market integration with respect to wider financial structure

(Belgrami, 1998). Ghana Stock Exchange (GSE) can be easily associated with all these unique characteristics of developing capital markets.

Prevailing information on the association between prices of stock as a dependent variable, and microeconomic variables such as market earnings/ price, market capitalization growth rate, yield in dividend and macroeconomic variables, such as inflation, Gross Domestic Product (GDP), industrial production index, foreign remittance, etc. as explanatory variables, is essentially important due to the datum that a steady relationship amongst these factors is probable to establish a significant supposition in many models of econometrics. Many subjects behind fluctuations of market of stock like the causality associated with micro and macroeconomic factors are yet to be established for emerging stock markets. In a freer market economy, stock markets are held to be critical factors as far as sustainable growth of the economy is concern. Generally, the association between markets of stock and general economy is observed in two specific ways. Firstly, capital market is the foremost or sheathing indicator of general economic happenings in the country. Hence, to appreciate the performance of stock market and the effect thereof due to the impact of microeconomic and macroeconomic factors is very important

1.2 Statement of the Problem

There has always been a thought-provoking question by scholars, stockholders, government and magnates about the measuring proficiency of prices of stock as well as predictability efficiency of return on stocks at Ghana Stock Exchange (GSE). It is established fact that capital market is essentially critical intermediate that helps to provide long span funds to entrepreneurs from investors group. There is a strong thought reinforced by variety of econometric theory as well as many experiential data in various advanced and developing economies that stock prices is meaningfully impacted by numerous macroeconomic and microeconomic variables.From literature reviewed,there is no study that have modelled the relationship between stock price and, both macroeconomic and micoeconomic variables in the order to explain their combined effect on stock market returns using Autoregressive Distributed Lag (ARDL) model at the Ghana Stock Exchang. It is important to establish the significance or otherwise of the relationship among stock market price and, microeconomic and macroeconomic variables by drawing some linkages between them. It is crucial, also to determine the causality relationship among prices of stock and the selected macroeconomic and microeconomic factors and also determine the direction of causality among changes in the stock market prices and the selected macroeconomic and microeconomic variables.

1.3 Research Objectives

The general objective of the study is to statistically assess the significance of the relationship between some selected macroeconomic and microeconomic variables, and stock market prices at the Ghana Stock Exchange. Specifically, this study seeks to;

- Determine the best Autoregressive Distributed Lag Model (ARDL) for the selected Macroeconomic and Microeconomic variables
- Determine whether there exist long-run relationship between stock prices and some selected macroeconomic and microeconomic variables using Autoregressive Distributed Lag (ARDL).
- Determine whether there exist short-run relationship between prices of stock and our selected macroeconomic and microeconomic variables using Error Correction Model of (ARDL) model.
- Determine whether there exist causal relationship between prices of stock and the selected macroeconomic and microeconomic variables using Granger causality techniques.

1.4 Research Questions

The following research questions are to be considered by this study:

- What is the degree of the association between stock prices and the selected macroeconomic and microeconomic variables?
- Is there causal relationship among changes in prices of stock and the selected macroeconomic and microeconomic variables?
- If there is a causal relationship between changes in prices of stock and the selected macroeconomic and microeconomic variables, what is the direction of the causality?

1.5 Methodology

The study analyzed monthly data covering all the variables under study for the period January 2007 to December 2016 (12O monthly dataset) which were obtained from Monthly Market Report issued by Ghana Stock Exchange (GSE) and Monthly Economic Report issued by Ghana Statistical service. The data used for this study are mainly secondary data. Autoregressive Distributed Lag (ARDL) was adopted to determine the existence of long-run relationship between GSE all-share-price index and the selected macroeconomic and microeconomic variables. To determine the existence of short-run relationship between GSE all-share price index and our selected macroeconomic and microeconomic variables, the Error Correction Model (ECM) of the ARDL model was deployed. The also deployed granger causality to determine the existence of causality between GSE all-share-price index and the selected macroeconomic and microeconomic variables.

1.6 Significance of Study

This study is relevant in the following ways:

- Knowledge of the significance of the relationship between prices of stock and selected the economic variables will help government strategize on how and when to tap into the stock market to raise the much needed capital to fund its developmental initiatives. It will also help bring precision tp implementation of investments plan.

- Also, knowledge of both short-run and long-run relationship between stock prices and the selected economic variables will help established predictability efficiency of stock prices thereby helped in adequate preparation of investment strategies and plans by investors.

- Additionally, an efficacious assessment of the association between GSE all-share price index and our selected macroeconomic and microeconomic factors will help government agencies, and entrepreneurs to make effective, administrative, maintainable growth choices proficiently; stockholders can gain optimum return from their stock market investment; and regulatory agencies can articulate guidelines and make informed decisions that will ensure and create smooth investment and trading environment of stock market founded on credible and time tested information about the behavior of stock market prices.

1.7 Variables Under Study

The study will use the following variables collected from Monthly Market Report issued by Ghana Stock Exchange (GSE) and Monthly Economic Report issued by Bank of Ghana. The variables are in the category of macroeconomic and microeconomic variables.

- Ghana Stock Exchange (GSE) all share price index (GSI)
- Inflation (INF)
- Producer Price Index (PPI)
- Exchange rate (EXC)
- Value Traded (VAT)
- Market Capitalization (MAC)

The microeconomic variables have been chosen because they have been extensively used as good measure of the the stock markets worldwide whereas the macroeconomics variables have been chosen because they are most often than not considered by investors and entrepreneurs in their decision-making processes as they are a good indicator of how an economy is performing.

1.8 Organization Of The Study

Presentation in this study is in five chapters. Chapter one is the introduction which comprises the following; background, statement of the problem study, research objectives, research questions, significance and relevance of the study, justification for the chosen variables, motivation of the study and organization of the study.

Chapter two focuses on literature review which comprises; overview of the study, capital market, the relationship between macroeconomic variables and stock prices, the relationship between microeconomic variables and stock prices, and the last but not the least is predictability of stock markets. Chapter three discusses the study methodology whick looks at data sources and collection, data analysis, unit root test and, cointegration modelling and analysis. Chapter four looks at the data analysis and findings of the study.

Chapter five cover conclusions and recommendation.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

Review of literature reveals that studies done on the impact of macroeconomic indicators on prices of stock goes as far as the late 1970s. The research works largely engrossed on industrialized and developing capital markets. Existing works disclosed a robust relationships amongst diverse macroeconomic factors and prices of stock. A study carried out by Nelson (1976) to make available an evaluation on the monthly returns of stock market and inflation after the period of the second world war (1953 -1974) with data from the USA financial market revealed an adverse relationship among returns on stock, in both predictable as well as unanticipated inflation. Also, research carried out Bodie (1976) to investigate the effectiveness of mutual stocks used as an inflation hedge. The paper assessed the extent to which mutual stock is deployed to minimize the risk of stockholder's actual stock return as a result of unpredictability of future price of consumable goods and revealed that mutual stocks are effective when used as an infltion hedge.

Empirical studies on the influence of macroeconomic indicators on prices of stock of industrialized capital markets are very few. Chen,Roll and Rose (1986) examined the multivariate model by deploying seven of the macroeconomic factors from the USA market. Their results reveal that, financial market have no effect on market price index, consumption price index and oil prices. However, in explaining stock returns they found industrial production index, twist in the yield curve and changes in risk premium to be significant. Chen (1991) later in a study using USA data found out that futuristic stock market returns is predicted on account of some construed macroeconomic factors like dividend-price ratio, 30 days treasury-bill, spread term, spread of default and growth rate in industrial production. Clare and Thomas (1994) examined eighteen (18) of the macroeconomic indicators in the financial market of UK, to find out their impact on stock prices. Their findings suggest that, consumer price index, oil prices, exchange rate as well as corporate risk in default are pivotal factors of risk associated with UK stock returns. Mukherjee and Naka (1995) fitted a model using Vector Error Correction Model on Japanese stock market returns and some macroeconomic indicators from the Japanese financial system. The study revealed the existence of cointegration between prices of stock and some macroeconomic factor such as; money supply, rate of call money, real GNP, inflation rate, exchange rate and rate of government bond. Also, Gjerde and saettem (1999) examined the causality between stock prices and some macroeconomic factors in the financial system of Norway. Outcomes of the study indicate a positive relationship between real GNP and prices of stock and also oil price and returns on stock. They could not nevertheless find a positive relationship among returns on stock and inflation. Furthermore, Flannery and Protopapadakis (2002) in recent times have reexamined the significance of macroeconomic sequence on returns of USA stock market. Amongst the sequence are some macroeconomic indicators; M1, producer price index, housing starts, trade balance ,consumer price index and employment which appear to affect stock market returns. However, the study found out that two general indicators of cumulative financial activity; industrial production index and Gross National Product, have no linkages with stock market returns.

Additional set of research work examine the relationship among returns on stock and macroeconomic indicators for some emerging economies such as Eastern Asia. Bailey and chung (1996) studied the influence of risks of macroeconomic variables on the capital market of Philippines. Results of the research work suggest that, economic instabilities, movement in exchange rate and political transfer of ownership of stocks listed on Philippine stock market are unable to account for the returns on stock of Philippine capital market. According to Mookerjee and Yu (1997) in a research work to examine the impart of macroeconomic factors on stock market of Singapore. Their findings show that prices of stock and, both money supply and total foreign exchange reserve are cointegrated. They found however that there is a long-run relationship between exchange rate and prices of stock. Also, Kwon and shin (1999) studied the impact of macroeconomic indicators in evaluating prices of stock of the Korean stock market. Their results indicate that some combination of macroeconomic factors such as industrial production, trade balance, money supply and exchange rate appear to be cointegrated with Stock indices. Again, Ahmed (2000) employs Granger-Causality technique to investigate the causal relationship between prices of stock and some macroeconomic indicators such as industrial production, investment expenditure and consumption expenditure in Dhaka financial market using monthly data from 1978-79 to 1996-97. His findings indicate the existence of causality and the causal direction is from changes in prices of stock to variations in consumption expenditure. Additionally, he also found existence of causal relationship between prices of stock and investment. However, when he examined the causal relationship between prices of stock and national investment, it came to light that aggregate national investment leads to prices of stock and also prices of stock lead to investment in fixed asset of companies. Furthermore, his results suggested that the relationship between Gross Domestic Product and prices of stock was weak, however prices of stock are most probable granger-caused GDP. The paper further revealed that the immediate causality among prices of stock and industrial production seems to be very weak or absent due to the fact the market is informationally inefficient within the given data set. Ibrahim and Aziz (2003) examined the relationship among prices of stock and money supply, industrial production, exchange rate and consumer price index in Malaysia. Their results indicate that in long-run there is positive relationship between prices of

Stock and, consumer price index and industrial production. However, they found a negative relationship between prices of stock and, Ringgit exchange rate and money supply. Furthermore, we consider another set of research works that investigated the scenario for multiple economies or countries. Cheung and Ng (1998) examined the association between prices of stock and some macroeconomic variables such as; money supply, real oil price, Gross National Product and total personal consumption in Italy, Canada, USA, Japan and Germany. Their findings suggest a long- run relationship between the chosen macroeconomic factors and actual prices of stock at the market. Also, as recent as in 2001 Bilson, Brailsford and Hooper (2001) deployed the use of world market value weighted index and selected macroeconomic factors for evaluating returns on stock in particular emerging markets. Their results indicate that prices of goods and real economic activity have inadequate ability to evaluate the disparity in returns on stock. Additionally, they indicate that world market return, Money supply and exchange rate prove to be the most important. Wongbangpo and Sharma (2002) examine the relationship among prices of stock and some selected macroeconomic variables in five selected ASEAN countries such as; Thailand, Indonesia, Singapore, Malaysia and Philippines. Their findings indicate that there is a positive long-run relationship between prices of stock and output growth rate. However, they found a short-run relationship between prices of stock and, current and lagged values of some macroeconomic factors. None of the studies reviewed above have modelled sock market price on other industry indicators such as market capitalization, price per earnings, average value traded etc. to examine their impact on stock returns. This study intends to fill this gap by regressing stock prices on both macroeconomic variables and industry indicators (microeconomic variables).

