THE INFLUENCE OF MICROECONOMIC VARIABLES ON STOCK PRICES OF COMPANIES LISTED ON GHANA STOCK EXCHANGE

BY

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JUNE, 2015
DECLARATION

Candidate’s Declaration

This is to certify that, this thesis is the result of my own research, under the guidance of my supervisors, except for references to other people’s work which have been duly acknowledged. and that no part of it has been presented for another degree in this University or elsewhere.

I am solely responsible for the views expressed in this study as well as all errors.

SIGNATURE: ……………………….. DATE: …………………………..

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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 of Ghana.

SIGNATURE: ……………………….. DATE………………………..

DR KWABENA DOKU-AMPONSAH
(Principal Supervisor)

SIGNATURE: ……………………….. DATE………………………..

DR FELIX OKOE METTLE
(Co-Supervisor)
ABSTRACT

This study examines the long-run equilibrium relationship and the direction of causality between stock prices at Ghana Stock Exchange (GSE) and a set of five stock market oriented factors technically can be defined as microeconomic variables. The study employs time series data comprising of the stock prices of listed companies for the period spanning from April 1998 to April, 2013 and key microeconomic variables, benchmarks of corporate performance, obtained from the annual financial statements of selected listed companies covering the time period December 1997 to December 2013. Unit root test was performed using Augmented Dickey-Fuller (ADF) and Kwiatkowski Phillips Schant and Shin (KPSS) test. Johansen and Juselius (1990) Cointegration test was used to establish long – run relationship between stock price and microeconomic variables. In order to determine the existence of causality, Granger Causality test proposed by Toda and Yamamoto (1995) was employed to investigate the long-run equilibrium relationship as well as causal relationships between the GSE all-share price index (GSI) and the five microeconomic variables (i.e. Earnings per share, Dividend per share, Return on equity, Net asset per share and Debt to equity ratio). The study revealed that Divided Per Share (DPS) has a bidirectional causal relation with Stock Price (SP). This position is confirmed by Bhattacharrya (1979) in literature. The results also revealed that there is a unidirectional causal relation running from Stock Price to NAPS, which is consistent with the Efficient Market Hypothesis (EMH). The Vector Error Correction Model (VECM) estimated the short – run relationship between the selected microeconomic variable and stock price of companies listed on GSE,. The estimated coefficient of ECM(-1) is (-0.3455) at 5% significant level which concluded that, in the absence of changes within the dependent variable, the deviation of the model in the long – run equilibrium is 35% corrected in each year.
DEDICATION

This thesis is dedicated to the Almighty God, my parents Alhaji Rufai Dimmua, Hassana Yahaya and Rufai Samira Elizabeth.
ACKNOWLEDGEMENT

First and foremost, I am grateful to the Almighty God for the strength and vitality He has endowed me with and for bringing me this far in the ladder of education.

My profound gratitude and appreciation also goes to my supervisors, Dr. K. Doku-Amponsah and Dr. F. O. Mettle without whose guidance and invaluable advice, this work would not have seen the light of day.

I also thank Dr. Salia Hussien and Dr. Williams A. Atuilik for their pieces of advice throughout my years of study.

I cannot forget the support I received from my loving parents, Alhaji Rufai, Hassana Yahaya, Rufai Samira Elizabeth, my siblings and all Dimmua family. Again, special thanks go to Madam Veronica, Madam Lucy Abayom, Mr. Dankwa Asare, Peprah Dorcas, and Charles Kwofei for your support, encouragement and advice. May the good Lord continue to bless you.

Finally, I acknowledge the tremendous support I have received from Abdul Rahaman Namawu.
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Name</th>
</tr>
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<tbody>
<tr>
<td>ABL</td>
<td>Accra Breweries Limited</td>
</tr>
<tr>
<td>AGC</td>
<td>Ashanti Goldfields Limited</td>
</tr>
<tr>
<td>AGA</td>
<td>Anglo Gold Ashanti Limited</td>
</tr>
<tr>
<td>ALW</td>
<td>Aluworks Ghana Limited</td>
</tr>
<tr>
<td>CFAO</td>
<td>CFAO Ghana Limited</td>
</tr>
<tr>
<td>EIC</td>
<td>Enterprise Insurance Company Limited</td>
</tr>
<tr>
<td>FML</td>
<td>Fan Milk Ghana Limited</td>
</tr>
<tr>
<td>GCB</td>
<td>Ghana Commercial Bank Limited</td>
</tr>
<tr>
<td>HFC</td>
<td>Home Finance Company Limited</td>
</tr>
<tr>
<td>MLC</td>
<td>Mechanical Lloyd Company Limited</td>
</tr>
<tr>
<td>PAF</td>
<td>Pioneer Aluminium Factory Limited</td>
</tr>
<tr>
<td>PKL</td>
<td>Pioneer Kitchenware Limited</td>
</tr>
<tr>
<td>PZ</td>
<td>Paterson Zochonis Ghana Limited</td>
</tr>
<tr>
<td>SCB</td>
<td>Standard Chartered Bank Limited</td>
</tr>
<tr>
<td>SPPC</td>
<td>Supper Paper Products Company Limited</td>
</tr>
<tr>
<td>SSB</td>
<td>Social Security Bank Limited</td>
</tr>
<tr>
<td>SG-SSB</td>
<td>Societe Generale - Social Security Bank Limited</td>
</tr>
<tr>
<td>UNIL</td>
<td>Unilever Ghana Limited</td>
</tr>
<tr>
<td>EPS</td>
<td>Earnings Per Share</td>
</tr>
<tr>
<td>NAPS</td>
<td>Net Assets Per Share</td>
</tr>
<tr>
<td>DPS</td>
<td>Dividends Per Share</td>
</tr>
<tr>
<td>ROE</td>
<td>Return on Equity</td>
</tr>
<tr>
<td>DE ratio</td>
<td>Debt/Equity ratio</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>GSE</td>
<td>Ghana Stock Exchange</td>
</tr>
<tr>
<td>ARDL</td>
<td>Autoregressive Distributed Lag</td>
</tr>
<tr>
<td>ECM</td>
<td>Error Correction Model</td>
</tr>
<tr>
<td>VECM</td>
<td>Vector Error Correction Model</td>
</tr>
<tr>
<td>VAR</td>
<td>Vector Autoregressive</td>
</tr>
<tr>
<td>SEC</td>
<td>Security Exchange Commission</td>
</tr>
<tr>
<td>ADF</td>
<td>Augmented Dickey-Fuller</td>
</tr>
<tr>
<td>AIC</td>
<td>Akaike Information Criteria</td>
</tr>
<tr>
<td>SBC</td>
<td>Schwartz Bayesian Criteria</td>
</tr>
<tr>
<td>HQ</td>
<td>Hannan-Quinn</td>
</tr>
<tr>
<td>CUSUM</td>
<td>Cumulative Sum of Recursive Residuals</td>
</tr>
<tr>
<td>EMH</td>
<td>Efficient Market Hypothesis</td>
</tr>
<tr>
<td>ETR</td>
<td>Efficient Tax Rate</td>
</tr>
<tr>
<td>CNLRM</td>
<td>Classical Normal Linear Regression Model</td>
</tr>
<tr>
<td>KPSS</td>
<td>Kwiatkowski Phillips Schant and Shin</td>
</tr>
<tr>
<td>AFE</td>
<td>Analyst Forecast Error</td>
</tr>
<tr>
<td>FPE</td>
<td>Final Prediction Error</td>
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</table>
CHAPTER ONE

INTRODUCTION

1.1 Background

There is extensive discussion in the finance literature that investment decisions are largely influenced by corporate financial information released, and that capital market participants tend to follow closely the release of corporate financial information. (Ball and Brown, 1968; Lev, 1989; Holthausen and Larcker, 1992; Myring, 2006; Cohen and Lys, 2006; Habib, 2008; Latridis and Valahi, 2008). “Wall Street surges higher after upbeat earnings reports” is the caption of a story on the internet in www.quamnet.com, which reports that “Wall street rallied Wednesday after better than expected quarterly results from JP Morgan Chase and two other Dow Jones Industrials raised investors hope that companies and the economy are recovering from the protracted global credit crisis. The Dow rose more than 250 points as investors shrugged off any concerns about oil passing 115 US dollars a barrel for the first time. A market anxious about corporate earnings and their effect on the economy was relieved after JP Morgan Chase & Co., Coca-Cola Co. and Intel Corp. all topped first quarter projections.

The Finance literature is replete with theories (Efficient Market Hypothesis Theories, Signaling models, Pecking Order Theories, Capital Asset Pricing Theories, Arbitrage Pricing Theories, Theories on Dividend policy etc.) that suggest that stock prices change in response to knowledge of a number of variables. Some of these important variables include: earnings, dividends, cash flow projections, net assets, returns on capital employed, debt to equity ratio, etc. Most of these variables are usually announced in the financial statements or are derived from information contained in the financial statements.
Fama (1970) suggested that Capital Markets may be classified as:

i. **Weak form efficient markets**: where security prices incorporate all relevant historical information.

ii. **Semi-Strong-form efficient markets**: where security prices reflect all relevant, publicly-available information.

iii. **Strong-form efficient market**: where security prices incorporate all relevant information – public and private.

### 1.2 Statement of the Problem

The daily prices of shares traded on the Ghana Stock Exchange are always made public through television or radio business news and the print media. These prices at the time of report are not linked to the financial results of the concerned companies. Even though the financial reports and statements are also published quarterly in the print media, it is important to find out whether or not the results of performance indicated by the financial statements have any influence or bearing on the prices of the stocks.

There are several factors that account for changes in share prices, which are not necessarily linked, to performance measured by microeconomic results. The economic principle of supply and demand works in every market. In a situation where more stocks are demanded than can be supplied, prices will most likely increase. Such an increase may not necessarily be as a result of good performance or fundamentals. An important question to ascertain is whether share prices change in accordance with the performance of listed companies as reported by their financial statements.
1.3 Objective of the study

The objective of this study is to determine whether stock prices are influenced by the microeconomic variables (as captured by annual published financial statements) of companies listed on the Ghana Stock Exchange. Specifically the project seeks to;

i. Establish the existence of long-run relationship between microeconomic variables and the performance of listed companies on the Ghana Stock Exchange using Johansen-Juselius Cointegration techniques.

ii. Establish the existence of short-run relationship between microeconomic variables and the performance of listed companies on the Ghana Stock Exchange using Vector Error Correction Model (VECM)

iii. Establish the existence of causality between microeconomic variables and the performance of listed companies on the Ghana Stock Exchange using Toda-Tomamoto causality approach.

1.4 Research Questions

The following research questions are to be investigated in this study:

- What is the extent to which the annual financial statements issued by firms listed on the Ghana Stock Exchange used by the investing public to make investment decisions?

- Do the figures released in published financial statements of the companies listed on the Ghana Stock exchange influence the value of the companies concerned?

- Are the market prices of shares of companies listed on the Ghana Stock exchange consistent with the “fundamentals” as indicated by information contained in the published financial statements of the listed companies?
1.5 Significance and relevance

This study is relevant in finance theory in the following ways:

i. It will explain whether or not, published financial statements have any significance with respect to investment decisions by Ghanaian investors.

ii. Whether or not, share prices of companies listed on the Ghana Stock Exchange fully reflect all available information.

1.6 Variables under study

The study will use the following variables obtained from the financial statements as explanatory variables for stock prices:

i. Earnings Per Share (EPS)

ii. Net Assets Per Share (NAPS)

iii. Dividends Per Share (DPS)

iv. Returns On Equity (ROE)

v. Debt to Equity Ratio (DE Ratio)

These variables are chosen because they have been frequently mentioned in the literature and used as variables that explain performance of corporate entities as has already been demonstrated in chapter two.