2.2 Capital Market

2.2.1 Introduction to Capital Market

Investopedia defines capital market as both bond and stock markets. When corporations and government need funds in other words capital to finance their long-term operations and to pursue their strategic investments drive, they do so through the sale of bonds and stocks in their respective names in order to carry out their operations and investments. Example is when an initial public offering (IPO) is carried out by corporations as a means to tapping the investor community for funds and this is a classical use of capital markets Another example is the issuance of Treasury bonds by governments in the bond market to fund their expenditure, they do so in the capital market. Both governments and corporations sell their securities through the primary market whereas investors buy these securities in the secondary market- through exchanges and on the counter. This to say that primary and secondary markets for both bonds and stocks is what is termed as capital market. Securities and Exchange commission regulates the Ghanaian capital market.

2.2.2 History of Capital market

According to Dimson, Marsh and Staunton (2002) in their book "Triumph of The Optimists: 101 Years of Global Investment Returns" stated that, it is obvious that three significant changes occurred in the worldwide stock market in the previous century, that is: the United States capital market became supreme; there was consolidations of the exchanges; and the attainment of secular sector evolution. Regrettably, understanding the previous market events doesn't necessarily provide certainty in predicting future market's event. Regrettably, until "Triumph of The Optimists" was authored, most obtainable stock market statistics before 1970 was solely for the financial market in U.S market. However, it is not startling, because the stock market in the U.S was the biggest winner with regard to the century in the twenties. It's average value weight moved to 47

2.3 Macroeconomic Variables And Stock Prices

2.3.1 Evidence from Developed Economies

Levy(1987) point out that the changes in U.S.A dollar exchange rate can negatively affect a company's gross profit nonetheless the extent of the impact varies from sector to sector. He also noticed that the variations in the exchange rate of the U.S.A dollar have enormously great bearing on earnings of long-lasting goods producers as compared to specific service industries. Contrary to what levy found,Soenin and Hennigar (1988) found a negative(weak) relationship between variations in the U.S.A dollar external value and manufacturing stock price indicators. In Australia research work covering the duration of the post-float time period from January 1984 to December 1989, was carried out by Loudon (1993) on stock earnings responsiveness of some companies relative to variations in the exchange rate of the Australian Dollar and discovered that reserve stocks and industrialized stock respond in different ways to variations in the external value of the Australian Dollar. In a related work, Banny and Enlaw (2000) also uncovered the relationship among the external value of the Malaysian Ringgit relative to the U.S.A dollar and stock values at the Kuala Lumpur Stock Exchange (KLSE) by employing single index and multi-index models. They concluded that an adverse relationship exists among stock prices at the Kuala Lumpur Stock Exchange (KLSE) and exchange rate relative to the U.S.A dollar. Ang and Ghallab (1976) examined the impact of devaluing the U.S.A dollar on the fifteen (15) U.S.A Multinational companies' stocks covering the period between August, 1971 and March, 1973, stated that stock marketplace is efficient and that stock prices change rapidly to variations within exchange rate. This is consistent with the finding of the work done by Aggarwal (1981) that from 1974 to 1978, the fluctuating rate of the U.S.A dollar and the prices of stock at the US stock market are strongly (positive) correlated, however, this conflicts the conclusion reached by Franck and Young (1972) which state that there are no positive or unchanging relationship of how prices of stock response to external rate readjustment in their research paper to establish the relationship among U.S.A multinational companies' stocks and exchange rate . Solnik (1987) carried out a studied on the impact of some variables including interest rate, exchange rate, and variations in expected inflation on stock prices. This study covered nine industrialized economies, specifically, the U.S.A, Germany, Japan, United Kingdom France, Belgium, Switzerland, Netherlands and Canada. The research paper found that a decrease in the external (exchange) rate had a positive impact on the U.S.A stock market and against variations in expected inflation. Fama (1981) carried out a study and found a positively strong correlation between mutual stock earnings and actual economic indicators like industrial production index, capital expenditures, money supply, real GNP, interest rate and lagged inflation whereas (Chen et al.,1986) found that the variations in inflation, aggregate production, interest rates, default risk-premium and maturity risk-premium are the various economic indicators that account for the variations in the prices of stock using United States of America economic data In investigating the effect of macroeconomic factors on the Straits Times Industrial Index (STII), Ying (2001) characterized the macroeconomic variables into two classes, these are; interest rates and money supply. He found that money supply has no pattern of impacts on the STII, however, interest rate plays a significant part in arriving at the monthly investing outlook using the STII. Using data (time series) between January, 1982 and December, 2002 on some selected macroeconomic indicators and major stock indicators of Singapore and U. S.A were employed to analyze the long–run relationship among the two nations, Wong et al. (2005) unearthed using a cointegration technique that prices of stock at the Singapore's stock market usually show a long-run symmetry relationship with money supply and interest rate however similar relationship do not pertain in the United States market. In ascertaining the prove of stock marketplace sensitiveness to inflation and interest rates in the UK, Nicholas (2003) examined the performance of real and nominal interest rates, monthly total earning of thirty-five (35) industry indicators as well as ten (10) sector indicators and four (4) financial times indicators by employing linear regression model and the results showed that movements in interest rate are crucial contributing factor to equity earnings variability and the rest of the industries except paper and forestry sectors and stock market securities are adversely associated with interest rate variations. It was further observed that services have the greatest sensitivity to changes in interest rates (nominal) due to their strong association with inflation. Statistical results resolve that there exist significant differences among inflation and interest rate sensitivities in all the economic sectors. Employing Arbitrage Pricing Theory (APT) in analyzing the stock returns of the Japanese Stock market and some macroeconomic indicators like price definite of crude oil, industrial production, interest rate (short-term) and money supply, Elton and Gruber (1988) that there is a definite association among prices of stock and interest rate (short-term).Chen et al. (1986) investigated the impact of changes in discount rate on the unpredictability of prices of stock and trading volume. They revealed that changes in the unpredicted discount rate influenced to higher, but short-lived, fluctuations and volume traded. Smirlock and Yawitz (1985) discovered that changes in interest rate can influence prices of equity in two respects, that is, by influencing the rate of investment of companies' expected cash flows, and by varying prospects of expected cash flows. The authors revealed that if interest rates rise it brings about a decline in prices of stock and if interest rates decrease it increases prices of stock. Furthermore, they stated that an impact of both rates of investment and prospects of expected cash flows on interest rates would affect equity prices. Lee (1992) examined the causative relationships and the dynamic relationship amongst asset returns, inflation and actual economic activity in the United States after the world war, employing the Vector Autoregressive cointegration technique. He revealed that stock earnings help to elucidate the actual economic activity; yet, stock earnings give very little explanation to changes in inflation. A research carried out by Dropsy and Nazarian-Ibrahim (1994) to study the effect of the fundamental policies of macroeconomic indicators on stock earnings employing monthly data between 1970 and 1990 for eleven developed economies and concluded that predictive macroeconomic policies could not predict stock earnings. Ibrahim (1999) examined the dynamic relationship among seven macroeconomic indicators and prices of stock in Malaysia using Granger causality and cointegration technique. He observed that prices of stock are affected by variations in the exchange rates and national reserves in the short-run. Park and Ratti (2000) examined the dynamic relationship among stock returns, inflation, monetary policy and actual economic activity, employing a VAR technique. They deployed monthly United States of America data between 1955 and 1998, and resolved that shocks owing to monetary strengthening generated statistically substantial movements in stock earnings and inflation, and that he could not find same movements in opposite directions. Döpke, Hartmann and Pierdzioch, (2005) used Germany monthly data and resolved that fluctuations in the market is elucidated by the market-outlook of key macroeconomic variables which have impact on business run. Wang (2010) examined the association between volatility of stock market and macroeconomic indicator fluctuations for China deploring LAVAR and EGARCH tests and found proof that there exists two-sided relationship between prices of stock and inflation, and a unidirectional association between stock prices and interest rate; the direction is from prices of stock to interest rate. Though, no significant association was found between prices of stock and real Gross Domestic Product (GDP).

Evidence from Emerging Economies

Fabozzi , Tunaru and Wu (2004) assessed the factors that cause stock market growth for selected emerging and OECD markets, covering 27 nations in total. The paper found, aside legal rights and stable macroeconomic environment, that the scope of the institutionalized investor foundations positively influences stock market growth, and report prove of a causative time-series association between institutionalized stockholders and stock market growth. Caporale, Howells and Soliman, (2004) examined stock markets growth using panel data analysis on transition markets and emphasize the function of privatization in developing stock market using the countries sampled. The kind of economic implication of the association among stock market growth vary in accordant with the degree of economic growth of the countries sampled. They revealed that the under-developed economies experienced the biggests impact. In an attempt to estimate stock price volatility for some countries, Abugri (2008) and Raju (2004) concluded that there exists a higher volatility in both Chinese and Indian Stock market relative to other economies (emerging). The advocates of positive relations among stock market growth and economic development based their line of reasoning on the construct that stock market helps economic development through the deployment and provision of investments, liquidity creating capability, risk diversification and corporate governance enhancement among others. Chowdhury and Rahman (2004) examined the association between the changes in macroeconomic indicators and the returns on stocks in Bangladesh. They adopted VAR tests and observed that volatility in macroeconomic indicators significantly affects volatility of stock market. Mahmood and Dinniah(2009) employed the Juselius and Johansen maximum likelihood technique, and Engle-Granger test to assess the relationship among three macroeconomic factors namely; output, inflation and exchange rate, and prices of stock of 6 nations in the continent of Asia. They provided proof of a long-run association among these indicators in the countries sampled, thus support the hypotheses of the cointegration technique except in the case of Malaysia. Empirical results show that there is no short-run association among the indicators in the entire sample of nations but not among stock returns and exchange rates in Hong Kong as well as among stock price and real output in Thailand. Rahman, Mohd Sidek and Tafri (2009) investigated the interaction among some macroeconomic indicators and prices of stock in Malaysia using VECM/VAR framework. They stated that variations associated with the Malaysia stock marketplace indicator do have a cointegrating association with variations in interest rate, money supply, reserves, exchange rate, and production index. Wongbanpo and Sharma (2002) studied the relationship among the returns on stock of five ASEAN countries and five (5) macroeconomic indicators and observed that all the five (5) stock price indicators were positively linked to real growth and had adverse association with the aggregated price level in the long-run. Mukhopadhyay and Sarkarin (2003) Carried out a systematic investigation of returns at the stock market in India before and after the liberalization of the market and the impact of macroeconomic indicators on stock returns. Their outcome indicates that the period (from 1995) after the market liberalization, inflation, actual economic activity, external direct investment, money supply as well as the NASDAQ market index were substantial in explaining changes in stock returns at the Indian stock market. Alagidedea and Panagiotidisb (2010) investigated the association among inflation and prices of stock for some stock markets in Africa. For example, in South Africa, the paper revealed that stock price elasticity relative to consumer price to be approximately 2.3, hence in the short-run price of stock showed a temporary adverse reaction to consumer price whiles in the long-run it displayed a positive reaction. So therefore, in the long-run stock price is a hedgerow against inflation. Again Arjoon, Botes , Chesang and Grupta (2010) analyzed the association between prices of stock and inflation in South Africa. The paper found that in the long-run, prices of stock are not caused by a perpetual variation in inflation rate and that the deviations in prices of stock in the short- run will be corrected in the long-run. Grupta and Modise (2011) estimated the prognostic power of some macroeconomic factors in South Africa. The paper reported that for forecast of in-sample data; money supply, interest rates, and world crude oil growth exhibited some prognostic effect in the short-run. The paper further reported that for forecast of out-of-sample data; money supply and interest rates have short-run forecast ability, and revealed further that inflation showed a robust power of forecasting on not within sample data. Again, (Chinzara, 2011) studied macroeconomic unpredictability and uncertainty of stock market in South Africa. The paper indicated that volatility of stock markets is substantially caused by macroeconomic unpredictability of macroeconomic indicators, that economic crunches increase volatility of the markets and that unpredictability of interest rates and exchange rates are the biggest driving factors that cause volatility in stock market whereas uncertainties in prices of oil, prices of gold and inflation rates play an insignificant part in influencing volatility of stock market. Amadi, Onyema and Odubo (2002) used multiple linear regressions to examine the operational relationship among inflation, money supply, exchange rate, interest rate, and prices of stock in the Nigerian market. The study disclosed that the association between prices of stock and macroeconomic indicators are in agreement with theoretical proposition and experiential findings in selected countries. However, they observed that the association between inflation and prices of stock are inconsistent with some selected other works carried out outside Nigeria. Again, Nwokoma (2002) attempted to establish the long-run association between stock market return and some selected macroeconomic variables. The result showed that industrial production and interest rates exhibit a long-run association with stock market. The paper also observed that the stock market in Nigeria reacts to its previous prices than variations in macroeconomic indicators in the short-run. Also, Oseni and Nwosa (2011) employed the same statistical method as Amadi et al. (2002) examined the association between volatility of stock market and macroeconomic factors uncertainty in Nigeria. They both observed a bi-causal association between volatility of the market and real Gross Domestic Product (GDP). Though, they could not find proves relative to the causative association among volatility of stock market, interest rate volatility and inflation.