1.7 Justification for the chosen variables

The above variables have been chosen because they have been widely used as good measures of the performance of business enterprises in the literature. They measure the profitability, asset base and capital structure of enterprises.
1.7.1 Profitability

Profitability is measured as the ability to generate turnover from available capital and efficiently managing cost so as to conserve as much of the revenue into profit. Profit is a function of turnover and cost. Good profitability performance requires high turnover and low cost levels. Important measures of profitability include: Earnings Per Share (EPS) and Return on Equity (ROE). It is expected that good performance in these variables should have a positive effect on stock prices.

The EPS shows the amount of profit made on one ordinary share, and ROE measures the overall profitability of the enterprise. This indicates the percentage of equity capital invested that is earned as profit. The Dividend Per Share shows the amount paid or proposed to be paid to a shareholder as reward for his/her investment. The literature on signaling theories argue that dividends serve as a signal of the future cash flow and profit potential of a firm and is thus an important influence on the price of stocks.

1.7.2 Assets Base

Companies are able to carry out their operations effectively if they have adequate production capacity. This is proxied by the Net Assets Per Share (NAPS), which shows the value of one ordinary share based on the net assets available. It is expected that increases in this variable should have a positive influence on stock prices.

1.7.3 Capital Structure

This shows the mix of Debt and Equity in the total capital of the company. The Debt Equity Ratio (DE ratio) shows the proportion of equity that represents long term debt and is a good measure of
capital structure. The Miller and Modigliani (1961) theory has long argued about the role of debt on the price of stock.

Table 1.7. 1: Microeconomic variables and their hypothesized signs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesized sign</th>
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<tbody>
<tr>
<td>1. Earnings Per Share (EPS)</td>
<td>+</td>
</tr>
<tr>
<td>2. Dividend Per Share (DPS)</td>
<td>+</td>
</tr>
<tr>
<td>3. Net Assets Per Share (NAPS)</td>
<td>+</td>
</tr>
<tr>
<td>4. Return On Equity (ROE)</td>
<td>+</td>
</tr>
<tr>
<td>5. Debt Equity Ratio (DE ratio)</td>
<td>+</td>
</tr>
</tbody>
</table>

1.8 Motivation for the study

This study is motivated by the desire to determine the usefulness of the quarterly published microeconomic variables by companies listed on the Ghana Stock Exchange in explaining investment decisions and to ascertain whether or not microeconomic variables do have any influence on the market value of listed firms with specific reference to the companies listed on the Ghana Stock Exchange.

Is it the case that companies listed on the Ghana Stock Exchange publish quarterly microeconomic variables simply to satisfy legal and regulatory requirements. Such microeconomic variable statements are not used in making investment decisions. Rather that the published financial statements are actually used by investors to make various kinds of investment decisions.
1.9 Organization of the study

This research work will be organized into five chapters. Chapter one is the introduction and takes care of the following: background, statement of the research problem, research questions, objectives, significance of the research, research methodology, and the organization.

Chapter two looks at the literature review, which includes: introduction, the concept of capital market efficiency, definition of an efficient capital market, forms of market efficiency, theories of efficient markets, implications of efficient market hypotheses, evidence of market efficiency, and accounting results that influence stock prices. Chapter three discusses the methodology of the study and covers issues such as: research design, data type and sources, data collection, data processing and analysis. Chapter four treats the data analysis and presentation of the findings. The fifth chapter deals with the conclusions and recommendations of the study.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction
The Finance literature is replete with theories that suggest that stock prices of companies listed on a stock exchange are influenced by available information which is largely financial in nature. Some of the variables contained in financial statements identified to have some influence on stock prices include: Earnings Per Share (EPS), Dividends Per Share (DPS), Net Assets Per Share, Debt to Equity, Price/Earnings ratio just to mention a few. This chapter discusses the concept of market efficiency, the implications of capital market efficiency, and evidence of market efficiency in developed capital markets and emerging capital markets as well as a justification of the microeconomic or market oriented variables to be used as explanatory variables for this study.

2.2 The Concept of Capital Market Efficiency
The Efficient-Market Hypothesis (EMH) asserts that financial markets are "informationally efficient", or that prices on traded assets, e.g., stocks, bonds, or property, already reflect all known information. The efficient-market hypothesis states that it is impossible to consistently outperform the market by using any information that the market already knows, except through luck. Information or news in the EMH is defined as anything that may affect prices that is unknowable in the present and thus appears randomly in the future. However, a number of recent studies challenge this hypothesis by showing that, past prices can predict future movements in prices and that investment strategies based on historical returns can generate subsequent risk-adjusted abnormal returns. These trading strategies are based on the notion that markets have a tendency to overreact and underreact at medium and long run horizons. (Lasfer et al., 2003; Bowman and Iverson, 1998)
2.3 Definition of an Efficient Capital Market

An efficient capital market is defined by the Business Dictionary.com as a market where all pertinent information is available to all participants at the same time, and where prices respond immediately to available information. Stock markets are considered the best examples of efficient markets. According to Kothari (2001), when we speak about market efficiency, we are interested in the precision and speed with which the market prices of securities fully reflect all available information.

2.4 Forms of Market Efficiency

Capital Markets may be classified as: Weak form efficient markets; where security prices incorporate all relevant historical information. Semi-Strong-form efficient markets; where security prices reflect all relevant, publicly-available information. Strong-form efficient market; where security prices incorporate all relevant information – public and private (Fama, 1970).

2.5 Theories of Efficient markets

The statement that inefficient market prices fully reflects available information is a general and definitional one with no empirically testable implications. To make the model more testable, the process of price formation must be specified in more detail to define more exactly, what is meant by the term “fully reflect”. Fama (1970) discusses two such models, namely; expected returns or “fair game” and the random walk models. The random walk model has received much empirical attention and is discussed here.
2.6 The Random Walk Model

A price series is said to follow the random walk process if the successive price changes (or successive one period return) are independent and identically distributed according to some probability distribution. More formally, the random walk model says:

\[ f \left( R_{j,t+1} / \Phi_t \right) = f \left( R_{j,t+1} \right) \]

This merely says that the probability density function \( f \) of returns \( R_j \) does not depend on the information subset \( \Phi \). It implies that the information cannot be used in predicting the future distribution of returns and the returns are themselves serially independent, and hence such a market is said to be efficient.

The information subset relevant for tests of a random walk model is the sequences of past security prices and such tests have implications for the weak-form efficiency of the capital market.

An alternative representation of the random walk model often seen in Economic Literature is:

\[ \varepsilon_t = P_t - P_{t-1} \]

Where \( P_t \) the price of a security generated at time \( t \) and \( P_{t-1} \) is the price at \( t-1 \)

The relevant assumptions of the equation above are that the price change \( \varepsilon_t \) is random, where,

\[ E(\varepsilon_t, \varepsilon_{t-1}) = 0 \quad \text{for} \quad t \neq t-1 \]

The model as defined here however suggests that \( \varepsilon_t \) is a sequence of uncorrelated random numbers and that a change in price one period in the future cannot be predicted with a significant degree of precision.
2.7 Implications of Efficient Market Hypotheses

There are three common forms in which the efficient-market hypothesis is commonly stated — weak-form efficiency, semi-strong-form efficiency and strong-form efficiency, each of which has different implications for how markets work. Kim and Shamsuddin (2007), Metghalchi et al., (2007), Kan and Andreosso-O’Callaghan (2007), Groenewold et al. (2003), Fama (1970) made conclusions on various forms of efficiencies which are summarized below:

1. **Implications of Weak-form efficiency**
   - Excess returns cannot be earned by using investment strategies based on historical share prices.
   - Technical analysis techniques will not be able to consistently produce excess returns, though some forms of fundamental analysis may still provide excess returns.
   - Share prices exhibit no serial dependencies, meaning that there are no "patterns" to asset prices. This implies that future price movements are determined entirely by unexpected information and therefore are random.

2. **Implications of Semi-strong-form efficiency**
   - Semi-strong-form efficiency implies that share prices adjust to publicly available new information very rapidly and in an unbiased fashion, such that no excess returns can be earned by trading on that information.
   - Semi-strong-form efficiency implies that neither fundamental analysis nor technical analysis techniques will be able to reliably produce excess returns.
   - To test for semi-strong-form efficiency, the adjustments to previously unknown news must be of a reasonable size and must be instantaneous. To test for this, consistent upward or downward adjustments after the initial change must be looked for. If there are any such adjustments it would
suggest that investors had interpreted the information in a biased fashion and hence in an inefficient manner.

3. Implications of Strong-form efficiency

- Share prices reflect all information, public and private, and no one can earn excess returns.
- If there are legal barriers to private information becoming public, as with insider trading laws, strong-form efficiency is impossible, except in the case where the laws are universally ignored.

2.8 Evidence of Market Efficiency

In this section, results of empirical studies (literature review) on market efficiency are discussed. Although it has been noted previously that the forms of market efficiency are in a hierarchy, the discussion of the empirical work would be made in a descending order; strong-form, semi-strong form and weak-form efficiency.

2.9 Strong-form and Semi-strong form Tests

Studies on the strong form of the EMH have sought to find out whether stock prices fully reflect all available information. For empirical purposes, the thrust of the research has been to determine whether any groups of investors, analysts or insiders have private information not reflected in stock prices. Earlier studies supported the strong form efficiency (Treynor, 1965; Sharpe, 1966; and Jensen, 1968); the majority of later studies reject the strong form efficiency (Worthington and Higgs, 2006; Dimson and Mussavian, 1998 and Frimpong and Oteng-Abayie, 2007 are examples).

The semi-strong literature, on the other hand, examines the degree to which securities prices fully reflect one kind of publicly available information or another. Unlike the strong form of the EMH,
the developed markets have been found to be reasonably semi-strong efficient, (see for example, Ball and Brown (1968), Fama, Fisher, Jensen and Roll (1969) and Haugen, Ortiz and Arjona, (1985), although a few other studies, for example, Bernard and Thomas (1990) depart from this conclusion.

2.10 Evidence of weak-form efficiency from developed markets

Empirical work on the weak-form of EMH is largely based on the theory of random walk. The random walk theory posits that stock prices actually involve two hypotheses: (i) successive price changes are independent; and (ii) the price changes conform to some probability distribution (see Fama, 1965). However, most of the studies do not report the distribution evidence. Fama (1965) is one of the exceptions in the early literature. An important early evidence of stock market efficiency is Fama (1965). Thereafter examined the validity of the independence assumption of the random walk model on the successive daily price changes of the 30 stocks of the Dow-Jones Industrial Average on the New York Stock Exchange from the end of 1957 to September 1962. After extensive analysis Fama concluded that: For all tests and for all Differencing intervals the amount of dependence in the data seemed to be either extremely slight or else non-existent. Finally, there were some evidence of bunching of large values in the daily difference’s but the degree of bunching seemed to be only slightly greater than would be expected in a purely random model. On the basis of all these tests it was concluded that the independence assumption of the random walk model seems to be an adequate description of the reality (Fama, 1965)

However Rosenberg, Reid and Lantein (1985) departed from the huge support for the efficiency of the U.S. markets. The authors concluded that the prices on the NYSE can be inefficient. Inspite of
these exceptions the early literature largely supported weak-form market efficiency on the US markets.

Solink (1973) presented similar evidence for European markets, although Solink found deviations that were slightly more apparent than in the U.S. in more recent works, however daily data on New York Stock Exchange (NYSE) and America Stock Exchanges (AMEX) from the Centre for Research in Security Prices (CRSP) makes it possible to estimate precisely the auto-correlation in daily and weekly returns. This has led to the growth of a new body of literature on volatility and predictability of stock returns. For example Lo and MacKinlay (1988) found that weekly returns on size-grouped portfolios of NYSE stocks show reliable positive autocorrelations. This auto correlation is stronger for portfolios of small stocks. Fama (1991) suggested that this result may, in part, be due to the non-synchronous trading effect. Conrad and Kaul (1998) examined the autocorrelations of Wednesday-to-Wednesday returns for size-based portfolios that trade on both Wednesday. This is to mitigate against the nonsynchronous trading problem. But like Lo and MacKinlay they find positive weekly autocorrelations, and more so for portfolios of small stocks.

2.11 Evidence from Emerging Stock Markets

The market efficiency literature on less developed markets also present mixed results as on the mature markets. The majority of the literature is concentrated on weak-form efficiency and less on semi-strong from efficiency, and virtually no evidence on strong-form efficiency.
2.11.1 Semi-strong Form of EMH.

Da Costa (1994) investigated stock market overreaction on the Sao Paolo Stock Exchange (Brazil) and found that the stock prices on the market are positively related to their lag prices.

According to DeBondt and Thaler (1985), overreaction occurs when individuals, in revising their beliefs, tend to attach greater weight to recent information and less weight to prior information. Overreaction, therefore, is a manifestation of market inefficiency. With evidence of a weighted index from a sample of 121 securities, Da Costa reports that in contrast to the US evidence, the magnitude of the overreaction effect was more pronounced in Brazil than in the US.

Similar individual studies on the Malaysian and Hong Kong markets also came to mixed conclusions. Dawson (1981) showed that the Kuala Lumpur Stock Exchange (KLSE) was not efficient in the semi-strong form. Dawson (1982) found similar evidence on the Hong Kong markets.

2.11.2 Evidence of Weak-form efficiency from “Less mature’ Emerging Markets

Gandhi, Saunders and Woodward (1980) found that, in comparison with the NYSE, prices and quantities on the Kuwaiti stock market were more volatile. The authors further observed that there were significant potential gains for Kuwaiti investors and therefore, concluded that the market was inefficient.

Butler and Malaikah (1992), in a comparative study of 71 securities from Kuwait (36) and Saudi Arabia (35) using serial correlation tests, they found that only 13 of the computed serial correlation coefficients from the Kuwaiti market were significant at 5% level of significance. It was also
observed that the magnitudes of the coefficients were not large enough to support any profitable mechanical trading rules based on them.

In a study of the Nairobi Stock Exchange (NSE), Dickinson and Muragu (1994), using a sample of 30 securities found results that compare quite well with those found in mature markets. At lag 1 they found only one serial correlation coefficient to be statistically significant. The authors therefore concluded that:

*Overall, this study provides evidence that small markets, such as the NSE provide empirical results consistent with the weak-form efficiency. The evidence holds for the NSE irrespective of the prices used in conducting the market study (Dickinson and Muragu, 1994, pp 148).*

This conclusion largely supports Parkinson’s (1987) earlier finding on the market that the slight deviations from randomness the author found could not be used to derive any profitable trading rules, given the “practicalities” of the market.

Osei (1998) using the law of one price and the random walk test, established that the Ghana Stock Exchange is "weak-form" inefficient. Simons and Laryea (2004) examined the efficiency of selected African stock markets using weekly and monthly data series from 1990 to 2003. The authors employed both nonparametric and parametric tests to ascertain weak form efficiency of these markets. Their results indicate that with the exception of South Africa (which exhibits features of weak form efficiency), the stock markets in their sample (Ghana, Mauritius and Egypt) are weak form inefficient. Other recent studies have concluded that the Ghana Stock Exchange is weak form inefficient (Frimpong and Oteng-Abayie, 2007; Ntim and Opong, 2007 and Appiah-Kusi and Menyah, 2003 etc.).
2.12 Microeconomic variables that Influence Stock Prices

Faris Nasif Al-Shubiri (2010) carried out a study on the determinants of stock price movement. Using simple and multiple linear regression methods, he discovered a positive linear relationship between the stock price and the net asset value per share and the market price of stock dividend percentage. Such factors as inflation and lending rate had negative relationship between stock price movements. This study was carried out using data from the Stock Exchange in Jordan.

Mostafizur et al (2013) analysed the financial variables that had significant impact on the market price of shares. With the use of time series analysis on some selected variables from the company RPL, it was found that, the variables that have the most impact are the ROA, P/E ratio and the Cash Flow Per Share (CFPS). Amongst these, the CPFS had the highest impact on the stock price movement.

In the area of property investments, Thim, Choong, & Nur (2012) examined the factors that affect the stock performance of the property sector in Malaysia. Thirty six (36) property firms were selected from the Main Board of Bursa, Malaysia, from 2003 to 2007. These firms were studied using the Ordinary Least Squares (OLS) method. At the end of the study, it was found that out of the ROA, ROE, DR, NPM, Effective Tax Rate (ETR), Earnings Per Share (EPS), and Price Earning (PE) ratio, the EPS, ROA and Roe have the most major relationship with the stock performance of these firms.

Placid (2012) examined whether Earnings Per Share (EPS) and Return On Assets (ROA) had a significant influence on share price of publicly listed firms in the Philippines. Their study used the 2009 financial reports of 50 publicly listed firms taken from the (OSIRIS) electronic database and
employed the Spearman Rank order Correlation methodology. The authors concluded a strong positive correlation of EPS with share price whiles ROE had a weak negative correlation with share price. Multiple regression results showed that the chosen model was able to explain 73% of the average change in share price.

Er and Vuran (2012) conducted their study using Dynamic Panel Data Analysis to examine the factors affecting stock returns of 64 manufacturing firms that are continuously quoted in (ISE) during the period of 2003-2007. The authors concluded that stock performance; financial structure, activity and profitability ratios can be used to explain the stock returns as well as the oil prices, economic growth, exchange rate, interest rate, and money supply.

Mohammed (2011) investigated the long-run equilibrium relationship and the direction of causality between stock prices at Dhaka Stock Exchange (DSE) and a set of four stock market oriented factors technically can be defined as microeconomic variables using of Unit–Root tests, Cointegration test and the long–run Granger Causality test proposed by Toda and Yamamoto (1995). Their results indicated that, there was long-run equilibrium relationship among the variables and (DSI), in any way, do not granger cause dividend yield but rather (DSI) has bi-directional causal relation with market price earnings, multiples and the first lag of the monthly average trading volume. On the other hand, unidirectional causality is found from DSI to the first lag of monthly average market capitalization but no causality was found from the opposite direction.

Shen (2000) investigated the historical relationship between price-earnings ratios and subsequent stock market performance. The authors found strong historical evidence that high price-earnings
ratios have been followed by disappointing stock market performance in the short and long term. Specifically, high price earnings ratios have been followed by slow long-run growth in stock prices. He moreover emphasized that, when high price earnings ratios have reduced the earnings yield on stocks relative to returns on other investments, short-run stock market performance has suffered as well.

Ali (2011) examined the impact of changes in selected microeconomic and macroeconomic variables on stock returns at Dhaka Stock Exchange (DSE). He employed Multivariate Regression Model computed on Standard OLS Formula to estimate the relationship. The regression coefficient revealed that inflation and foreign remittance had negative influence and industrial production index; market P/Es and monthly percent average growth in market capitalization had positive influence on stock returns. Forty - four percent (44.5%) of the independent variable jointly explained the variation in DSE all-share price index. No unidirectional Granger Causality was found between stock prices and all the predictor variables except one unidirectional causal relation from stock price and market P/Es. The author drew a conclusion that lack of Granger causality between stock price and selected micro and macro variables ultimately reveals the evidence of inefficient market.

Shubiri (2010) invested the relationship microeconomic factors have on the stock prices using multiple regression analysis. The sample of his study included 14 commercial banks of Amman Stock Exchange for the period 2005 -2008. His findings were that, there was a highly positive significant relationship between market price of stock and net asset value per share; market price of stock dividend percentage, gross domestic product, and negative significant relationship on
inflation and lending interest rate but not always significant on some years of Amman Stock Exchange in Jordan.

Uddin (2009) conducted a multiple regression analysis in the study of the movement of the stock price as the consequence of the movement of the micro and macroeconomic factors on Dhaka Stock Exchange in Bangladesh and reported that there was a significant linear relationship among market return and some microeconomic factors such as net asset value per share, dividend percentage, earning per share of bank leasing and insurance companies. Uddin (2009) added that there existed a non-linear relationship among the variables which was insignificant at 95 percent level of significance.

Maysami and Koh (2000) examined the long-term equilibrium relationships between the Singapore stock index and selected microeconomic variables as well as among stock indices of Japan, and the United States using vector error-correction models. They detected that changes Earnings Per Share (EPS) and exchange rates contribute significantly to the cointegrating relationship while that of price levels and money supply do not. The author however argued that the Singapore stock market interest rate and exchanges rate sensitive. Additionally, they concluded that the Singapore stock market is significantly and positively cointegrated with stock markets of Japan.

Qiao (1997) used daily stock price indices and exchange rates obtained from Hong Kong, Tokyo, and Singapore to examine the possible relationship between these financial variables. From the Granger causality he conducted, it was observed that the changes in stock prices are caused by changes in exchange rates in Tokyo and Hong-Kong markets. The author also used the vector autoregressive model to establish a strong long-run stable relationship between stock prices and exchange rates for all the three markets.
Shahbaz et al. (2008) examined relationship between stock market and economic growth in Pakistan. Shahbaz et al. (2008) used data set from 1971 to 2006. The authors established the order of integration of the variables, using Phillip-Perron test. The Augment autoregressive distributed lag (ARDL) methodology was used to establish the presence of cointegration between the variables. They investigated the long-run causal linkages and short-run dynamics, Engle-Granger causality and ARDL tests were applied respectively. Thereafter, the study concluded that there exist a very strong relationship between stock market development and economic growth. The Engle Granger-Causality confirmed that in the long-run, there is bi-directional causality between stock market development and economic growth. However, in the short-run, there existed only one way causality, from stock market development to economic growth.

Ball and Brown (1968) using net income and earnings per share as proxies for income concluded that of all the information about an individual firm which becomes available during a year, one half or more is captured in that year’s income number as disclosed by the annual income report. The annual income report has a considerable effect on stock prices. It however does not rate highly as a timely media since most of its content (about 85% to 90%) is captured by more prompt media which perhaps include interim reports.

The relationship between stock market and economic growth in Pakistan was investigated by Shahbaz et al., (2008). The authors used data set from 1971 to 2006. In establishing the order of integration of the variables, the Phillip Perron test was used. The ARDL methodology was used to establish the presence of cointegration between the variables. Also, in investigate the long-run causal linkages and short-run dynamics, Engle-Granger causality and ARDL tests were applied.
respectively. After determining the order of integration, the study concluded that there exist a very strong relationship between stock market development and economic growth. The Engle Granger-Causality confirmed that in the long-run, there is bi-directional causality between stock market development and economic growth. However, in the short-run, there existed only one-way causality, from stock market development to economic growth.

Lev (1989) reviewed two decades of empirical research on the usefulness of earnings and earnings research and came to the interesting conclusion that: “while earnings appear to be used by investors the extent of its usefulness is rather limited. This is indicated by the weak and intertemporally unstable contemporaneous correlation between stock returns and earnings and by the very modest contribution of earnings to the prediction of stock prices and returns” Lev (1989) attributes the weak earnings returns correlation to: low information content (quality) of currently reported earnings and other financial variables. The low information content is probably due to biases induced by accounting measurement and valuation principles and in some cases to manipulation of reported data by managers. Methodological shortcomings of the returns/earnings paradigm and Investor irrationality (“noise trading”).