2.3.2 Evidence from Ghana

There are few empirical studies on the relationship between stock prices and some macroeconomic factors in Ghana. Adam and Tweneboah (2008) established a positive long-run association among macroeconomic indicators and prices of stock. They concluded that exchange rates and inflation are significant factors in determining prices of share in Ghana in a short-run. However, inflation and interest rate are significant factors in the long-run. Employing johansen maximum likelihood technique, Kuwornu and Owusu-Nantwi (2011) found a significant association among returns on stock and macroeconomic indicators namely; treasury bill, inflation and exchange rate. They found that inflation showed a positive association with returns on stock whereas treasury bill and exchange rate showed a negative association with returns on stock. However, they discovered no significant association between returns on stock and oil (crude) prices. Furthermore, Kuwornu (2012) using VECM observed that in a long-run returns on stock are positively influenced by treasury bill, inflation and exchange rate and adversely by oil (crude) prices. However, in a short-run, they discovered that changes in returns on stock and inflation have an adverse relationship and returns and treasury bill have relationship (positive). Also, Kyereboah-coleman and Agire-Tettey (2008) in their paper indicated that the lending rates of banks exhibited an adverse relationship with returns on stock and have the capacity to improve growth of enterprises in Ghana. The paper further found an adverse relationship among inflation and stock market performance. Clearly,from the review of the literature above, there is no study that have modelled the relationship between stock price and, both macroeconomic and microeconnomic variables in order to explained their combined effect on stock market returns at the Ghana Stock Exchange. To fill this gab, this study constructed a model between stock market prices and some selected macroeconomic and microeconomic variables at the Ghana Stock Exchange using Autoregressive Distributed Lag (ARDL). This study deployed the use of ARDL because it has a superior advantage of working with data be it stationary or non-stationary compared to the other models used in the existing literature.

2.4 Microeconomic Variables And Stock Prices

2.4.1 Evidence from Developed Economies

A significant number of experiential evidence has been found in industrialized economies in examining stock price performance and stock market efficiency. The empirical proof of prices of stock performance and stock market effectiveness employing underlying indicators, macroeconomic indicators and microeconomic indicators are unsatisfactory yet. Many experiential researches have been undertaken to investigate the association of stock market with dividend announcements. Aharony and Swary (1980),Kwan (1981), Eades (1982) as well as Woolridge (1982) revealed a positive relationship among changes in dividend announcement and returns on stock, employing dividend announcement occasioned excluding other industry news report. Gordon (1962 & 1963) as well as Walter (1963) supported the relevancy of the dividend doctrine. They suggested that policy on dividend and policy on investment are interconnected. Policy on Investment could not be divorced from policy on dividend and the selection of a suitable dividend policy influences stock returns. The leading advocates of the theory called bird-in-the-hand, Gordon (1962) as well as Lintner (1962) observed that investors rate a dollar gained in dividend much highly relative to dollar earnings saved. Consequently, policy on dividend is pertinent to shares value. Miller and Scholes (1981) contended that the experiential association among mutual stock earnings and yields in dividend depends on the positive info held by investors as confined in the erudition that an investment will definitely announce the very least dividend. Also, Dhillon and Jhonson (1994) examined the bond and stock price response to dividend variations. This positive stock market reaction to increase in dividend can br explained by the following: most commonly talk about is information content and redistribution of wealth between bondholders and stockholders. They submitted evidence that support the hypothesis of wealth redistribution but their evidence does not reject the hypothesis of information content. Particularly, they discovered that the price of bond response to declaration of huge dividend variations is directly opposite to response of stock price. Their findings differ from what (Handjinicolaon & Kalay found in 1984.

2.4.2 Evidence from Emerging Economies

Ahmed (1991) investigated the policy on dividend of the companies listed on the stock market in Bangladesh and established a relation between Japanese listed firms and Bangladeshi listed enterprises. He stated that retained earnings and dividend deliver returns to the investor, however in Bangladesh, rate of dividend showed a decreasing trend whereas the Japanese firms seemed to be rather stable. Therefore, lower yield in dividend at the Bangladesh's stock market is ascribable to both greater market capitalization and smaller dividend rate whereas in Japan it is more often than not due to greater market capitalization. He also stated that firms that pay dividend regularly have higher Price/Earnings ratio relative to the enterprises paying erratically which eventually suggests that the market relate to regular dividend policy and that they accelerate prices of stock. Again Ahmed (2000) investigated the comparative significance of retained earnings and dividend to elucidate the variations in stock price at the Bangladesh's stock market. The results revealed that both retained earnings and dividend affect stock price and that their impact exist notwithstanding the usual anticipation of robust dividend

effect on sectors of the economy that are experiencing a lessr-than-average growth rate and of retained earnings effect on sectors of the experiencing a higher-than-average growth rate. For instances, the postulation on dividend seems to be robust relative to the hypothesis on retained earnings. Dividends carry valuable knowledge to the stockholders and there is record to show that the fund managers' behavior seems to be in harmony with this standpoint, thus reinforcing the theory on Dividend Relevance. Though there exist other alternative via which fund administrators can spread info, however dividends are extremely noticeable relative to other statements added to the trustworthiness of money indicators.
Pu Shen (2000) examined the past relationship among P/E ratios and consequent performance of stock market. The paper observed a strong past evidence that higher P/E ratios are followed by unsatisfactory stock market returns in a short-run and long-run. Precisely, higher P/E ratios are followed by sluggish long-run growth of stock prices. Furthermore, higher P/E ratios have decreased the returns on stocks compared to earnings on other investing vehicles, performance of stock market is affected as well. Hamid and Chowdbury (2005) employed two instruments: "daily market- adjusted abnormal return (MARR)" as well as "daily cumulative abnormal return (CAR)" to examine the influence of dividend declaration on stockholders' net worth. The paper elucidated "MARR" to be a measure of the comparative day-to-day percent price variation associated with the dividend shell out stocks relative to the variation in market price average. While "CAR" is described to be an indicator of the stockholders' total return from the period long before dividend is announced to long after dividend announced day. They examined 137 data set of dividends shell out firms listed on the Stock Exchange in Bangladesh and observed that MARR was statistically insignificant on the dividend declaration day which implies that the stock market responds before the actual declaration of dividend. However, the results of CAR indicate that stockholders decreased in value more after the dividend period relative to the value increased before dividend period. The results also submit that declaration

of dividend does not convey information on cash flows and future earnings of the enterprises. Anderson and Brooks in 2006, observed that price/earnings computed from manifold yearly returns to be superior forecaster of earnings compared to the conventional single-year price/earning ratio. Hossain (2006) analyzed the determining factors of stock prices as well as changes in earnings of listed firms at the stock market in Bangladesh.The paper employed multiple factors such as listed companies (total), total IPO, EPS, DPS and dividend payout ratio and as well employed several macroeconomic indicators such as money supply, GDP, income per capital, investment, consumption, savings, export, exchange reserves, import, inflation rate, interest rate deposit, interest rate advance to be significant determinants for fixing stock price. He observed an adverse relationship among dividend yield and prices of stock. Vorek (2009) analyzed stocks investment and indicated that stock investments with low P/E ratio recorded higher returns relative to average stock earnings. The study laid emphases on the opposite direction of the relationship: can a high P/E ratio forecasts future reduction in prices of stock and also can the P/E ratio act as a measure of the future bear market. He concluded that price/earnings ratio as a measure of the coming stock markets decline is inconclusive. Ali and Chowdbury (2010) studied the influence of dividend declaration on prices of stock of twenty-five listed banks at the stock market in Bangladesh. They used the general event research methodology to examine reaction of stock price to dividend declaration and observed that eleven out of twenty-five banks' prices of stock declined, six bank's stock prices increased and eight bank's stock prices experienced no change. Lastly, the paper concurred with the theory on dividend insignificance and concluded that dividend declaration on it own has no impact on prices of share. Ong and Yichen (2010) study the capacity of the price/earnings (average) ratio to predict future returns on stock earnings. This paper examined to know if price/earnings can be employed to forecast coming market falls and if price/earnings can function as an indicator of the future market falls at the stock market in Malaysia. The study revealed that the postulation that the price/earnings ratio is not an effective forecaster of the index on KLCI was not accepted. A linear affirmative gradient is among the yearly earnings of KLCI and price/earnings, which implies that a surge in price/earnings possibly could have induced the ensuing increase in the returns of KLCI. Also, a decrease in price/earnings ratio caused in the ensuing fall in the returns of KLCI, hence, functioning as a measure of the future market falls in the Malaysian stock market.

2.5 Predictability Of Stock Markets

Fama (1965) theory on market efficiency can be considered as the foundation of contemporary finance. Market efficiency entails that, all obtainable information is completely and instantly reflected in stock price, and none of the market players is capable of making abnormal profit. However, the set of information is restricted to historical return and price and this case the stock market is considered to be weakly efficient and therefore the stock return is completely unpredictable This assertion is highly debatable as assessments by behavioral finance scholars have revealed illogical, but extremely predictable, investor behaviors such as overconfidence and overreaction. (DeBondt & Thaler, 1985, Barber & Ordean, 2001) In reacting to these criticism, Campbell et al. (1997) suggested the theory of relative market efficiency, which start out from all-or-nothing viewpoint. With relative efficiency of the market, it is convenient to determine the level of return predictability. (Yen & Lee, 2008) examined data from the Japanese stock market on efficiency of the market between the period 1960 and 1990 and reported that the "market is efficient" in the period 1960's; "mixed outcomes" between the period of 1970's and 1980's; as well as "challenging outcomes" in the period 1990's. (Park & Irwin,2007) conducted a similar study, where early surveys (1960-1987) found no proof of usefulness of rules on technical trading while most contemporary studies (1988-2004) state otherwise. Therefore, the results of these research papers draw attention to the fact that stock markets are generally less predictable over time. Gu and Finnerty (2002) carried out a study on the United States of America stock market and reported that the stock market revealed improved efficiency after late 1970's; whereas (Lo, 2004) reported that the level of efficiency changes in a recurring style and that the stock market proved to be more predictable in the period of 1950's compared to the period 1990's. The changing nature of predictability of returns on stock can be explained by the model constructed in 2004 by Lo called Adaptive Markets Hypothesis (AMH). Taking into consideration investor rationality is at the center of the debate between proponents of the market efficient theory and their behavioral critics. (Lo, 2004) provided a rapprochement via his AMH framework which explains market efficiency from the viewpoint of evolutionary. Empirically, there exist a growing literature that provides evidence of changing stock market predictability and they are in harmony with the forecast of the AMH Lim and Brooks (2011). But, not a single study previous conducted, investigated whether predictability of market return is propelled by market conditions that are constantly changing. Kim, Lim and Shamsuddin, (2011) assessed the changing predictability of return at the United States stock market during the last century by testing whether its progressive change is in harmony with the propositions by the AMH. They measured return predictability employing improved type of variance ratio technique of Lo and Mackinlay constructed, 1988 as well as the portmanteau technique of Ljung and Box Constructed in 1978. In other to detect whether there exists a potential return non-linear dependence, the paper deployed generalized spectral technique constructed by Escanciano and Velasco in 2006. The paper obtained monthly indicators on predictability of return using DJIA index between 1900 and 2009 to test whether these measures are linked to dissimilar market factors and economic indicators. Since 1900, the stock market in U.S has faced some extraordinary and unanticipated events, like wars, the market crashes, political or economic crises, and asset bubbles. These incidents have strong consequences to the psychology and behavior of market players, which may influence the form of changes in price. (Kim & Shamsuddin, 2008, Lim et al., 2008) In the light of Lo AMH in 2004, it is extremely possible that the measure of predictability of return is propelled by such active market conditions. Kim and Shamsuddin found strong proof that predictability of return is propelled by transmuting market conditions. Particularly, during the stock market crash from 1929 to 1987), the paper observed nil evidence of return predictability, however there was a great degree of doubt associated with predictability of return. Contrastingly, during the political crises or economic fundamental, the stock market returns were observed to be extremely predictable with a reasonable degree of doubt. During the economic bubbles, return predictability and its associated doubt are smaller relative to the normal times. Differing to the universal results of past researches, the paper before 1980 observed a higher measure of predictability; and a robust tendency to nil-predictability afterwards. The findings are in harmony with the changing nature of stock market efficiency proposed by Lo(AMH).