The study then, suggested that capital market research should shift its focus to the examination of the role of accounting measurement rules in asset valuation. Following from this conclusion, the present study will ascertain whether earnings, among other accounting results have any significant relationship with stock prices.

Bernard and Thomas (1990) investigated the possibility that stock prices fail to reflect fully the implications of current earnings for future earnings. Specifically, they entertained the hypothesis
that prices fail to reflect the extent to which the time-series behavior of earnings deviates from a naive expectation: a seasonal random walk, where expected earnings are simply earnings for the corresponding quarter from the previous year. It is well known that earnings forecast errors based on such a naive model are correlated through time. In contrast, in a market that fully impounds all prior earnings information, forecast errors should not be auto correlated. By assuming that stock prices are at least partially influenced by the above naive earnings expectation, we are able to predict with a significant degree of accuracy the three-day reaction to future earnings announcements (up to four quarters ahead), given only current earnings and information about the (historical) time-series behavior of earnings. In contrast to the well-documented positive relation between unexpected earnings for quarter \( t \) and post-announcement drift for quarter \( t + 1 \), the authors found a negative relation between unexpected earnings of quarter \( t \) and the abnormal returns around the announcement of earnings for quarter \( t +1 \).

Bernard (1992) reviewed recent evidence on market efficiency with respect to accounting earnings. His study included evidence indicating that the average initial response to earnings announcements is an underreacting. The author documented that there is evidence that has been interpreted to indicate that extreme stock price movements may represent overreactions to earnings.

Myring (2006) asserted that assessing the usefulness of financial information has become the primary goal of accounting research. In his study, he used earnings-returns relationship to examine the usefulness of earnings in an international setting. Specifically, Myring (2006) examined the monthly market reaction to unexpected earnings defined by both change in earnings per share (CEPS) and Analyst Forecast Errors (AFE). The results of analyses using data from the entire time period pooled by accounting regimes reveal a significant market reaction to the announcement of
earnings (either AFE or CEPS) in all regimes. This indicates that investors view accounting information as value relevant and react when earnings do not meet expectations. In addition, analyst forecast errors appear to have incremental explanatory power over the change in EPS in most regimes. This suggests that investors around the world act efficiently to incorporate analyst earnings forecasts into earnings expectations. Results of the multi-period analysis reveal a trend toward increased significance of the reaction to the earnings release. This implies that in recent years, investors are more likely to react to the release of earnings. In addition, the results suggest that investors are more likely to incorporate analyst forecasts into earnings estimates in recent years.

According to Habib (2006), the Financial Accounting Standards Board (FASB), contends that the primary focus of financial reporting should be on earnings rather than cash flows because “information about enterprise earnings based on accrual accounting generally provides a better indication of an enterprise’s present and continuing ability to generate favourable cash flows than information limited to the financial aspects of cash receipts and payments” (FASB, 1978, ix). Some accountants believe, however, that cash flows, not earnings, are the primary source of information that affects the relative market prices of its securities.

Lee (1974) argue that investors’ information demand is best served by cash flow analysis because cash portrays the ability of the enterprise to survive, is not contaminated by innumerable measurement problems, and facilitates the prediction of future dividends, credit and loan payments.

The results from Habib (2006) provided evidence that both earnings and cash flows are value-relevant in New Zealand. Furthermore, both earnings and cash flows have incremental information content with respect to security returns. This finding could be attributed to, the value-enhancing role
that dominant owners play in such an environment. This study finds that earnings lose relevance when earnings permanence is incorporated into the regression model. However, there is no corresponding increase in the cash flow variable.

According to Miller and Modigliani (1961), the value of a firm can be determined by using a number of approaches such as: the discounted cash flow approach; the current earnings plus future investment opportunities approach; the stream of dividends approach and the stream of earnings approach.

Bhattacharya (1979) concluded that the payment of cash dividends functions as a signal of expected cash flows of firms in an imperfect information setting. This then influences the value of firms. In his study however, the incorporation of other sources of information for example accountants reports was ignored on the ground that taken by themselves, they are fundamentally unreliable “screening” Mechanism because of the moral hazard involved in communicating profitability. This study intends to observe whether the information contained in published financial statements have served as signals of expected benefits and thus influenced firm value.

Miller and Rock (1985) intimated that “in a world of rational expectations, the firm’s dividend (or financing) announcements provide just enough pieces of the firm’s sources and uses statement for the market to deduce the unobserved piece, to wit, the firm’s current earnings. The market’s estimate of current earnings contributes in turn to the estimate of the expected future earnings on which the firm’s market value largely hinges.”
Bradshaw et al. (2006) examined the relation between firms’ external financing activities, future stock returns, future profitability and analysts’ forecasts and provided the following summary: ‘‘the key innovation of our research design is the use of statement of cash flows data to construct a comprehensive and parsimonious measure of the net amount of cash generated by corporate financing activities’’ (p. 1). Their primary findings are that there exists a negative and statistically significant relation between net external financing and future stock returns, and future profitability, and a positive relation with optimism in analysts’ forecasts. These results, in turn, imply that the relevant information in financing activities is that the firm raised (or repaid) funds, rather than the specific means by which the firm raised (e.g., debt versus equity) or repaid (dividends and stock repurchases versus interest and repayment of debt) funds. The overall results on the relation between external financing and future stock returns and future profitability imply that investors do not correctly infer the negative relation between financing activities and future performance. These findings were confirmed by (Cohen and Lys, 2006)

2.13 Summary

Latridis and Valahi (2008) find that financial measures, such as leverage, profitability, liquidity and growth affect the decision to voluntarily adopt an accounting policy or regulation. Firms may voluntarily abide by an accounting regulation in order to influence their financial performance and suit their corporate plans. For example, following that International Accounting Standard (IAS) 1 enhances the quality of financial reporting; firms with higher leverage might be inclined to voluntarily adopt IAS 1 in order to favorably affect their financial position. Voluntary IAS 1 disclosers are generally firms that perform well and particularly tend to exhibit higher profitability and growth. Voluntary IAS 1 disclosers are also firms that tend to provide voluntary accounting disclosures about their financial performance and display high managers’ remuneration and stock
returns. Also, firms that raise equity capital appear to voluntarily adopt IAS 1. The study also indicates that large firms, which are more visible in the stock market, voluntarily abide by the reporting requirements of IAS 1 in order to provide evidence of quality in their reported financial numbers and positively influence investors.

Holthausen and Larcker (1992) supported the contention of Ou and Penman (1989) that financial statement items can be combined into one summary measure to yield insights into the subsequent movement of stock prices. Ou and Penman (1989) selected the potential financial statement items for their model from a comprehensive set of 68 accounting ratios which texts on fundamental analysis had emphasized prior to the beginning of their sample period, [see Ou and Penman (1989, table 2)]. Holthausen and Larcker (1992) dropped eight of the 68 ratios and used the remaining ratios for their model. Among the ratios used in both studies are: Earnings per share, Net Assets per Share, Price Earnings ratio, Debt/Equity ratio.

This study intends to discover whether or not all available information, particularly, information disclosed in annual published financial statements do influence the prices of stocks of the companies listed on the Ghana Stock exchange. The prices of selected stocks listed on the Ghana Stock Exchange will be observed over an eleven year period from April 1998 to April 2014 against the annual accounting results recorded over the period spanning from December 31st 1997 to December 31st 2013. The variables that will be used as a proxy for the microeconomic results include the following: Earnings per share, Net Assets per share, Dividends per share, Return on equity and Debt/Equity ratio. These variables have been chosen because texts on fundamental analysis have emphasized their usefulness in explaining corporate performance.
CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section explains how the whole study will be carried out. The study basically tries to analyze the relationship between stock prices of companies listed on the Ghana Stock Exchange and a set of five (5) market variables mostly characterized as microeconomic variables (EPS, NAPS, DPS, ROE, and DE ratio). It outlines the data types and sources, Data collection, Data processing and the statistical models that will be used to do the study.

3.2 Data Sources and Data Collection

Data for this study are mainly secondary data comprising of the stock prices of listed companies for the period spanning from April 1998 to April, 2013 and key microeconomic variables, benchmarks of corporate performance, obtained from the annual financial statements of selected listed companies covering the time period December 1997 to December 2013. The Ghana Stock Exchange has been chosen because not much research has been done on this subject on The Ghana Stock Exchange.

The microeconomic variables published in the annual financial statements of fifteen (15) selected companies listed on the Ghana Stock Exchange from December 31st 1997 to December 31st 2013 were used for the study. The selected companies are: ABL, AGC/AGA ALW, CFAO, EIC, FML,
GCB, HFC, MLC, PAF/PKL, PZ, SCB, SPPC, SSB/SG-SSB, and UNIL. These companies were selected because they have complete data for the time horizon under the study.

Nineteen years period is chosen because it is a long enough period to bring out the relationship between the microeconomic variables and stock prices. This period is chosen also because it is a period during which complete data is available for the selected companies. The financial results are obtained from the financial summaries contained in the Ghana Stock Exchange Facts Books for 2014, 2008, 2006 and 2001. The daily stock prices were also obtained from the Ghana Stock Exchange.

3.3 Data Analysis
To achieve the main objectives of in this study, Johansen-Juselius Cointegration analysis was first carried out to determine whether or not if there is the existence of long – run equilibrium relationship between stock market index and five selection market oriented microeconomic variable, thus EPS, DPS NAPS ROE and DEratio. The second stage is the determination of the short – run equilibrium relationship between stock market index and five selection market oriented microeconomic variable using vector error correction model. The final stage of this research is to determine the direction of causality among these variable using Toda – Yamamoto Long – run Causality techniques. This tool gives informed decision to investors the directional behavior of the selected market oriented variables to the changes in stock price of companies listed on Ghana Stock Exchange (GSE).
3.5 Unit root tests (Stationarity Test)

Most microeconomic time series are stochastic in nature. In other words they are found to be non-stationary. A stationary process is one with a constant deterministic trend, over some time. Its mean and variance are constant. A non-stationary series can however be obtained if any of these conditions are violated.

A variety of unit root test have been found in most economic literature used to ascertain the order of integration. (Example, Sargan and Bhargave, 1986; Phillips and Parron, 1988; Kwiatkowski, Phillips, Schant and Shin (KPSS), 1992 and Dickey and Fuller,1979 among others).

The study employs KPSS test, Phillips and Parron (P-P) test and Augmented Dickey-Fuller (ADF) test to establish the order of integration in each variable. In Kwiatkowski et al. (1991) and KPSS test, the null hypothesis to be stationary and non-stationary data series in the alternative hypothesis. Augmented Dickey-Fuller (ADF) and Phillips and Parron (P-P) test caries the same assumptions. This test assumes that the null hypothesis is non-stationary whiles the alternative hypothesis is stationary.

Engle and Granger (1987) demonstrated that many time series data are integrated of order one I (1). The variables used in the study are the stock prices and five (5) stock market oriented variables (EPS, DPS, NAPS, ROE and DE ratio ). To investigate whether or not the variables are stationary or cointegrated, the unit root test is carried out. The paper adopts the Augmented Dickey-Fuller (ADF) unit root test. This would eliminate the problem of spurious regression of the variables in the regression model. The ADF regression equations are formulated as;

\[
\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \epsilon_t
\]

\[
\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \epsilon_t
\]

\[
\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 t + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \epsilon_t
\]
Where \( \varepsilon_t \) are white noise errors, \( \Delta \) is the first difference operator, the additional lagged terms are included to ensure that errors are uncorrelated. The tests are based on the null hypothesis:

\[
H_0: Y_t \text{ is not } I(0) \quad \text{thus } Y_t \text{ is not stationary}
\]

\[
H_1: Y_t \text{ is } I(1) \quad \text{thus } Y_t \text{ is stationary}
\]

If the calculated DF and ADF statistics are less than their critical values from Fuller’s table, then the null hypothesis \( H_0 \) is accepted and the series are non-stationary or not integrated of order zero. The \( p \)-values of the test is compared with to the significant level of the test.

3.6 Cointegration Modeling

Cointegration analysis allows nonstationary data to be used so that spurious results are avoided. With this technic, we can separate short and long – run relationship among the variables under study. It tells us the existence of long – run equilibrium if the variables are found to have unit roots (nonstationarity), and are of the same order of integration. Cointegration introduces one additional causal channel (error correction term) for one variable to affect the other variables. Another and perhaps very important aspect of this method is its, restrictions on the parameters and proper accounting of these restrictions could improve estimation efficiency. The cointegration relationship among the variable can be analyzed using Engle and Granger (1987) Charemza and Deadman (1992), Cuthbertson et al. (1992), Inder (1993), Phillips and Johansen-Juselius procedure (Johansen 1988; Johansen-Juselius 1992, 1999) and the ARDL (also known as the bounds testing approach to cointegration) developed by Pesaran et al. (2001) among others. In this study, the Johansen-Juselius procedure is employed.
3.7 Johasen – Juselius Modeling Approach to Cointegration (J - J)

Johasen (1992) method applies the Maximum Likelihood procedure to establish the existence of cointegrating vectors in non-stationary I(1) time series as a vector autoregressive (VAR).

Considering a VAR (p) with I (1) variables in level

\[ Y_t = \alpha + A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + \varepsilon_t, \]  

(3.1)

where \( Y_t \) is the \( k \) vector of non-stationary I (1) variables
\( \varepsilon_t \) is a vector of innovation.

Subtracting the lagged vectors \( Y_{t-1} \) on both sides of equation (3.1) to get

\[ \Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-1} + \varepsilon_t, \]  

(3.2)

where \( \Delta Y_t = Y_t - Y_{t-1} \), \( \Pi = \sum_{i=1}^{p} A_i - I \) and \( \Gamma_i = - \sum_{j=i+1}^{p} A_j \)

Estimates of \( \Pi \) and \( \Gamma_i \) gives information on the long-run and short-run adjustments with respect to changes in \( Y_t \) respectively. Cointegrating Rank, which refers to the number of linearly dependent cointegrating vectors that exist in the system may range from 1 to \( n - 1 \) (Greene 2000). The three possible cases where \( \Pi Y_t \bot I(0) \) holds are:

i. Rank \( \Pi = 0 \), reduced rank and no cointegration. Both eigenvalues are zero

ii. Rank \( \Pi = 1 \), reduced rank and cointegration. One eigenvalue is different from zero.

iii. Rank \( \Pi = 2 \), full rank, both eigenvalue are different from zero and VAR is stationary.

In most scenarios, the matrix \( \Pi \) has a reduced rank with \( r < (p - 1) \) cointegrating vector present in \( \beta \). In particular, \( \Pi = \alpha \beta \) where \( \alpha \) and \( \beta \) are \( p \times r \) matrix, \( (r < p) \). The matrix \( \Pi \) called long-run
matrix, tells the long-run effects to the Vector Error Correction Model (VECM). $\beta^1Y_{t-1}$ represent r-cointegration relations inside the system. Johansen and Juselius (1990) offer two likelihood ratio test statistics to test for the number of cointegrating vectors. The first likelihood ratio statistics for the null of exactly r cointegrating vectors against the alternative of r+1 vectors is the maximum eigen value statistic. The second statistic for the hypothesis of at most r cointegrating vectors against the alternative is the trace statistic. Critical values for both test statistics are tabulated in Johansen and Juselius (1990).

3.7.1 Johansen - Juselius Model specification as applied to the variables under study

Johansen - Juselius specification of the relationship between the GSE market price and market oriented variables, in other words microeconomic variables is given as:

$$\Delta SP_t = \alpha + \sum_{i=1}^m \beta_1 \Delta SP_{t-i} + \sum_{i=1}^n \beta_2 \Delta EPS_{t-i} + \sum_{i=1}^2 \beta_3 \Delta DPS_{t-i} + \sum_{i=1}^w \beta_4 \Delta ROE_{t-i} + \sum_{i=1}^z \beta_5 \Delta NAPS_{t-i} + \sum_{i=1}^p \beta_6 \Delta DEratio_{t-i} + \epsilon_t$$

Where $SP = GSE market Price$

$EPS = Earnings per share$

$DPS = Dividend per share$

$ROE = Return on equity$

$NAPS = Net asset per share$

$DEratio = Divided ratio$

$m, n, k, w, z$ and $p$ are lag length of GSE market price, EPS, DPS, ROE, NAPS and DEratio respectively.

$\epsilon$ is white noise error term

$\alpha$ is the drift components and $\beta$ is the cointegration vector.
3.8 Vector Error Correction Model (VECM)

The error – correction term, measures the speed at which the dependent variable $Y_t$ returns to equilibrium after a change in the independent variable $X_t$. The estimated VAR from equation (3.2) can be rewritten as an Vector Error Correction Model including deterministic trend and dummy variables as:

$$
\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma \Delta Y_{t-1} + \mu_0 + \mu t + \Phi D_t + \epsilon_t,
$$

(3.3)

where; $\Delta$ is the first difference operator, $\mu_0$ is a vector of constant, $D_t$ is a vector of deterministic variables (i.e linear time trend, seasonal dummies etc.) and $\epsilon_t \sim iid\left(0, \sigma^2\right)$. Without loss of generality, let $p = 2$ equation (3.3) becomes,

$$
\Delta Y_t = \Pi Y_{t-1} + \Gamma_1 \Delta Y_{t-2} + \mu_0 + \mu t + \Phi D_t + \epsilon_t
$$

(3.4)

The effect of deterministic trend and dummy variables are partitioned into two components based on if the effect is inside the cointegration system or not. The decomposition can be done by:

$$
\mu_0 = \alpha \beta_0 + \gamma_0
$$

$$
\mu_1 = \alpha \beta_1 + \gamma_1
$$

$$
\Phi = \alpha \beta_D + \Phi_D
$$

(3.5)

Substitute (3.5) in (3.4), we get

$$
\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \alpha \beta^t Y_{t-1} + \alpha \beta_0 + \gamma_0 + \alpha \beta_1 t + \gamma_1 t + \alpha \beta_D D_t + \Phi_D D_t + \epsilon_t
$$

$$
\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \alpha \left[ \beta^t \beta_0 \beta_1 \beta_D \right] \begin{bmatrix} Y_{t-1} \\ 1 \\ t \\ D_t \end{bmatrix} + \gamma_0 + \gamma_1 t + \Phi_D D_t + \epsilon_t
$$

(3.6)
In this case, the parameters $\beta_0$, $\beta_1$ and $\beta_D$ becomes the restricted parameters, which imply that the deterministic trend and dummy variables are restricted only in the Cointegration relations.

### 3.8 VEC Model specification as applied to the variables under study

**The short – run dynamics** is modeled and estimated between the market price and the independent variable in the study as:

$$
\Delta SP_t = \alpha + \alpha_0 \epsilon_{t-1} + \sum_{i=1}^{m} \beta_i \Delta SP_{t-i} + \sum_{i=1}^{n} \beta_i^{EPS} SP_{t-i} + \sum_{i=1}^{k} \beta_i^{DPS} SP_{t-i} + \sum_{i=1}^{w} \beta_i^{ROE} SP_{t-i} + \\
\sum_{i=1}^{z} \beta_i^{NAPS} SP_{t-i} + \sum_{i=1}^{p} \beta_i^{DEratio} SP_{t-i} + \epsilon_{t}, \quad (3.7)
$$

where all the variables maintain their meaning as explained in section (3.6.1). $\epsilon_{t-1}$ is the error correction term obtained from the cointegrating equations. The error correction coefficient $\alpha_0$ is expected to capture the adjustment of $SP_t$ towards long – run equilibrium.

### 3.9 Maximum Likelihood Estimation

Johansen (1988) first derived the Maximum Likelihood (ML) Estimation of Gaussian case (1988). for simplicity, the notation in equation (3.6) is rewritten as,

$$
Z_{tr} = \alpha \tilde{\beta} Z_{tr} + \Phi Z_{2tr} + \epsilon_t, \quad (3.8)
$$

where $\Phi = [\Gamma_1 \gamma_0 \gamma_1 \Phi_D]$, $\tilde{\beta} = [\beta_1 \beta_0 \beta_1 \beta_D]$, $Z_{tr} = [Y_{t-1} \ 1 \ t \ D_t]$, $Z_{2tr} = [\Delta Y_{t-1} \ 1 \ t \ D_t]$ and $Z_{lr} = \Delta Y_t$.

We then estimate the following regression by the Ordinary Least Squares (OLS) method.

$$
Z_{lr} = \hat{\beta}_1 Z_{2r} + R_{lr} \quad (3.9)
$$

$$
Z_{lr} = \hat{\beta}_2 Z_{2r} + R_{lr}
$$
The residual $R_{it}$ and $R_{tt}$, which are the concentrated model is formulated as,

$$R_{it} = \alpha \tilde{\beta}^t R_{it} + \varepsilon_i, \quad \varepsilon_i \sim N_p \left(0, \sigma \right) \quad \text{(3.10)}$$

If we assume $\tilde{\beta}^t$ is known, $\alpha$ can be estimated as a function of $\tilde{\beta}, \alpha = \hat{\alpha} \left( \tilde{\beta} \right)$ by multiplying equation (3.9) by the factor $R_{it}^t \tilde{\beta}$ and discarding the error term $\varepsilon_i$. Thereafter we find the Least Square Estimators of $\alpha$.

$$R_{it} R_{iti}^t \tilde{\beta} = \alpha \tilde{\beta}^t R_{iti} R_{iti}^t \tilde{\beta} \quad \text{(3.11)}$$

$$S_{01} \tilde{\beta} = \alpha \tilde{\beta}^t S_{11} \tilde{\beta}, \text{ where } S_0 = T^{-1} \sum_i R_{iti} R_{iti}^t \left( \tilde{\beta} S_{11} \tilde{\beta} \right)^{-1}$$

The error covariance matrix $\hat{\sigma}$ as a function of fixed $\beta$ and $\alpha$ is formulated as;

$$\hat{\sigma} = S_{00} - S_{01} \hat{\alpha} \hat{\beta} - \alpha \tilde{\beta}^t S_{10} + \alpha \tilde{\beta}^t S_{11} \hat{\beta} \hat{\alpha}^t$$

$$= S_{00} - S_{01} \tilde{\beta} \left( \tilde{\beta} S_{11} \tilde{\beta} \right)^{-1} \tilde{\beta}^t S_{10} \quad \text{(3.12)}$$

In principle, Multivariate normality assumptions maximizing the Likelihood Function of the residuals in equation (3.9) is equivalent to minimizing the determinant of $\hat{\sigma}$; i.e

$$|\hat{\sigma}| = |S_{00}| \left| \tilde{\beta}^t \left( S_{11} - S_{10} S_{00}^{-1} S_{01} \right) \tilde{\beta} \right| \left| \tilde{\beta}^t S_{11} \tilde{\beta} \right| \quad \text{(3.13)}$$

By solving the eigenvalue problem, (3.12) is minimized to with respect to $\beta$ as follows

$$|\lambda S_{11} - S_{10} S_{00}^{-1}| = 0 \quad \text{(3.14)}$$

The solution of this equation gives eigenvalues $1 \succ \hat{\lambda}_1 \succ ... \succ \hat{\lambda}_p \succ 0$ and eigenvectors
\( \hat{V} = (\hat{d}_1, \ldots, \hat{d}_n) \) which satisfies the equations \( \lambda_i S_{11} \hat{v}_i = S_{10}^{-1} S_{01} \hat{v}_i \) and \( 1 = \hat{v}_i^T S_{11} \hat{v}_i, \ i \ldots n \).