CHAPTER 3

METHODOLOGY

3.1 Introduction

This explains how the entire study will be carried out. The study essentially seeks to assess the relationship between prices of stock and selected macroeconomic and microeconomic variables. (INF, PPI, EXC, VAT and MAC). It outlines the data types and sources, data collection, data processing and the statistical models that will be used in this study.

3.2 Data Sources And Collection

In this study, Ghana Stock Exchange (GSE) all-share-price index (GSI) is the response variable. Whiles three macroeconomic variables that is, Inflation (INF), Producer Price Index (PPI), Exchange rate (EXC) and two Microeconomic variables that is, Value Traded (VAT) and Market Capitalization (MAC) are the explanatory variables. The study analyzed monthly data covering all the variables under study for the period January 2007 to December 2016 (12O monthly dataset) which were obtained from Monthly Market Report issued by Ghana Stock Exchange (GSE) and Monthly Economic Report issued by Ghana Statistical service. The data for this study are mainly secondary data.

3.3 Method/ Statistical Techniques

To achieve our main objective in this research, Autoregressive Distributed Lag (ARDL) was adopted to determine the existence of long-run relationship between

GSE all-share-price index and the selected macroeconomic and microeconomic variables. The second stage is to determine the existence of short-run relationship between GSE all-share price index and our selected macroeconomic and microeconomic variables using Error Correction Model (ECM) of the ARDL model. The final stage is to determine the existence of causality between GSE all-share-price index and the selected macroeconomic and microeconomic variables using Granger causality technique.

3.4 Unit Root Test(Stationarity Test)

Economic variables are stochastic in nature. That is, they are noted to be non-stationary. A stationary process is one with a constant deterministic trend over time with mean and variance as constant. A non-stationary series can occur if any of these conditions are violated. In most economic literature, various forms of unit root test have been used to ascertain the specific integration order. (Kwiatkowski, Phillips, Schantz & Shin (KPSS),1992; Dickey & Fuller,1979 Phillips & Parron,1988 and Sargan & Bhargave,1986). In this study, KPSS, Augmented Dickey-Fuller(ADF) as well as Phillips and Parron (P-P) tests are employed to test for the integration order in each variable. KPSS test posit the null hypothesis to be stationary and non-stationary data series to be the alternative hypothesis. These assumptions apply also to Phillips and Parron(P-P) as well as Augmented Dickey-Fuller (ADF) tests. However, in this test the null hypothesis is assumed to be non-stationary whiles the alternative hypothesis to be stationary. Time series data have been demonstrated to be order one (1) of integration. (Engle & Granger 1987). GSE all-share-price index (GSI) and five economic variables (three macroeconomic-INF, PPI, EXC and two microeconomic-VAT, MAC) are variables under study. This study adopts Augmented Dickey-Fuller (ADF) stationarity test technique to investigate and ascertain if the variables are non-stationary or stationay. This is done to eliminate the problem of spurious regression of the variables in the regression model. The

ADF regression equations are formulated as follows:

$$\Delta Y_t = \beta_1 Y_{t-1} + \sum_{i=1}^{k} \omega_i \Delta Y_{t-1} + \varepsilon_t \tag{3.1}$$

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \sum_{i=1}^{k} \omega_i \Delta Y_{t-1} + \varepsilon_t \tag{3.2}$$

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 t + \sum_{i=1}^{k} \omega_i \Delta Y_{t-1} + \varepsilon_t \tag{3.3}$$

where ε_t, are the error correction terms, Δ is the first difference operator, the extra lagged terms are part of the tests to make sure that the errors are not correlated. These tests are founded on the null hypothesis:

$$H_0 : Y_t \neq I(0) \text{ that is } Y_t \text{ is non-stationary}$$

$$H_1 : Y_t \text{ is } I(1) \text{ that is } Y_t \text{ is stationary}$$

The study fails to reject the null hypothesis H_0 if the critical values of the test are greater than the computed ADF and P-P statistics and therefore the dataset are not zero-order integrated (that is they are non-stationary). The compares the $\rho - values$ of the test to the significant level of the test.

3.5 Cointegration Modelling

To prevent the occurrence of spurious result in the use of non-stationary data, cointegration analysis is employed. This technique allows the separation of short-run and long-run association amongst the research variables. In the event that the research variables are observed to be non-stationarity (unit root) and to have the same integration order, this technique brings to fore the presence of long-run symmetry amongst the variables. Cointegration presents one added causal term (error correction term) for one of the variables to affect the other variables. Another important feature of this technique is its limiting effects on the parameters and a proper accounting of these limiting effects could enhance estimation proficiency. Examples of cointegration techniques are: Engle and Granger (1987), Charemza and Deadman (1992), Philips and Johansen- Juselius (1988, 1992 and 1999), Inder (1993), ARDL (also known as the bound testing method to cointegration) established by Pesaran et al., (2001), Cuthbertson et al.,(1992) and others. This study adopts ARDL approach to cointegration

3.6 Autoregressive Distributed Lag (ARDL) Model

The ARDL model comprise of response variable regressed on previous figures of the response variable and, previous and current figures of one or more predictor variables. One advantage of ARDL model is that it permits us to establish what the real effects are as result of variations in any policy variable.

3.6.1 A ARDL Model (1,1) Illustration

$$Y_t = c + \gamma_1 Y_{t-1} + \alpha_0 X_t + \alpha_1 X_{t-1} + \varepsilon_t \tag{3.4}$$

Given that Y_t and X_t stationary variables, and ε_t is the error correction term. ε_t is a series which has a constant variance and a zero mean, and sequentially not correlated. The series ε_t is the error correction term if for each time t,

$$E(\varepsilon_t) = E(\varepsilon_{t-1}) = ... = 0$$
$$E(\varepsilon_t^2) = E(\varepsilon_{t-1}^2) = ... = \sigma^2$$
$$E(\varepsilon_t \varepsilon_{t-p}) = E(\varepsilon_{t-i} \varepsilon_{t-i-p}) = ... = 0, for\ all\ \varepsilon.$$

3.6.2 Regression Estimate And Estimation

If the value of X_t is uncorrelated with the error term ε_t, then Ordinary Least Square estimate is consistent. But, if X_t and Y_t are simultaneously determined and, E($X_t \varepsilon_t$)$\neq$ 0, then the ordinary least square estimate is inconsistent. Since the error term ε_t is stationary and independent of $Y_t, Y_{t-1}, ...$ and $X_t, X_{t-1}, ...$, then the ordinary least squares can be used to estimate the ARDL models more consistently.

3.6.3 Dynamic Effect of the ARDL Model

The ARDL model is inverted to give equation (1) model as a lagged polynomial in Y_t as:

$$Y_t = (1 + \gamma_1 + \gamma_1^2 + ...)c + (1 + \gamma_1 P + \gamma_1^2 P^2 + ...)(\alpha_0 X_t + \alpha_1 X_{t-1} + \varepsilon_t). \quad (3.5)$$

The present figure of Y is based on the present and all lagged figures of X and ε.

$$\frac{\Delta Y_t}{\Delta X_t} = \alpha_0, \quad (3.6)$$

And this is called the multiplier Effect.

After one time period the impact is given as;

$$\frac{\Delta Y_{t+1}}{\Delta X_t} = \alpha_1 + \gamma_1 \alpha_0, \quad (3.7)$$

After two time periods the impact is given as

$$\frac{\Delta Y_{t+2}}{\Delta X_t} = \gamma_1 \alpha_1 + \gamma_1^2 \alpha_0, \quad (3.8)$$

The impact multiplier (long-run) is given as $\Delta\alpha_0 + \alpha_1 1 - \gamma_1$ if $|\gamma_1| < 1$.

3.6.4 The Error Correction Model of the ARDL Model

We reparameterize by replacing X_t and Y_t with $X_{t-1} + \Delta X_t$ and $Y_{t-1} + \Delta Y_t$.

$$\Delta Y_t = c + \alpha_0 \Delta X_t - (1 - \gamma_1) Y_{t-1} + (\alpha_0 + \alpha_1) X_{t-1} + \varepsilon_t, \tag{3.9}$$

$$\Delta Y_t = \alpha_0 \Delta X_t - (1 - \gamma_1)[Y_{t-1} - \frac{c}{1 - \gamma_1} - \frac{\alpha_0 + \alpha_1}{1 - \gamma_1} X_{t-1}] + \varepsilon_t. \tag{3.10}$$

This is known as the Error Correction model (ECM). ΔY_t is a summation of two components. The first one is proportionate to Δx_t. The next one is a partial correction of the deviation of Y_{t-1} from the symmetry figure relative to X_{t-1}.

3.6.5 Generalized Model

The ARDL (s,r) model:

$$M(P)Y_t = c + N(P)X_t + \varepsilon_t \tag{3.11}$$

with

$$M(P) = 1 - \gamma_1 P - \gamma_2 P^2 - ... - \gamma_s P^s,$$

$$N(P) = \alpha_0 + \alpha_1 L + \alpha_2 P^2 + ... + \alpha_r L^r.$$

The general ARDL $(r, s_1, r_2, ..., r_g)$ model:

$$M(P)Y_t = c + N_1(P)X_{1t} + N_2(P)X_{2t} + ... + N_g(P)X_{gt} + \varepsilon_t, \tag{3.12}$$

The model is referred to as the distributed lag model if $M(P) = 1$ which implies that the model lacks the lag values of Y_t .

3.6.6 ARDL Model Specification

In practice assessing the long-run association amongst the variables under study using the ARDL model leads to the exclusion of the previous value of the variables under study. In this study the ARDL model approach to cointegration is illustrated as;

$$\Delta(GSI)_t = \varphi_0 + \varphi_1 \sum_{j=1}^{k} \Delta(GSI)_{t-j} + \varphi_2 \Delta(INF)_t + \varphi_3 PPI_t + \varphi_4 \Delta(EXC)_t + \varphi_5 (VAT)_t + \varphi_6 \Delta(MAC)_t + \sum_{j=1}^{k} \varphi_{7j} PPI_{t-j} + \sum_{j=1}^{k} \varphi_{8j} \Delta(INF)_{t-j} + \sum_{j=1}^{k} \varphi_{9j} \Delta(EXC)_{t-j} + \sum_{j=1}^{k} \varphi_{10j} VAT_{t-j} + \sum_{j=1}^{k} \varphi_{11j} \Delta(MAC)_{t-j} + \varepsilon_t \tag{3.13}$$

where GSI = GSE All-share price index

INF =Inflation

PPI - Production PRICE Index

EXC = Exchange rate

VAT = Value Traded

MAC = Market Capitalization

k = lag length

Δ = First differencing operator

ε = white error term

φ_0 = drifting component

To establish the presence of long-run association among (GSE) all-share price index and our selected economic indicators, the ARDL cointegration technique is employed. This testing technique depends on the Wald-test. The null hypothesis for the F-test is that there is no cointegration amongst the variables under study and the alternative hypothesis is that there is existence of cointegration amongst the variables under study and this is illustrated below:

$$H_0 : \varphi_i = 0$$

$$H_1 : \varphi_i \neq 0$$

where i=1,...,11

The limiting distribution of the F-test is non-standard normal under the null hypothesis of no cointegration amongst the variables under study. Two critical values are obtained by ARDL cointegration test technique. The lower critical value presumes all the research variables are I(0) which implies that there exist no cointegration association among the research variables. The upper critical value presumes that all the research variables are I (1) which implies that there exist cointegration amongst all the research variables. If the calculated Wald-statistic is greater than the bigger critical value, then we fail to accept the H_0. When the Wald-statistic is less than the smaller critical value, then we accept the H_o. If the calculated Wald-statistics lies between the smaller and bigger critical values, then the outcomes are unsettled.