And the minimum of \( |\hat{\sigma}| \) is:

\[
|\hat{\sigma}|_{\text{min}} = |S_{00}| \prod_{i=1}^{p} (1 - \lambda_i) \tag{3.15}
\]

The final stage involves Maximum Likelihood estimates of \( \hat{\beta}_i \) which is achieved by normalizing the corresponding eigenvector of \( \lambda_i \). It tests the null hypothesis of \( r \) cointegrating vectors against the alternative hypothesis of \( (r + 1) \) cointegrating vectors. The value of \( \lambda \) measures the stationarity of the corresponding \( \hat{\beta}_i Y_{t-1} \), the larger the \( \lambda_i \) is, the more stationary the relation is. However, if for some reason \( \lambda_i = 0 \), the corresponding linear combination \( \hat{\beta}_i Y_{t-1} \) is non-stationary.

### 3.9.1 The trace test statistics

To determine the cointegration rank which in other words is the number of non–zero eigenvalues, the trace test is calculated. The null hypothesis of trace test is:

\[
H_0 = \text{rank} \leq r
\]

\[
H_0 = \text{rank} > r
\]

This informs us that there exist at most \( r \) cointegration relation. The trace test encapsulates the idea of likelihood ratio test (LR). The test statistics is:

\[
\tau_{p-r} = -2lnQ \left( \frac{H_0}{H_1} \right) = -2ln\left( \frac{|S_{00}|(1-\lambda_1)(1-\lambda_2)\ldots(1-\lambda_r)}{|S_{00}|(1-\lambda_1)(1-\lambda_2)\ldots(1-\lambda_r)(1-\lambda_p)} \right)
\]
\[-T \ln(1-\lambda_{r+1})(1-\lambda_{r+2})\cdots(1-\lambda_p)\]
\[-T \sum_{i=r+1}^{p} \ln(1-\lambda_i)\]

If the estimated is larger than the critical value, \(H_0\) is rejected, otherwise the hypothesis is accepted.

3.10 Toda and Yamamoto (1995) Causality Test

To avoid the problem of specification bias and spurious regression, the study does not focus on
Traditional Granger – Causality procedure to test for the relationship between more than two
Variables. Toda – Yamamoto (1995) methodology to unleash causal relationships for
finding the way of bilateral relation or existence of unidirectional causal relationship between
stock price index on Ghana Stock Exchange and five (5) selected microeconomic variables
( EPS, NAPS, DPS, ROE and DERATIO).

Toda – Yamamoto (1995) requires the estimation of a VAR in levels which minimizes the
danger involved with wrongly identifying the order of integration in the series. The procedure
involve a modified Wald (MWALD) test in an augmented VAR model. The idea underlying the
Toda–Yamamoto (TY) test is to artificially augment the true lag length \(p\) of the VAR
model by the maximal order of integration \(d_{\text{max}}\) that might occur in the process. Then, we
can estimate the VAR model with a \((p + d_{\text{max}})\) order, ignoring the coefficients of the last \(d_{\text{max}}\)
lagged vectors, and test the linear or nonlinear restrictions on the first \(k\) coefficient
matrices by the standard Wald test. The methodology proves that the Wald statistic used in this
setting converges in distribution to a chi square \(\chi^2\) random variable whether the process is
stationary or nonstationary. From equation (3.1),
The lag length $p$ estimated by some consistent lag selection criteria. The hypothesis are as follows:

- $H_0$: row $i$; column $j$ element in $A_k = 0$, $k = 1,...,p$
- $H_1$: row $i$; column $j$ element in $A_k \neq 0$, $k = 1,...,p$

If the $j^{th}$ element of $Y_t$ Granger-cause the $i^{th}$ element of $Y_t$ if the null hypothesis is rejected. $H_0$ is tested by a Wald test which is termed as modified Wald (MWALD).

3.10.1 Toda and Yamamoto (1995) Model specification as applied to the variables under Study

A bivariate VAR $(p + d_{max})$ comprising of stock price and market variables following Yamamoto (1998) is as follows:

VAR $(p + d_{max})$ between Stock Price (SP) and Earnings per share (EPS).

$$SP_t = \omega + \sum_{i=1}^{p} \theta_i SP_{t-i} + \sum_{i=m+1}^{p+d_{max}} \phi_i SP_{t-i} + \sum_{i=1}^{p} \delta_i EPS_{t-i} + \sum_{i=m+1}^{p+d_{max}} \phi_i EPS_{t-i} + \epsilon_{1t}$$

$$EPS_t = \phi + \sum_{i=1}^{p} \phi_i SP_{t-i} + \sum_{i=m+1}^{p+d_{max}} \phi_i SP_{t-i} + \sum_{i=1}^{p} \beta_i SP_{t-i} + \sum_{i=m+1}^{p+d_{max}} \beta_i EPS_{t-i} + \epsilon_{2t}$$
VAR \((p + d_{\text{max}})\) between Stock Price (SP) and Earnings per share (DPS);

\[
SP_i = \omega_0 + \sum_{i=1}^{p} \theta_i SP_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \theta_i SP_{i-1} + \sum_{i=1}^{p} \beta_i DPS_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \beta_i DPS_{i-1} + \nu_{1t}
\]

\[
DPS_i = \phi_0 + \sum_{i=1}^{p} \theta_i DPS_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \theta_i DPS_{i-1} + \sum_{i=1}^{p} \phi_i SP_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \phi_i SP_{i-1} + \nu_{2t}
\]

VAR \((p + d_{\text{max}})\) between Stock Price (SP) and Return on equity (ROE).

\[
SP_i = \omega_1 + \sum_{i=1}^{p} \theta_i SP_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \theta_i SP_{i-1} + \sum_{i=1}^{p} \beta_i ROE_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \beta_i ROE_{i-1} + \tau_{1t}
\]

\[
ROE_i = \phi_1 + \sum_{i=1}^{p} \theta_i ROE_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \theta_i ROE_{i-1} + \sum_{i=1}^{p} \phi_i SP_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \phi_i SP_{i-1} + \tau_{2t}
\]

VAR \((p + d_{\text{max}})\) between Stock Price (SP) and Net Asset Per Share (NAPS);

\[
SP_i = \omega_2 + \sum_{i=1}^{p} \theta_i SP_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \theta_i SP_{i-1} + \sum_{i=1}^{p} \beta_i NAPS_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \beta_i NAPS_{i-1} + \zeta_{1t}
\]

\[
NAPS_i = \phi_2 + \sum_{i=1}^{p} \theta_i NAPS_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \theta_i NAPS_{i-1} + \sum_{i=1}^{p} \phi_i SP_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \phi_i SP_{i-1} + \zeta_{2t}
\]

VAR \((p + d_{\text{max}})\) between Stock Price (SP) and Dividend ratio (DEratio);

\[
SP_i = \omega_3 + \sum_{i=1}^{p} \theta_i SP_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \theta_i SP_{i-1} + \sum_{i=1}^{p} \beta_i DEratio_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \beta_i DEratio_{i-1} + \xi_{1t}
\]

\[
DEratio_i = \phi_3 + \sum_{i=1}^{p} \theta_i DEratio_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \theta_i DEratio_{i-1} + \sum_{i=1}^{p} \phi_i SP_{i-1} + \sum_{i=m+1}^{p+d_{\text{max}}} \phi_i SP_{i-1} + \xi_{2t}
\]

where SP, EPS, DPS, NAPS and DEratio have their usual meaning as defined in the previous section. The \(\omega\)'s, \(\theta\)'s, \(\beta\)'s, \(\phi\)'s and \(\phi\) are parameters of the model. \(d_{\text{max}}\) is the maximum order of integration suspected to occur in the system; \(\epsilon_i\)'s, \(\nu_i\)'s, \(\tau_i\)'s, \(\zeta_i\)'s and \(\xi_i\) are residuals of the model \(\Sigma\) covariance matrix for each error term respectively.
3.11 Lag Length Selection by Information Criteria

There exist in recent literature several lag selection criteria mostly used to obtain the appropriate number of lag order of the model. In Johansen – Juselius test of cointegration as well as the VECM, the optimum number of lags must be specified. Among other criteria include; Aikaike Information Criterion (AIC) (Akiake 1973), Schwarz Information Criterion (SIC) (Schwarz 1978), Hannan – Qiunn criterion (HQC) (Hannan and Quinn 1979), Final Prediction Error (FPE) (Akiake, 1969), Bayesian Information Criterion (BIC) (Akiake 1979), and sequential modified LR test statistic (LR). The model with the lowest BIC, SIC, HQC, FPE and LR value is adjudged the best. Moreover if for some cases at least two models appears with the same BIC, SIC, HQC, FPE and LR value, the principle of parsimony would be used.

3.11.1 Schwarz Information Criterion (SIC)

The route around this problem is to estimate the precise value of \( p \). By this approach, we minimize \( \hat{p} \). the SIC is defined by

\[
SIC = \ln(\hat{\sigma}_p^2) + \frac{p \ln(T)}{T},
\]

where \( \hat{\sigma}_p^2 = (T - p - 1)^{-1} \sum_{i=p}^{T} \hat{\varepsilon}_i^2 \), \( \hat{\varepsilon}_i \) is the model’s residuals and \( T \) being the sample size.

The SIC estimator of \( \hat{p} \) is the value that minimizes SCI (p) among the possible choices \( p = 0, 1, 2, ..., p_{\text{max}} \), where \( p_{\text{max}} \) is the largest value of \( p \) considered.

3.11.2 Akaike Information Criterion (AIC)

First introduced by Hirodoga Akiake in 1973. The Akaike Information Criterion (AIC) achieved
a tremendous widespread recognition and acceptance. If the BIC yields a model with too few
lags, the AIC provides a reasonable alternative. The AIC is defined by;

\[
AIC_p = -2T \left[ \ln(\hat{\sigma}_p^2) \right] + 2p,
\]

where \( \hat{\sigma}_p^2 = (T - p - 1)^{-1} \sum_{i=p}^{T} \hat{\epsilon}_i^2 \), \( \epsilon_i \) is the model’s residuals and \( T \) being the sample size.

The AIC measures the model suitability which balances model fit and complexity for the given data
set. One portion measures the goodness of fit of the model and the other section penalizes the
chosen model by the number of parameters used. This in literature is known as the penalty function.

### 3.11.3 Hanna – Quinn Criterion (HQC)

The Hannan-Quinn criterion was introduced by Hannan and Quinn (1979). The adjusted version of
it can also be applied to regression models, It is obtained by replacing the non – negative penalty
function in AIC by \( \ln(\ln T) \). Thus;

\[
HQC_p = \ln(\hat{\sigma}_p^2) + 2T^{-1} p \ln(\ln T),
\]

where \( \hat{\sigma}_p^2 = (T - p - 1)^{-1} \sum_{i=p}^{T} \hat{\epsilon}_i^2 \), \( \epsilon_i \) is the model’s residuals and \( T \) being the sample size.

. The best model is the model that corresponds to minimum HQC i.e. \( p = 0, 1, 2, \ldots, n \)

\[
\left[ HQC(p) \right]_{\text{min}}.
\]

The order selection procedure presented above have the advantage of being objective and
automatic, but it over-fit when the sample size is small.
3.11.4 Final Prediction Error (FPE)

In the Final prediction Error as proposed by Akaike (1969), the mean square prediction of the model is fitted to the present data is applied to another independent observation to make a one-step prediction. Based on the FPE, the parameters in each candidate model are estimated so that the minimum of FPE is attained. i.e. \[ \left[ FPE\left(p\right)\right]_{\text{min}} \] for \( p = 0, 1, 2, \ldots, n \) for this model, and then a model which has the minimum FPE within the candidate models is selected. The FPE is calculated as;

\[
FPE_p = \hat{\sigma}^2_p (T - p)^{-1} (T - p),
\]

where \( \hat{\sigma}^2_p = (T - p - 1)^{-1} \sum_{i=p}^{T} \hat{\epsilon}_i^2 \) and \( \hat{\epsilon}_i \) is the model’s residuals and \( T \) being the sample size.

The main task of these selection criteria is to compute the probability of each of these criteria in correctly estimated the true autoregressive lag length. The probability takes a value between zero and one inclusively, with a probability of zero implies that the criterion fails to pick up any true lag length and thereby is a poor criterion. On the other hand, a probability of one implies that the criterion manages to correctly select the true lag length in all cases and hence is an excellent criterion.

3.12 Model Diagnostic Checks

Diagnostic checks are carried out in order to report with a high degree of certainty, the adequacy or goodness of fit test of the selected model. The ECM must fulfill the assumptions of Classical Normal Linear Regression (CNLRM). The assumptions are:

- Residuals are normally distributed.
- There is no serial correlation or heteroscedasticity among \( \epsilon_i \).
There is no perfect multicollinearity

Linear regression model.

On the basis of these assumptions, diagnostic test have to be conducted on $\epsilon_t$ in order to conclude whether the assumptions have been violated or not.

### 3.12.1 Normality Test

Jacque-Bera test is used to determine whether the $\epsilon_t$ is normally distributed. This test measures the difference in kurtosis and skewness of a variable compared to those of the normal distribution (Jarque and Bera, 1980). In the test, the null and alternative hypothesis as follows:

- \( H_0 \): Variable is normally distributed.
- \( H_1 \): Variable is not normally distributed.

The test statistic is given by:

\[
JB = \frac{N - K}{6} \left[ S^2 \left( \frac{(K-3)^2}{4} \right) \right],
\]

where \( N \) is the number of observations, \( K \) is the number of estimated parameter, \( S \) is skewness of the variables and \( K \) is the number of kurtosis of the variables.

The null hypothesis rejected if the \( p-value \leq \text{significant} \) level or better still if \( JB > \chi^2(2) \).

### 3.12.2 Heteroscedasticity test

Heteroscedasticity is as a result of a sequence of random variables having different variances. That is \( \text{Var}[\epsilon_t | \alpha_{t-1}] \neq 0 \). It implies that during regression analysis there is non-consistent variance. The
defect is tested using the Langrange multiplier, also known as Engle’s Arch LM test (Engle, 1982).

The null and alternative hypothesis as follows:

\[ H_0 : \text{There is homoscedasticity.} \]

\[ H_1 : \text{There is heteroscedasticity.} \]

The test statistic is given by;

\[ LM_E = nR^2, \]

where \( n \) is the number of observations, and \( R^2 \) is the coefficient of determination of the augmented residual regression. The null hypothesis is rejected if the \( p \)-value \( \leq \) level of significance and conclude that the variables are heteroscedastic.

### 3.12.3 Serial Correlation Test

Serial correlation is accorded whenever there is cross-correlation of a signal (white noise) with itself. It may be caused by – non-stationarity of dependent and explanatory variables, and data manipulation (averaging, interpolation and extrapolation) among others. Ljung and Box (1978) suggested the use of Ljung-Box test to test the assumption that the errors contain no autocorrelation up to any order \( p \) The null and alternative hypothesis as follows:

\[ H_0 : \text{There is no autocorrelation up to order } p \]

\[ H_1 : \text{Autocorrelation exists up to order } p \]

The test statistic is given by;

\[ Q_{LB} = T(T + 2) \sum_{j=1}^{r} \frac{r_j^2}{T-j}, \]
where $T$ is the number of observations, $p$ is the highest order of autocorrelation for which to test, and $r_j^2$ is the $j^{th}$ autocorrelation. The null hypothesis is rejected on the evidence that the p-value \( \leq \) level of significance and we conclude that autocorrelation exists up to order $p$

### 3.13 Parameter Stability

The study employed Bahmani-Oskooee and Shin (2002) to investigate the CUSUM to the residuals of (3.7). The CUSUM test plot is updated recursively against break points in the data. For stability of the short-run dynamics and the long run parameters of the stock price function, it is important that the CUSUM statistics stay within the 5 percent critical bound (represented by a straight line whose equation is detailed in Brown et al., 1975).
CHAPTER FOUR
DATA ANALYSIS AND FINDINGS

4.1 Introduction
This chapter presents the analysis and discussion of the results obtained from the study. The data
Used for the study consist of annual stock prices of some companies listed on Ghana Stock
Exchange (GSE) and their corresponding microeconomic variables Earnings per Share (EPS),
Dividend per Share (DPS), Net Asset per Share (NAPS), Return on Equity (ROE) and Debt
Equity Ratio (DE ratio) extracted from their annual statement of account. In the first stage,
stationarity of the five variables (Price, EPS, DPS, ROE, NAPS and DE ratio) is analyzed followed
by Johansen-Juselius cointegration methodology used in determining the long and short run
dynamism between the variables. Toda and Yamamoto (1995) Causality Test was used to establish
the direction of causality between (Price and EPS, Price and DPS, Price and ROE, Price and NAPS
and Price and DE ratio). EVIEWS 7.2 was used in the analysis of Johansen – Juselius Modeling
Approach to Cointegration, and Statistical Application Software (SAS) was also used to arrive at
the various graphs on the methodology.

4.2 Preliminary test
Figure 4.2.1 shows that all the six variables under study, thus STOCK PRICE, EPS, DPS, NAPS,
ROE and DERATIO were found to be non-stationary, in other words they are integrated of order
one $I(1)$. This means their mean does not revolve around a constant and variance being unstable.
These variables are nonstationary. To confirm the presence of these results, the Augmented Dickey-
Fuller (ADF) test, Phillips - Parron (P-P) test and; Kwiatkowski Phillips Schant and Shin (KPSS) test was performed.

With the ADF test, the test statistics for some variables was greater than the corresponding critical value hence the null hypothesis of unit root (non–stationarity) is rejected at 5% significant level and thus report that those variable are stationary over the time period (December 1997 – December 2013). The KPSS test ensures a cross check in the order of integration of these variables. In other words, it is subjected to compliment the ADF test. Joint testing of both nulls strengthens inferences made about the stationarity or non-stationarity of the variable under study when the results of two

Figure 4.2. 1:Time Series plot of the mean annual Stock Price, DPS, EPS and ROE.

With the ADF test, the test statistics for some variables was greater than the corresponding critical value hence the null hypothesis of unit root (non–stationarity) is rejected at 5% significant level and thus report that those variable are stationary over the time period (December 1997 – December 2013). The KPSS test ensures a cross check in the order of integration of these variables. In other words, it is subjected to compliment the ADF test. Joint testing of both nulls strengthens inferences made about the stationarity or non-stationarity of the variable under study when the results of two
nulls corroborate one another. The LM statistics were greater than the critical values. Another area of concern is their p-values, it was observed that these values (p-values) were greater than 0.05 therefore the null hypothesis unit root (non-stationarity) is accepted at 5% level of significant and thus conclude that the variable are non-stationary over the period December 1997 to December 2013.

Table 4.2.1: Augmented Dickey-Fuller (ADF) and Kwiatkowski – Phillips – Schmidt – Shin (KPSS) Unit Root Test of Variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model Type</th>
<th>ADF Test</th>
<th>KPSS Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Price</td>
<td>Constant</td>
<td>-4.9164</td>
<td>-2.8733</td>
</tr>
<tr>
<td></td>
<td>Constant + Trend</td>
<td>-4.9446</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-4.5593</td>
<td>-1.9423</td>
</tr>
<tr>
<td>EPD</td>
<td>Constant</td>
<td>-6.2442</td>
<td>-2.8733</td>
</tr>
<tr>
<td></td>
<td>Constant + Trend</td>
<td>-6.4476</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-2.6530</td>
<td>-1.9423</td>
</tr>
<tr>
<td>DE ratio</td>
<td>Constant</td>
<td>-2.6779</td>
<td>-2.8733</td>
</tr>
<tr>
<td></td>
<td>Constant + Trend</td>
<td>-3.0673</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-1.8451</td>
<td>-1.9423</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

Tables 4.2.1 and 4.2.2 report that, under ADF test, Price, EPS, DPS, ROE, NAPS and DEratio are all only non-stationary data series at levels. KPSS test reveals the same output about mean order of integration in each of the variable under study at levels.
Table 4.2. 2: Augmented Dickey-Fuller (ADF) and Kwiatkowski – Phillips – Schmidt – Shin (KPSS) Unit Root Test of Variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model Type</th>
<th>ADF Test</th>
<th>KPSS Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test-Stat</td>
<td>Critical Value</td>
<td>P-Value</td>
</tr>
<tr>
<td>ROE</td>
<td>Constant</td>
<td>-6.1598</td>
<td>-2.8733</td>
</tr>
<tr>
<td></td>
<td>Constant +Trend</td>
<td>-6.1731</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-3.6044</td>
<td>-1.9423</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-2.4341</td>
<td>-2.8733</td>
</tr>
<tr>
<td>NAPS</td>
<td>Constant +Trend</td>
<td>-3.2779</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-1.7509</td>
<td>-1.9423</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-3.7474</td>
<td>-2.8733</td>
</tr>
<tr>
<td>DPS</td>
<td>Constant +Trend</td>
<td>-3.9162</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-3.5069</td>
<td>-1.9423</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

Table 4.2.4 reports the confirmatory unit root analysis extracted from the two unit root tests shown in Table 4.2.1 and Table 4.2.2 respectively. It confirms that, at level, all the variables are non-stationary series data. However, the results of an inconclusive decision was not uncounted during the confirmatory analysis thus where both nulls of a stationary accepted or rejected. Hence our VER model will only add a zero (0) extra lag \( d_{\text{max}} = 0 \) to be used in the causality test.

Table 4.2. 3: Confirmatory Unit Root Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF Test</th>
<th>KPSS Test</th>
<th>Judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE</td>
<td>I (1)</td>
<td>I (0)</td>
<td>Non-Stationary (Conclusive Decision)</td>
</tr>
<tr>
<td>EPS</td>
<td>I (1)</td>
<td>I (0)</td>
<td>Non-Stationary (Conclusive Decision)</td>
</tr>
<tr>
<td>DE ratio</td>
<td>I (1)</td>
<td>I (0)</td>
<td>Non-Stationary (Conclusive Decision)</td>
</tr>
<tr>
<td>ROE</td>
<td>I (1)</td>
<td>I (0)</td>
<td>Non-Stationary (Conclusive Decision)</td>
</tr>
<tr>
<td>DPS</td>
<td>I (1)</td>
<td>I (0)</td>
<td>Non-Stationary (Conclusive Decision)</td>
</tr>
<tr>
<td>NAPS</td>
<td>I (1)</td>
<td>I (0)</td>
<td>Non-Stationary (Conclusive Decision)</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data
To proceed further analysis, all our variables such as STOCK PRICE, EPS DPS, ROE, NAPS and DE ratio must be made stationary (Asymptotic). This can be done by transformation such as taking natural logarithms, taking square roots, and ordinary differencing among others. The study employs ordinary differencing for this purpose. Figure 4.1.3 shows a pictorial view of the first differenced data indicating that both mean and variance of the first difference of PRICE(d(PRICE)), DPS(d(DPS)), EPS(d(EPS)), ROE(d(ROE)), NAPS (d (NAPS)) and DE ratio (d (DE ratio) revolves around a constant value over time.