The long-run association among the variables under study using the ARDL cointegration technique is specified as:

$$\Delta(GSI)_t = \sigma_0 + \sigma_2 \Delta(INF)_t + \sigma_3 PPI_t + \sigma_4 \Delta(EXC)_t + \sigma_5 VAT_t + \sigma_6 \Delta(MAC)_t + \theta EC_t + \varepsilon_t \tag{3.14}$$

Where INF, PPI , EXC, VAT and MAC maintain their original meanings. The σ_0 is the drift component of tne model. Also, $\sigma' s$ are the the parameters of the model, θ is the speed of adjustment parameter and ε is the white noise of the model. Again θ is the factor that measures the adjustment speed whiles EC is the white noise in the model. EC_t indicates the degree of correction of the disequilibrium in the model, thus, the level to which any imbalance in the lagged period is being corrected in ΔGSI_t. If θ is positive then it implies a divergence and when θ is negative then it implies convergence. When the estimated value of $EC_t = 1$, then 100% of the correction occurs in each period of time. When the estimated value of $EC_t = 0.5$, then 50% of the correction occurs in each time period. If the $EC_t = 0$ then it indicates that there exists no correction, and that the assertion that there exist a long-run relationship makes no statistical sense any more.

3.7 EC Model Specification

To determine the existence of short-run association among GSE all-share price index and the selected economic variables, the ECM Model is employed. The Error Correction Model as applied to the variables under study is illustrated as:

$$\Delta(GSI)_t = \phi_0 + \sum_{j=j}^{k} \phi_{1j}\Delta(GSI)_{t-j} + \sum_{j=1}^{k} \phi_{2j}PPI_{t-j} + \sum_{j=1}^{k} \phi_{3j}\Delta(INF)_{t-j} + \sum_{j=1}^{k} \phi_{4j}\Delta(EXC)_{t-j} + \sum_{j=1}^{k} \phi_{5j}VAT_{t-j} + \sum_{j=1}^{k} \phi_{6j}\Delta(MAC)_{t-j} + \varepsilon_t \tag{3.15}$$

Where GSI, PPI, INF, EXC, VAT and MAC maintain their original meanings. The ϕ_0 is the drift component of tne model. Also, $\phi's$ are the the parameters of the model. ε is the white noise of the model.

3.8 Granger Causality Technique

Granger causality technique is concerned with short-run predictability of ECM model.

For instance, in a bivariate method, given that X_t and Y_t are time series dataset with the same integration order, if the lagged and current value of Y_t provides some useful info to forecast X_{t+1} at period t, then Y_t is said Granger caused X_t. Granger (1988). Also, the intensity of the Granger causality can vary and the direction of causality can similarly vary contingent on the time period it is evaluated. The direction of the causality can be unidirectional or bidirectional. Largely, the Granger causality implies that there exist a lead-lag association among variables in a multiple time series model.

The standard testing method for Granger causality is assessing for the significance of the coefficients of the previous values of Y_t, which are modelled as the predictor variables for X_t in the regression framework. From the Error-Correction Model in the equation (9), the assessment for Granger causality of y to x is an Wald-test for the joint significance of $\phi's$

3.8.1 Granger Causality Model Specification as Applied to the Variables Under Study

A bivariate of ECM comprising all-share price index of the Ghana Stock Exchange (GSI) and the selected economic variables for Granger causality test is as follows;

ECM between All-share price index (GSI) and Inflation (INF).

$$\Delta(GSI)_t = \varphi + \sum_{j=1}^{k} \theta_{1j}\Delta(GSI)_{t-j} + \sum_{j=1}^{k} \beta_{1j}\Delta(INF)_{t-j} + \varepsilon_t$$

$$\Delta(INF)_t = \omega + \sum_{j=1}^{k} \mu_{1j}\Delta(INF)_{t-j} + \sum_{j=1}^{k} \rho_{1j}\Delta(GSI)_{t-j} + \varepsilon_{2t}$$

ECM between All-share price index (GSI) and Producer Price Index (PPI).

$$\Delta(GSI)_t = \varphi_0 + \sum_{j=1}^{k} \theta_{2j}\Delta(GSI)_{t-j} + \sum_{j=1}^{k} \beta_{2i}PPI_{t-J} + \varepsilon_{3t}$$

$$PPI_t = \omega_0 + \sum_{j=1}^{k} \mu_{2j}PPI_{t-j} + \sum_{j=1}^{k} \rho_{2i}\Delta(GSI)_{t-J} + \varepsilon_{4t}$$

ECM between all-share price index (GSI) and Exchange rate (EXC).

$$\Delta(GSI)_t = \varphi_1 + \sum_{j=1}^{k} \theta_{3j}\Delta(GSI)_{t-j} + \sum_{j=1}^{k} \beta_{2i}\Delta(EXC)_{t-J} + \varepsilon_{5t}$$

$$\Delta(EXC)_t = \omega_1 + \sum_{j=1}^{k} \mu_{3j}\Delta(EXC)_{t-j} + \sum_{j=1}^{k} \rho_{3i}\Delta(GSI)_{t-J} + \varepsilon_{6t}$$

ECM between All-share price index (GSI) and Value Traded(VAT).

$$\Delta(GSI)_t = \varphi_2 + \sum_{j=1}^{k} \theta_{4j}\Delta(GSI)_{t-j} + \sum_{j=1}^{k} \beta_{4i}VAT_{t-1} + \varepsilon_{7t}$$

$$VAT_t = \omega_2 + \sum_{j=1}^{k} \mu_{4j}VAT_{t-j} + \sum_{j=1}^{k} \rho_{4i}\Delta(GSI)_{t-j} + \varepsilon_{8t}$$

ECM between All-share price index (GSI) and Market Capitalization(MAC).

$$\Delta(GSI)_t = \varphi_3 + \sum_{j=1}^{k} \theta_{5j}\Delta(GSI)_{t-j} + \sum_{j=1}^{k} \beta_{5i}\Delta(MAC)_{t-j} + \varepsilon_{9t}$$

$$\Delta(MAC)_t = \omega_3 + \sum_{j=1}^{k} \mu_{5j}\Delta(MAC)_{t-j} + \sum_{j=1}^{k} \rho_{4i}\Delta(GSI)_{t-j} + \varepsilon_{10t}$$

Where INF, PPI, EXC, VAT and MAC pertain their original meanings. The $\varphi's$ and $\omega's$ are the drift component of tne model. Also, $\beta's$, $\theta's$, $\mu's$ and $\rho's$ are the the parameters of the model and $\varepsilon's$ are the white noise of the model.

3.9 Selection of the Model Lag Length

There are numerous literature on the criteria employed in selecting the lag length of times models. These criteria are deployed to assist in determining the most suitable number of lag length of any time series model. Cointegration techniques such as ARDL and VECM require the specification of the optimal number of lags. The selection criteria mostly used are; Aikaike Information Criterion (AC) constructed by Alkaike in 1973, Hannan-Qiunn Criterion (HC) established by Hannan and Quinn in 1979, Schwarz Information Criterion (SC) constructed by

Schwarz in 1978 and Final Prediction Error (FPE) established in 1969 by Alkiake. The model with the least value of SC, AC, HC and FPE is considered to be the best model.However,if two models have same value of SC, AC, HC and FPE then we adopt the parsimony theory.

3.9.1 Schwarz Information Criterion (SC)

The Schwarz Information Criterion (SC) approach to the selection of the model lag length (k) is given;

$$SC = In(\hat{\lambda}_k^2) + \frac{[kln(V)]}{V},$$

where

$$\hat{\lambda}_k^2 = (V - k - 1)^{-1} \sum_{i=k}^{V} \hat{\varepsilon}_t^2$$

ε_t is the white noise of the model and V is the sample size. The SC is the estimator of k, $\hat{k}$, which is the value that minimizes SC (k) amongst all the plausible options of $k = 0, 1, 2, ..., k_{max}$ where k_{max} is the biggest value of k under consideration.

3.9.2 Akaike Information Criterion (AC)

The Akaike Information Criterion is the most widely used lag selection criterion due to its comparative advantage to yield to a model with multiple lags. It has a added advantage of measuring the goodness of fit of the model and correct any complexity in any given data set.AC was first mooted by Hirodoga Akaike in 1973. The AC estimator of k is given by;

$$AC_k = -2V[In(\hat{\lambda}_k^2)] + 2k,$$

where

$$\hat{\lambda}_k^2 = (V - k - 1)^{-1} \sum_{i=k}^{V} \hat{\varepsilon}_t^2$$

ε_t is the white noise of the model and V is the sample size.

3.9.3 Hannan-Quinn Information Criterion (HC)

This information criterion was first mooted in 1979 by Hannan-Quinn.The attuned version of HC is attained by substituting the non-negative correction of the AC function by $In(InV)$ and is given by;

$$HC_k = In(\hat{\lambda}_k^2) + 2V^{-1}kIn[InV],$$

where

$$\hat{\lambda}_k^2 = (V - k - 1)^{-1} \sum_{i=k}^{V} \hat{\varepsilon}_t^2$$

ε_t is the white noise of the model and V is the sample size.The model with the least HC value is the best model. That is $k = 0, 1, 2, ..., n$ $[HC_K]_{min}$. The greatest critique of the Hannan-Quinn Information Criterion is that is over fit when the sample size is very small.

3.9.4 Final Prediction Error (FPE)

The Final Prediction Error is given by;

$$FPE_k = \hat{\lambda}_k^2(V - k)^{-1}(V - k),$$

where

$$\hat{\lambda}_k^2 = (V - k - 1)^{-1} \sum_{i=k}^{V} \hat{\varepsilon}_t^2$$

ε_t is the white noise of the model and V is the sample size. The model with the least FPE value is the best model. That is $k = 0, 1, 2, ..., n$ $[FPE_K]_{min}$. The objective of all these selection criteria is to correctly estimate the true lag length of the ARDL model. The estimates are probability estimate, that is, $0 \leq k \leq 1$. If a selection criterion gives a probability of 0, it means that the criterion could not correctly pick up any true lag length and hence it is deficient criterion. If a selection criterion gives a probability of 1, it means that the criterion successfully selected the true lag length in the model and hence it is the best criterion.

3.10 Diagnostic Tests

Diagnostic tests are performed to state with a high-level of confidence the suitability or otherwise of the model chosen. There are some Classical Normal Linear Regression Model (CNLRM) assumptions that must be fulfill by the ECM model and these are;

- ε_t must be normally distributed.
- The residuals should not be serially correlated. Thus, there should not be heteroscedasticity amongst ε_t.
- The model should have no perfect multicollinearity.
- The model should be a linear regression model.

3.10.1 Test For Normality

In this study, the Jacque-Bera (1980) test is adopted to investigate whether there is white noise term ε_t is distributed normally distributed. The test determines the difference in kurtosis and skewness of a variable relative to that of the normal distribution.The null hypothesis and the alternative hypothesis for this test are;

$$H_0 : \text{Z is normally distributed}$$

$$H_1 : \text{Z is not normally distributed}$$

where Z is a variable under this study. The Jacque-Bera (JB) test statistic is defined by;

$$JB = \frac{V-G}{6}\left[w^2 \frac{(u-3)^2}{4}\right] \tag{3.16}$$

where V is the sample size, G is the number of estimated parameter,w is the skewness of the study variables and u is the number of the kurtosis of the study variables.We fail to accept H_0 when $JB \prec \chi^2(2)$ or when $\rho - value \leq$ level of significance.

3.10.2 Test For Heteroskedasticity

In autoregressive models,the occurrence of serially random variables with dissimilar variances is term as Heteroscedasticity. Thus, $var[\varepsilon_t/\alpha_{t-1}] \neq 0$.This means that there exist inconsistent variance in the regression analysis.In this study we employed the Engles Arch LM (1982) test to for heteroscedasticity. The null hypothesis and the alternative hypothesis are;

$$H_0 : \text{There exist homoskedasticity}$$

$$H_1 \text{ ; There exist heteroskedasticity}$$

The LM test statistic is defined by;

$$LM_E = VR^2 \tag{3.17}$$

where V is the sample size and R^2 is the determinant coefficient of the white noise term in the augmented regression model. We fail to accept H_0 when $\rho - value \leq levelofsignificance$ and infer that there exist heteroscedastic among the variable

.

3.10.3 Test For Serial Correlation

In serial correlation test,we are interested in knowing if the residuals are correlated across each other. This usually occurs as a result of the existence of unit root among the response and predictor variables or data manipulation. In this we adopt the Breusch-Godfrey LM test to assess if the residuals are serially correlated up to any order h.The null hypothesis and the alternative hypothesis of this test are;

H_0 : ε_t are serially not correlated up to order h

H_1 : ε_t are serially correlated up to any order h

The Breusch-Godfrey test statistic is defined by;

$$LM^* = \left[\frac{V-G}{m}\right]\left[\frac{R^2}{1-R^2}\right] \tag{3.18}$$

where V is the sample size,h is the order (highest) of the serial correlation to be tested, R^2 is the determinant coefficient of the white noise term in the augmented regression model, G is the number of estimated parameter and m is the number of restrictions.We faii to accept H_0 when $\rho - value \leq$ level of significance and infer that the residuals serially correlated up to order h.

3.11 Parameter Stability

For the stability of the long-run and short-run of the fitted model, it is necessary the CUSUM statistics to lie within the significance level bound which is denoted by a straight line. The equation of the line is extensively discussed by (Brown et al.,1975).

CHAPTER 4

DATA ANALYSIS AND DISCUSSIONS

4.1 Introduction

This chapter analyzes and discuss the outcomes of this research study. The study employed data such as Ghana Stock Exchange All-Share Price Index (GSI), Market Capitalization (MAC) and Value Trade (VAT) obtained from the Ghana Stock Exchange as well as Inflation (INF), Exchange Rate (EXC) and Producer Price Index (PPI) obtained from the Ghana Statistical Service. The first test for the stationarity of all the variables under study. This is followed by Autoregressive Distributed Lag cointegration technique deployed to establish the short-run and long-run association among the variables under study. Granger Causality technique was employed to determine the causal relationship among the variables under study and their corresponding directions. The study used EVIEWS in the analysis of the Autoregressive Distributed Lag modeling approach to cointegration and for all other graphs used in this study.

4.2 Preliminary Test

Figure 4.1 shows all the research variables and reveals that GSI, INF, EXC and MAC are not stationary,which implies they are integrated at order one I(1) and therefore they have no constant mean and variance. The study further confirmed this assertion using Phillips and Perron (P-P) test and the Augmented Dickey Fuller (ADF) test at 5% significance level and the variables GSI, EXC, and MAC except of the case of INF where there was a disagreement, with (P-P) confirming stationarity of INF and ADF indicating otherwise. This justifies the need for joint testing in order to strengthen inferences made about about the stationarity or otherwise of the variables. Primarily, the ADF and (P-P) tests consider their respective test statistic and $\rho-value$, and the null hypothesis of existence of unit root (non-stationarity) being accepted when the $\rho - value > 0.05$

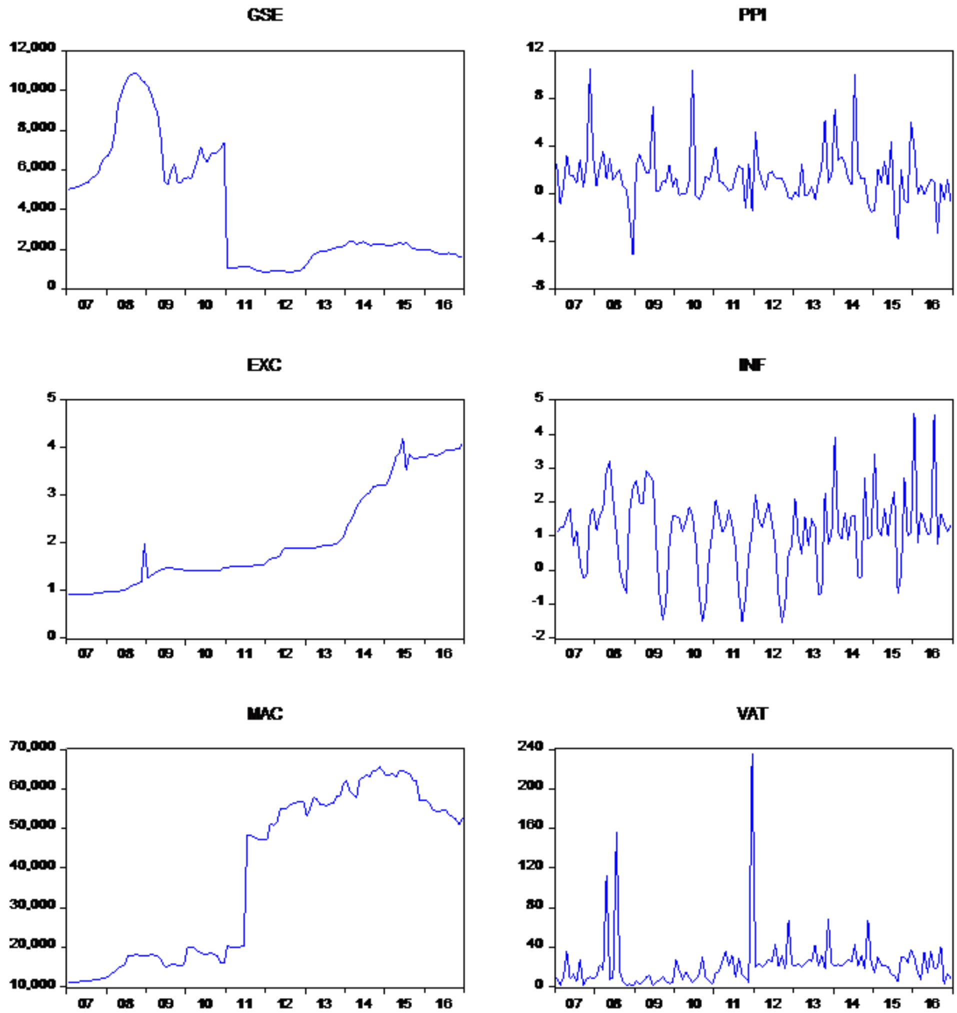


Figure 4.1: Plots of the variables (original data)

Table 4.1: Augmented Dickey Fuller (ADF) test and Phillips-Perron (P-P) test of variables

Variable	Model type	ADF Test Statistic	$\rho - value$	P-P Test Statistic	$\rho - value$
GSI	Constant	-2.886	0.6970	-2.886	0.6203
	Constant + Trend	-3.448	0.6526	-3.448	0.5047
	No Constant	-1.615	0.2605	-2.886	0.6203
INF	Constant	-2.889	0.8802	-2.886	0.0000*
	Constant + Trend	-3.452	0.9721	-3.448	0.0000*
	No Constant	-1.944	0.8533	-1.944	0.0000*
PPI	Constant	-2.886	0.0000*	-2.886	0.0000*
	Constant + Trend	-3.448	0.0000*	-3.448	0.0000*
	No Constant	-1.944	0.0000*	-1.944	0.0000*
EXC	Constant	-2.886	0.9955	-2.886	0.9942
	Constant + Trend	–3.448	0.8688	-3.448	0.7834
	No Constant	-1.944	0.997	-1.944	0.9996
MAC	Constant	-2.886	0.6846	-2.886	0.6875
	Constant + Trend	-3.448	0.9131	-3.448	0.9104
	No Constant	-1.944	0.8459	-1.944	0.8472
VAT	Constant	-2.886	0.0000*	-2.886	0.0000*
	Constant + Trend	-3.448	0.0000*	-3.448	0.0000*
	No Constant	-1.944	0.0043*	-1.944	0.0000*

* indicates significance at 5% alpha level

Source: Computations based on data obtained from the field

Table 4.1 indicated that at 5% level of significance under both ADF and (P-P) test, GSI, EXC as well as MAC are not stationary but PPI as well as VAT are staionary. However, there were some disagreement in the case of INF, where (P-P) test indicate that INF is stationary whiles at the same level ADF indicate otherwise. We proceed to transform all our variables which were not stationary

(GSI, INF, EXC and MAC) at order zero to be stationary. This can achieved either by first differencing the variables or taking the natural logarithm of the variables or taking square root of the variables. The first differencing approach is adopted in this study. INF is considered non-stationary because no consensus between the (P-P) and ADF test at order zero.

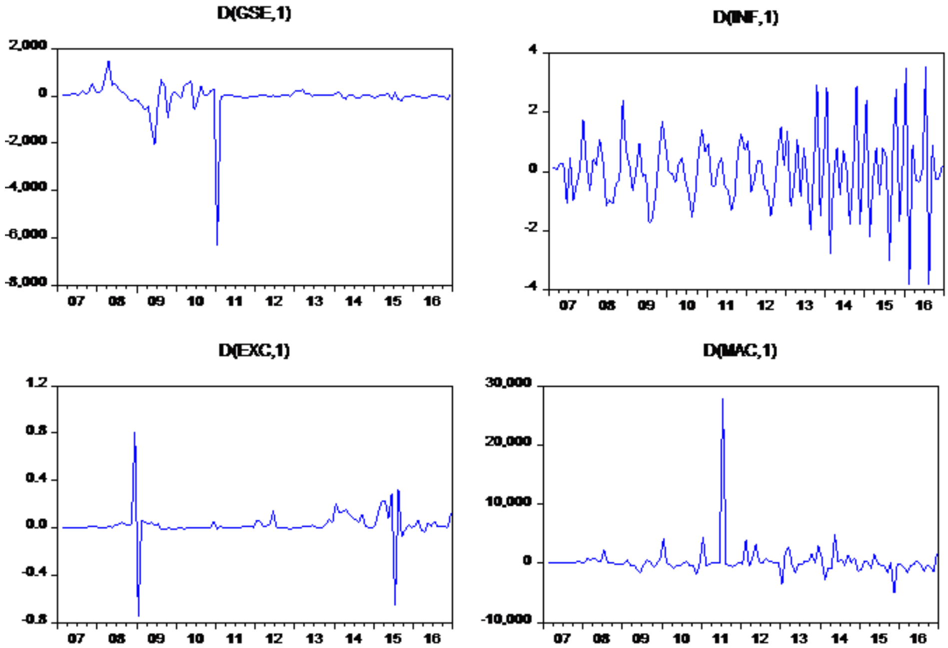


Figure 4.2: Plots of first differenced of GSI, INF, EXC and MAC variables

Table 4.2: Augmented Dickey Fuller (ADF) test and Phillips-Perron (P-P) test of GSI, INF, EXC and MAC after first difference

Variable	Model type	ADF Test Statistic	$\rho - value$	P-P Test Statistic	$\rho - value$
GSI	Constant	-2.886	0.0000*	-2.886	0.0000*
	Constant + Trend	-3.448	0.0000*	-3.448	0.0000*
	No Constant	-1.944	0.0000*	-1.944	0.0000*
INF	Constant	-2.886	0.0000*	-2.886	0.0000*
	Constant + Trend	-3.452	0.0000*	-3.448	0.0000*
	No Constant	-1.944	0.0000*	-1.944	0.0000*
EXC	Constant	-2.886	0.0000*	-2.886	0.0001*
	Constant + Trend	–3.448	0.0000*	-3.448	0.0001*
	No Constant	-1.944	0.0000*	-1.944	0.0000*
MAC	Constant	-2.886	0.0000*	-2.886	0.0000*
	Constant + Trend	-3.448	0.0000*	-3.448	0.0000*
	No Constant	-1.944	0.0000*	-1.944	0.0000*

*

indicates significance at 5% alpha level
Source: Computations based on data obtained from the field

Table 4.2 reported that the variables (GSI, INF, EXC and MAC) are not stationary at order zero, are now stationary after their first difference since the test statistic is greater than the $\rho - value$. However INF is staionary under both ADF test and (P-P) test at order one as oppose to the result in table 4.2 where there was a disagreement between ADF test and (P-P) test with respect to the stationarity of INF.

4.3 Model and Lag Length Selection

The ADF and (P-P) test confirmed that GSI, INF, EXC and MAC are stationary at order one after first difference whiles PPI and VAT are stationary at order zero. Taking into considerations the Akaike Information Criterion (AC), Hannan-

Quinn Information Criterion (HC), Final Prediction Error (FPE) and Schwarz Information Criterion (SC), EVIEWS automatically selected the optimal lag length to be eight (8) and the selection method to be the Akaike Information Criterion (AC) based on the sample size and the number of independent variables. The Akaike Information Criterion evaluated automatically about 472392 models and selected the best fit ARDL model. Figure 3 report the best fit model to be ARDL (1,0,7,0,0,0).

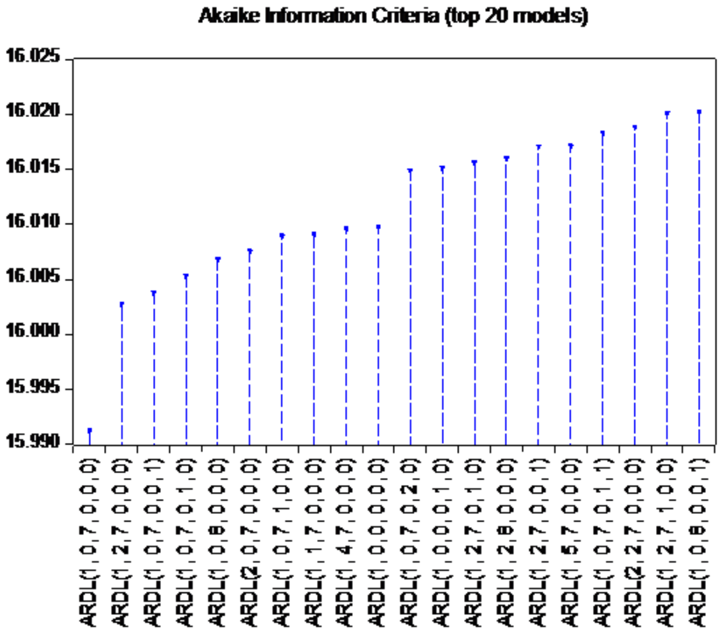


Figure 4.3: Akaike Information Criterion best 20 models

The fitted ARDL (1,0,7,0,0,0) is given by;

$$
\begin{aligned}
\Delta GSI_t = 0.103\Delta(GSI)_{t-1} - 27.580\Delta(INF)_t - 30.765PPI_t + 3.850PPI_{t-1} \\
+9.935PPI_{t-2} + 4.635PPI_{t-3} + 19.917PPI_{t-4} + 36.900PPI_{t-1} \\
+65.265PPI_{t-6} - 71.535PPI_{t-7} + 22.373\Delta(EXC)_t + 2.186VAT_t \\
+0.011\Delta(MAC)_t - 134.146
\end{aligned} \tag{4.1}
$$

4.4 ARDL Cointegrating and Long run form

In practice the Conditional Error Correction Model (CECM) is the one-one reparameterization of ARDL model and it deployed as the ARDL cointegration technique. Table 4.3 report the findings of the ARDL (CECM) cointegration test application amongst the research variables. The null hypothesis of no cointegration at 5% level of significance.The null hypothesis of no cointegrating aamong the variables under study is therefore rejected if the $\rho - value$ less than 0.05.

Table 4.3: Conditional Error Correction Regression

Variable	Coefficient	Std.Error	t-statistic	$\rho - value$
C	-134.1460	133.9364	-1.001565	0.3190
D(GSI(-1))	-0.897198	0.097139	-9.236199	0.0000
D(INF,1)*	-27.58013	52.91772	-0.521189	0.6034
PPI(-1)	38.20066	72.51937	0.526765	0.5995
D(EXC,1)*	22.37308	470.6075	0.047541	0.9622
VAT*	2.186364	2.286053	0.956393	0.3412
D(MAC,1)*	-0.011483	0.022169	-0.517971	0.6056
D(PPI)	-30.76501	27.96584	-1.100092	0.2740
D(PPI(-1))	-65.11565	65.01949	-1001479	0.3190
D(PPI(-2))	-55.18042	59.67940	-0.924614	0.3574
D(PPI(-3))	-50.54531	53.33185	-0.947751	0.3456
D(PPI(-4))	-30.62840	47.23117	-0.648478	0.5182
D(PPI(-5))	6.270320	39.08251	0.160438	0.8729
D(PPI(-6))	71.53486	28.47079	2.512570	0.0136

* indicates those variables have long run relationship
Source: Computations based on data obtained from the field

Table 4.4: Long-run Equation

Variable	Coefficient	Std.Error	t-statistic	$\rho - value$
C	-149.5166	146.9564	-1.017422	0.3114
D(INF,1)	-30.74031	59.04111	-0.520659	0.6038
PPI	42.57775	80.23665	0.530652	0.5968
D(EXC,1)	24.93662	524.5429	0.047549	0.9622
VAT	2.436881	2.531090	0.962780	0.3380
D(MAC,1)	-0.012798	0.024737	-0.517387	0.6060

Source: Computations based on data obtained from the field

Table 4.5: Bound test

Test statistic	Value	significance	I(0)	I(1)
			Asymptotic n = 100	
F-statistic	12.38173	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual sample size	113	Finite sample: n= 80		
		10%	2.303	3.154
		5%	2.55	3.606
		1%	3.351	4.587

Source: Computations based on data obtained from the field

4.5 Long run relationship

The speed of adjustment also known as the error correction term (EC) is identical to the coefficient of lag one value of dependent variable (GSI) in the Conditional Error Correction Model (CECM), which is (-0.897198) and it is staistically significant at 5% alpha level. A negative error correction term indicates convergence among the variables in the long run. Again, 90% correction occurred in each time period from the disequilibrium stage (short-run) to the equilibrating stage (long-run). From table 4.4 and table 4.5, we can report that since the test statistic of F-Bound test (F= 12.3822) is greater than the critical value bounds at 5% level of significance, the null hypothesis is rejected. Hence there exist long run relationships among the variables. This makes staistical sense since the EC term is 89%.

4.5.1 Producer Price Index(PPI)

The results in table 4.4 indicated that PPI is not significance in explaining the variation in GSI at 5% significance level however PPI has a positive relationship with GSI. The bound test report that there exist a long-run relationship between GSI and PPI. Therefore PPI is statistically significant in explaining variations in GSI in the long-run. Table 4.4 again report that a unit increase in PPI will lead to an increase in GSI by 42.58 million cedis in the long run

4.5.2 Exchange Rate (EXC) AND Inflation (INF)

Our results in table 4.4 shows that EXC and INF are not significant in explaining the changes in GSI at 5% alpha level, however EXC has a positive relationship with GSI whiles INF has a negative relationship with GSI. The bound test reported that there a exist long-run relationship among GSI, INF and EXC. In ARDL cointegrating test, statistical significance test inference is based on the bound test and hence we conclude that INF and EXC are statistically significance in explaining variations in GSI in the long-run. Again we can report from table 4 that, a unit increase in INF will to lead a decrease in GSI by 30.74 million cedis whiles a unit increase in EXC will lead to an increase in GSI by 24.94 million cedis in the long run.

4.5.3 Value Trade (VAT) and Market Capitalization (MAC)

Our findings in table 4.4 we report that VAT and MAC are not significance in explaining the variations in GSI at 5% alpha level, however VAT has a positive relationship with GSI whiles MAC has a negative relationship with GSI. The bound test report that there exist a long-run relationship among GSI, VAT and MAC. In ARDL cointegrating test, statistical significance test inference is based on the bound test and hence we conclude that VAT and MAC are statistically significance in explaining variations in GSI in the long-run. From table 4.4 we can repotr that a unit increase in VAT will lead to an increase in GSI by 2.44 million cedis whiles a unit increase in MAC will lead to an decrease in GSI by 0.013 million cedis.

4.6 ECM Cointegrating and The Short-run Form

Table 4.6: Error Correction Regression

Variable	Coefficient	Std.Error	t-Statistic	$\rho - value$
D(PPI)	-30.76501	24.94661	-1.233234	0.2204
D(PPI(-1))	-65.11565	31.96645	-2.037000	0.0443
D(PPI(-2))	-55.18042	35.46151	-1.556065	0.1229
D(PPI(-3))	-50.54531	35.89218	-1.408254	0.1622
D(PPI(-4))	-30.62840	35.41821	0.864764	0.3893
D(PPI(-5))	6.270320	32.04228	0.195689	0.843
D(PPI(-6))	71.53485	25.51806	2.803303	0.0061
CointEq(-1)	-0.897198	0.o93578	-9.587751	0.0000
R-squared	0.538158	Mean dependent Var	0.557117	
Adjusted R-squared	0,507368	S.D dependent Var	929.7827	
S.E. of regression	652.5934	Akaike info criterion	15.86795	
Sum squared resid	4471205	Schwarz criterion	16.06104	
Log likelihood	-888.5392	Hannan-Quinn criterion	15.94630	
Durbin-Watson stat	1.986847			

Source: Computations based on data obtained from the field

Table 4.7: Bound test

Test statistic	Value	significance	I(0)	I(1)
F-statistic	12.38173	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Source: Computations based on data obtained from the field

The Error Correction Model (ECM) was deployed to estimate the short run relationship among our selected macroeconomic and microeconomic variables and Ghana Stock Exchange all-share price index. From table 4.6 we can conclude that only PPI is significant at 5% alpha level in explaining the variations in GSI . This was confirmed by the bound test and we can conclude that PPI has a positive cointegration (short-run) with GSI. Table 4.6 also report CointEq(-1) which is the Error Correction(EC)term to be -897198 and this was significant at 5% alpha level. A 90% error correction term is an indicative of a strong stability among the variables in the long-run. Table 4.6 again report the coefficient of the regression (R^2)to be 0.538158. This indicate that 53% of the variations in GSI is explained by the regressors in the model. Table 4.6 further report the Durbin-Watson statistic to be 1.986847. This is approximately 2. A value 0f 2 of Durbin-Watson statistic shows that there is no autocorrelation in the model.

4.7 Pairwise Granger Causality Tests

Table 4.8 report the findings of the Granger Causality test amongst the research variables. The null hypothesis is that Y does not Granger Cause X and X does not Granger Cause Y at 5% level of significance. We reject the null hypothesis if the $\rho - value$ less than 0.05.

Table 4.8: Pairwise Granger Causality Results

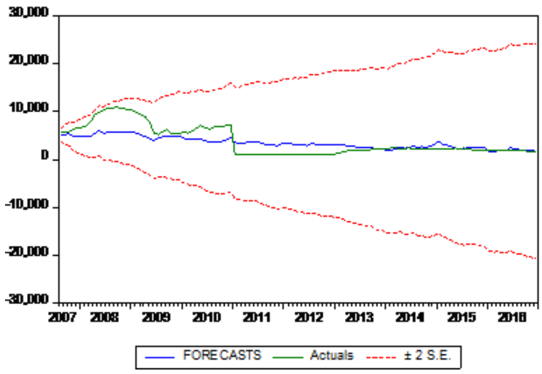
Null Hypothesis	F-statistic	$\rho - value$	Causality
D(GSI,1)does not Granger Cause D(INF,1)	0.54872	0.8168	-
D(INF,1)does not Granger Cause D(GSI,1)	0.54178	0.8222	-
D(GSI,1)does not Granger Cause PPI	0.23348	0.9837	-
PPI does not Granger Cause D(GSI,1)	1.97224	0.0584	-
D(GSI,1)does not Granger Cause D(EXC,1)	0.29523	0.9822	-
D(EXC,1)does not Granger Cause D(GSI,1)	0.59130	0.7828	-
D(GSI,1)does not Granger Cause VAT	0.23993	0.9822	-
VAT does not Granger Cause D(GSI,1)	0.24488	0.9810	-
D(GSI,1)does not Granger Cause D(MAC,1)	22.1404	1E-18	$\rightarrow$
D(MAC,1)does not Granger Cause D(GSI,1)	0.33576	0.9500	-

- indicate no causality and $\rightarrow$ indicate the direction of causality at 5% alpha level.
Source: Computations based on data obtained from the field

Table 4.8 report the results of the Pairwise Granger Causality Test between GSI and the independent variables (INF, PPI, EXC, VAT and MAC). The test used 8 lags which was the optimal lag length selected by the Akaike Information Criterion (AC). The test results indicate that there exist no causality between GSI and the respective independent variables except in the case of MAC. Particularly there exist an unidirectional causal relationship running from GSI to MAC at 5% level of significance. This implies that the lagged values of GSI can be used to forecast the curent value of MAC but the lagged values of MAC cannot be used to forecast the current value of GSI. No causal relationship from the respective independent variables to GSI implies that their respective previous values cannot be used to predict the current value of GSI. They appear respectively insensitive with respect to changes in GSI.

4.8 Cross-Validation Of The Selected ARDL Model

4.8.1 Residual diagnostic



Forecast: FORECASTS	
Actual: GSE	
Forecast sample: 2007M01 2016M12	
Adjusted sample: 2007M08 2016M12	
Included observations: 113	
Root Mean Squared Error	2182.147
Mean Absolute Error	1667.990
Mean Abs. Percent Error	73.11802
Theil Inequality Coef.	0.254869
Bias Proportion	0.023036
Variance Proportion	0.743420
Covariance Proportion	0.233544
Theil U2 Coefficient	10.92185
Symmetric MAPE	46.78915

Figure 4.4: Plot of forecast to actuals

Figure 4.4 is a plot of an approximately 95% forecast interval and summary statistic of our forecast-to-actual plot of the selected ARDL model. It reveals that any in-sample forecast of GSI using our selected ARDL model,has a 95% chance of falling within the actual value of GSI. This is further confirmed by the bias proportion which always lie between 0 and 1. The bias proportion for our fitted model is (0.023036). A smaller bias proportion shows that the mean of the forecast is able to track the mean of our response variable.

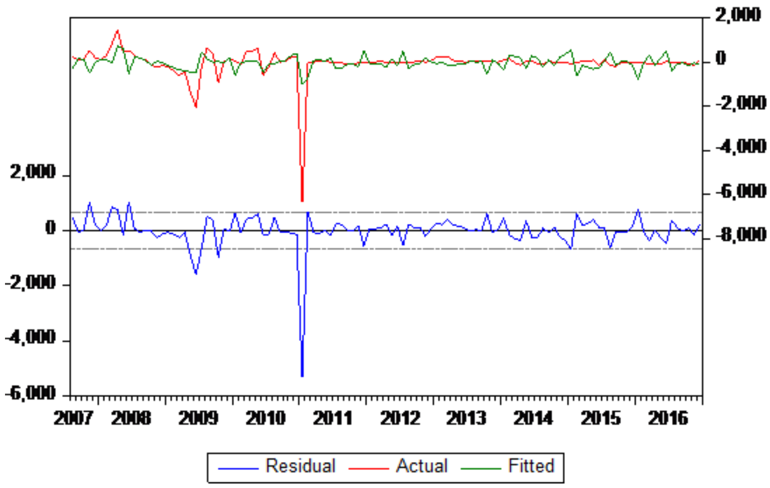


Figure 4.5: Residual Plot of fitted ARDL model

Figure 4.5 shows that our fitted ARDL model is good model since the residuals appear to have zero mean and a constant variance.

4.8.2 Test For Multicollinearity in the predictors

Table 4.9: Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
D(GSI(-1),1)	0.009436	1.136012	1.133422
D(INF,1)	2800.286	1.189734	1.189732
PPI	782.0883	1.502558	1.111027
PPI(-1)	768.0533	1.476231	1.084061
PPI(-2)	794.8742	1,529145	1.121842
PPI(-3)	768.9846	1.483032	1.079191
PPI(-4)	753.6114	1.469996	1.062360
PPI(-5)	787.9744	1.518152	1.071465
PPI(-6)	813.1036	1.565994	1.115081
PPI(-7)	810.5858	1.569584	1.113144
D(EXC,1)	221471.4	1.083274	1.039742
VAT	5.226036	1.770430	1.059184
D(MAC,1)	0.000491	1.069194	1.052860
C	17938.96	4.487828	NA

To test for the independence of predictor variables,we employed the Variance Inflation Factor.It is the ratio of the variance of our selected model divided the variance of a model with each predictor variable in our selected model. Table 4.9 report that there is little or no multicollinearity among the predictor variables in our selected model and hence our predictor variables are truly independent.

4.8.3 Test For Normality Of Residuals

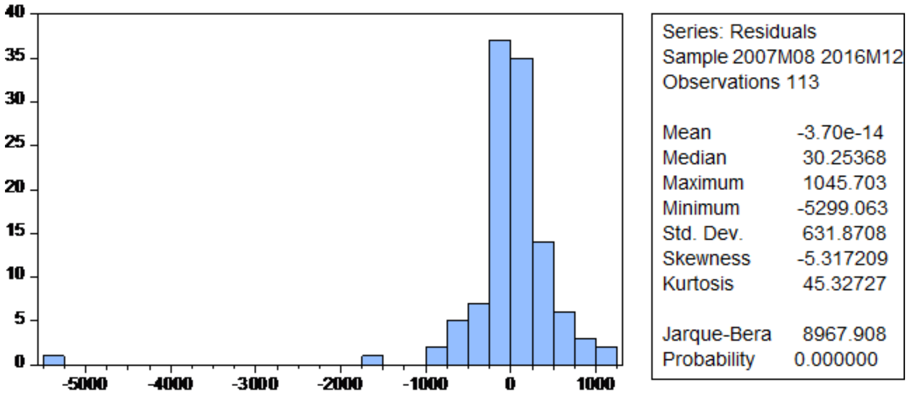


Figure 4.6: Residual Normality Test

From figure 4.6 above the residuals appear to be normally distributed diagrammatically. However,the Jarque-Bera test of normality at 5% alpha level conclude otherwise due to few outliers

4.8.4 Test For Serial Correlation among predictors

Table 4.10: Breusch-Godfrey Serial correlation LM Test
Null hypothesis:No serial correlation up to 8 lags

F-statistic	0.225565	Prob.F(8,91)	0.9854
Obs*R-squared	2.197121	Prob.Chi-Square(8)	0.9744

Source: Computations based on data obtained from the field

From table 4.10 we can conclude that there is no serial correlation among the predictors at 5% level of significance.

4.8.5 Testing For Hereroskedasticity

Table 4.11: Breusch-Pagan-Godfrey Heteroskedasticity Test
Null hypothesis:Homoskedasticity

F-statistic	1.652048	Prob.F(13,99)	0.0837
Obs*R-squared	20.14381	Prob.Chi-Square(13)	0.0917

Source: Computations based on data obtained from the field

Clearly from table 11 the residuals are homoskedastic at 5% level of significance.

4.8.6 Parameter Stability

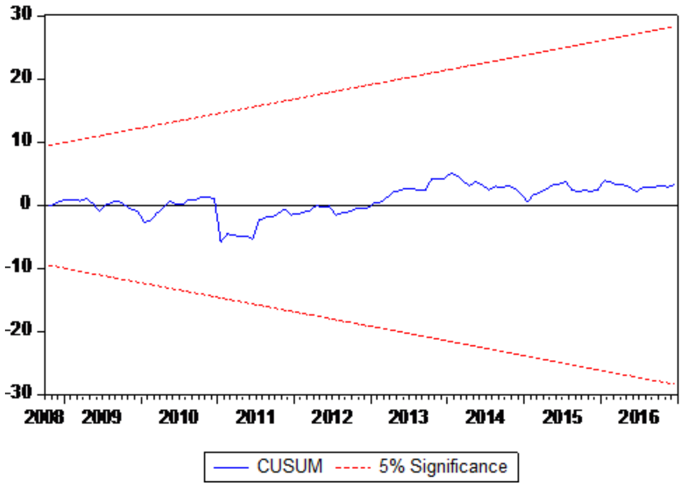


Figure 4.7: CUSUM at 5% alpha level

Figure 4.7 is CUSUM plot based on recursive residuals. It reveals that there are no breaks at 5% alpha level.This indicated stability in GSI relative to INF, PPI, EXC, VAT AND MAC over time. Thus the parameters of the ARDL model are stable over the selected time period . This is extremely good for investment decision-making processes.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This section present the summary of all the research findings, conclusions and recommendations derived from the research results. In order to attain the main objective of this research, the study selected the best fit model and investigated the short-run relationship, the long-run relationship and the direction of causality between Ghana Stock Exchange all-share price index (GSI) and three macroeconomic indicators namely; Inflation (INF), Producer Price Index (PPI) and Exchange rate (EXC), and two microeconomic indicators namely; Value Traded (VAT) and Market Capitalization (MAC). The study tested unit root employing ADF and P-P tests. Conditional Error Correction Model of the Autoregressive Distributed Lag cointegration test was deployed to determine the existence of long-run relationship between Ghana Stock Exchange all-share price index and the selected macroeconomic and microeconomic variables. The speed of adjustment also known as the error correction term (EC) of the Conditional Error Correction Model (CECM), was found to be (-0.897198) at 5% level of significance . A negative error correction term indicates convergence among the macroeconomic and microeconomic variables in the long run. A 90% EC means 90% of correction occurred in each time period from the disequilibrium stage (short-run) to the equilibrating stage (long-run) and hence there exist a long run relationships among the selected macroeconomic and microeconomic variables. The Error Correction was deployed to determine the short-run relationship between Ghana Stock Exchange all-share price index and selected macroeconomic and microeconomic variables. The study revealed that only Producer Price Index has a short-run relationship with Ghana Stock Exchange all-share price index and that 53% of the changes in Ghana Stock Exchage all-share price index is explained the Producer Price Index in the short term. To establish the causality relation, Pairwise Granger Causality Test was used to ascertain the causal association between Ghana Stock Exchange all-share price index (GSI) and the respective selected macroeconomic and microeconomic variables (Inflation, Producer Price Index, Exchange rate, Value Trade and Market Capitalization). It was discovered that Ghana Stock Exchange all-share price index has no causal relationship with the respective macroeconomic and microeconomic variables. However there was a causal relationship running from Market Capitalization to Ghana Stock Exchange all-share price index.

5.2 Conclusions

The study used 120 monthly observations for the Ghana Stock Exchange all-share price index and the selected macroeconomic and microeconomic variables over a period of ten (10) years (from 2007 to 2016) in an attempt to asses the statistical significance of the relationship between stock price and some economic variables obtained from the Ghana Statistical Service and the Ghana Stock Exchange. The study result indicated that the relationship between stock prices and economic variables is statistically significant. From our research findings, the following can be concluded;

- The speed of adjustment also known as the error correction term (EC) of the Conditional Error Correction Model (CECM) is (-0.897198) at 5% level of significance . Since the error correction term is negative, it indicates convergence among the macroeconomic and microeconomic variables in the long run. Also 90% EC means 90% of correction occurred in each time period from the disequilibrium stage (short-run) to the equilibrating stage (long-run) and hence there exist a long run relationships among the selected macroeconomic and microeconomic variables

- The producer price index (PPI0 is the only variable that is significant at 5% alpha level in explaining the variations in GSI . This was confirmed by the bound test that PPI has a positive cointegration (short-run) with GSI and hence the producer price index is the only variable that has a short-run relationship with Ghana Stock Exchange all-share price index.

- The pairwise granger causality test results indicate that there exist no causality between GSI and the respective independent variables at 5% level of significance. No causal relationship from the respective independent variables to GSI implies that their respective previous values cannot be used to predict the current value of GSI. They appear respectively insensitive with respect to changes in GSI.

5.3 Recommendation

The lack of no significant causal relationship between Ghana Stock Exchange all-share price index and the selected macroeconomic and microeconomic indicators is an indication that the stock market in Ghana is informationally inefficient. In efficient market, stocks are more likely to be priced by their intrinsic investment characteristic. thestudy therefore recommend the following;

- Government can use economic indicators due to their explanatory power with respect to variations in stock price on when and how to tap into the stock market industry to raise funds for development.

- The study established the predictability efficiency of stock price and hence stock price can be used by investors for their investment decisions.

- A negative relationship between Ghana Stock Exchage all-share price index and inflation indicate that the demand side of the stock market is static and the supply side is increased. Through the stock market surplus funds can be channel to profitable sector of the economy to ensure that they are well utilized.

- A negative relationship between Ghana Stock Exchange all-share price index and market capitalization indicate that a greater market capitalization by listed companies at the Ghana Stock Exchange leads to lower returns on stocks at the Ghana Stock Exchange.

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