Figure 4.2. 2A: Time Series plot of the mean annual SPI, EPS, DPS, ROE, NAPS and Deratio and their first difference on GSE (1997 – 2013)
Figure 4.2. 3B: Time Series plot of the mean annual SPI, EPS, DPS, ROE, NAPS and Deratio and their first difference on GSE (1997 – 2013)
Table 4.2. 4: Augmented Dickey-Fuller (ADF) and Kwiatkowski – Phillips – Schmidt – Shin (KPSS) Unit Root Test of Variables after first difference

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model Type</th>
<th>ADF Test</th>
<th>KPSS Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Test-Stat</td>
<td>Critical Value</td>
</tr>
<tr>
<td>Stock Price</td>
<td>Constant</td>
<td>-4.9164</td>
<td>-2.8733</td>
</tr>
<tr>
<td></td>
<td>Constant +Trend</td>
<td>-4.9446</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-4.5593</td>
<td>-1.9423</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-6.2442</td>
<td>-2.8733</td>
</tr>
<tr>
<td>EPD</td>
<td>Constant +Trend</td>
<td>-6.4476</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-2.6530</td>
<td>-1.9423</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-2.6779</td>
<td>-2.8733</td>
</tr>
<tr>
<td>DE ratio</td>
<td>Constant +Trend</td>
<td>-3.0673</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-1.8451</td>
<td>-1.9423</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-6.1598</td>
<td>-2.8733</td>
</tr>
<tr>
<td>ROE</td>
<td>Constant +Trend</td>
<td>-6.1731</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-3.6044</td>
<td>-1.9423</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-2.4341</td>
<td>-2.8733</td>
</tr>
<tr>
<td>NAPS</td>
<td>Constant +Trend</td>
<td>-3.2779</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-1.7509</td>
<td>-1.9423</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-3.7474</td>
<td>-2.8733</td>
</tr>
<tr>
<td>DPS</td>
<td>Constant +Trend</td>
<td>-3.9162</td>
<td>-3.4285</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-3.5069</td>
<td>-1.9423</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

The ADF and KPSS test values in Table 4.1.3 confirm that these variable becomes stationary after first difference, since their test statistics are greater than their critical values at 5% level of significant in the ADF test environment. The KPSS test environment also has the same conclusion. We conclude in this regard that all the variables are integrated of order one I (1).

Another and perhaps very important phenomenon governing Johansen- Julius cointegration test is that, all the variables must be integrated of same order before the analysis could be carried out. This means that, all the variable must be stationary at level thus I(0) or stationary after first
difference thus I(1). The ADF and KPSS unit root test performed earlier clearly shown that the variables are integrated of same order thus I(1).

4.3 Lag Length Selection by Information Criteria

According to our ADF and KPSS, unit root test all out six (6) variables are integrated of same order, thus I(1) at first difference. In this case, we set up a VAR model using all six (6) endogenous variables thus Price, EPS, DPS and ROE and the optimum lag length selected based on VAR lag order selection criterion. Table 4.3.1 suggests that the optimal lag length is four (4) based on Akaike information criterion (AIC), Final Prediction Error (FPE) and Sequential Modified LR test statistics (LR). On the other hand, Hannan – Quinn information criterion (HQ) and Schwarz information Criterion (SC) present an optimal lag length of seven (7) and one (1) correspondingly. In theory moreover, the optimal lag length selected must be justified and also checked whether or not if there is autocorrelation problem among the endogenous variable at some significant level. We used VAR residual serial correlation LM test and inverse root characteristic AR polynomial. All plots are contained within the unit circle as depicted in Figure 4.3.2. The confirmation for no serial correlation in the selected lag.

Table 4.3.1: VAR Lag Order Selection Criterion

<table>
<thead>
<tr>
<th>Lag</th>
<th>Log L</th>
<th>LK</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-8281.882</td>
<td>NA</td>
<td>4.96e+25</td>
<td>70.51814</td>
<td>70.57703</td>
<td>70.54188</td>
</tr>
<tr>
<td>1</td>
<td>-7901.866</td>
<td>743.8605</td>
<td>2.24e+24</td>
<td>67.42014</td>
<td>67.71457*</td>
<td>67.53884</td>
</tr>
<tr>
<td>2</td>
<td>-7882.255</td>
<td>37.71959</td>
<td>2.17e+24</td>
<td>67.38941</td>
<td>67.91939</td>
<td>67.60307</td>
</tr>
<tr>
<td>3</td>
<td>-7856.196</td>
<td>49.23609</td>
<td>2.00e+24</td>
<td>67.30379</td>
<td>68.06932</td>
<td>67.61242</td>
</tr>
<tr>
<td>4</td>
<td>-7824.944</td>
<td>57.98144*</td>
<td>1.75e+24*</td>
<td>67.17399*</td>
<td>68.17507</td>
<td>67.57758</td>
</tr>
<tr>
<td>5</td>
<td>-7800.286</td>
<td>44.90978</td>
<td>1.63e+24</td>
<td>67.10031</td>
<td>68.33692</td>
<td>67.59885</td>
</tr>
<tr>
<td>6</td>
<td>-7711.227</td>
<td>159.1698</td>
<td>8.77e+23</td>
<td>66.47852</td>
<td>67.95069</td>
<td>67.07203</td>
</tr>
<tr>
<td>7</td>
<td>-7680.426</td>
<td>53.99896</td>
<td>7.74e+23</td>
<td>66.35256</td>
<td>68.06027</td>
<td>67.04103*</td>
</tr>
<tr>
<td>8</td>
<td>-7658.676</td>
<td>37.39132</td>
<td>7.39e+23</td>
<td>66.30363</td>
<td>68.24688</td>
<td>67.08706</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data
Table 4.3.2: VAR Residual Serial Correlation LM Test

<table>
<thead>
<tr>
<th>Lags</th>
<th>LM-Stat</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>36.76970</td>
<td>0.0023</td>
</tr>
<tr>
<td>2</td>
<td>28.52406</td>
<td>0.0274</td>
</tr>
<tr>
<td>3</td>
<td>76.60555</td>
<td>0.0000</td>
</tr>
<tr>
<td>4</td>
<td>13.60263</td>
<td>0.3283</td>
</tr>
<tr>
<td>5</td>
<td>78.39798</td>
<td>0.0000</td>
</tr>
<tr>
<td>6</td>
<td>91.45653</td>
<td>0.0000</td>
</tr>
<tr>
<td>7</td>
<td>18.45869</td>
<td>0.2977</td>
</tr>
<tr>
<td>8</td>
<td>34.55972</td>
<td>0.0046</td>
</tr>
<tr>
<td>9</td>
<td>34.14368</td>
<td>0.0052</td>
</tr>
<tr>
<td>10</td>
<td>28.79914</td>
<td>0.0253</td>
</tr>
<tr>
<td>11</td>
<td>25.35120</td>
<td>0.0639</td>
</tr>
<tr>
<td>12</td>
<td>18.19725</td>
<td>0.3125</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

Figure 4.3.1 Inverse Root of AR characteristic polynomial.

Source: Computations based on researchers own calculation from field data

Table 4.2.3 shows the VAR residual serial correlation LM test. The LM statistic is 13.6026, which is the lowest with a probability of 0.3283 from a chi-square distribution with 16 degree of freedom.
The null hypothesis on serial correlation is rejected, indicating that the VAR with lag order 4 is dynamically stable.

Figure 4.3.1 depicts Inverse Root of AR characteristic polynomial. All plots are contained within the unit circle which is confirmation that there is no serial correlation in the selected lag.

### 4.4 Johansen-Juselius Cointegration Test

The test based on the optimal lag length of four (4) selected during the lag selection criterion. Tables 4.4.1 and Table 4.4.2 show the empirical findings from the application of Johansen – Juselius test of Cointegration among the variables Price, EPS, DPS and ROE which are of same other. In both tables, the maximum eigenvalue and trace test reject the null hypothesis of no Cointegration at 5% significant level based on the critical value estimates and their corresponding probabilities.

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigen Value</th>
<th>Trace Statistics</th>
<th>5% Critical value</th>
<th>P - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.21045</td>
<td>196.3661</td>
<td>95.75366</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1*</td>
<td>0.19580</td>
<td>174.3718</td>
<td>69.81889</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 2*</td>
<td>0.158395</td>
<td>113.2793</td>
<td>47.85613</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 3*</td>
<td>0.135603</td>
<td>72.92724</td>
<td>29.79707</td>
<td>0.0007</td>
</tr>
<tr>
<td>At most 4</td>
<td>0.084293</td>
<td>14.82799</td>
<td>15.49471</td>
<td>0.0752</td>
</tr>
<tr>
<td>At most 5</td>
<td>0.074918</td>
<td>1.02218</td>
<td>3.84146</td>
<td>0.9115</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

In other words, comparing the trace statistics and the maximum Eigen statistics with the critical value in both tables, we have the both critical values of 15.49% and 14.26% greater than their corresponding statistics at 5% significant level respectively. These results pinpoint the fact that there exist four (4) cointegrating vector among the variable under the unrestricted Cointegration
rank. We finally conclude that there is a long – run equilibrium relationship among Stock Price, EPS, DPS and ROE.

Table 4.4. 2: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigen Value</th>
<th>Max – Eigen Statistics</th>
<th>5% Critical value</th>
<th>P – Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.21045</td>
<td>112.41201</td>
<td>40.07757</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1*</td>
<td>0.19580</td>
<td>92.30720</td>
<td>33.87687</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 2*</td>
<td>0.158395</td>
<td>44.05182</td>
<td>27.58434</td>
<td>0.0009</td>
</tr>
<tr>
<td>At most 3*</td>
<td>0.135603</td>
<td>34.09925</td>
<td>21.13162</td>
<td>0.0015</td>
</tr>
<tr>
<td>At most 4</td>
<td>0.084293</td>
<td>14.10581</td>
<td>14.26460</td>
<td>0.0483</td>
</tr>
<tr>
<td>At most 5</td>
<td>0.074918</td>
<td>1.02218</td>
<td>3.841466</td>
<td>0.0115</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

4.5 Long Run Relationship

On the basis of theoretical and empirical Literature it was expected that EPS, NAPS, DPS, ROE and DE ratio would positively impact on price. From the estimated model, NAPS, DPS, and the DE ratio conformed to both the theory and empirical results, however, EPS and ROE impacted negatively on price.

4.5.1 Dividend Per Share (DPS)

The test results indicate that DPS is statistically significant at the 1 percent level in explaining variations in stock prices. The results also show that there is a positive correlation between DPS and price of stocks. An increase in DPS by 1 unit will lead price of stocks to increase by 7.26 cedis. This position is confirmed by the literature, Bhattacharrya (1979) for example concluded that, the payment of cash dividends functions as a signal of expected cash flows of firms and thus positively influences the value of the firm.
4.5.2 Net Assets Per Share (NAPS)

The results also show NAPS to be statistically significant in explaining share prices at the 1 percent level of significance, and that the correlation between prices and NAPS is positive. This means that a 1 unit increase in NAPS for example will result in an increase in share prices by 2.15 cedis. This result is consistent with the literature in general. (See Ou and Penman 1989 Table 2, Holthausen and Lacker, 1992).

4.5.3 Earnings Per Share (EPS), Return On Equity (ROE) and Debt Equity Ratio (DEratio)

The test results show that EPS, ROE and DE ratio are statistically not significant in explaining stock prices at the 5 percent level of significance. This implies that, these variables on their own have very little explanatory power as far as prices of stock are concerned. Again the result shows that EPS and ROE have a negative correlation with price of shares. These findings seem to depart from the results of many studies (see Ball and Brown 1968; Myring, 2006; Habib, 2006), which postulate strong positive correlation. The findings are however consistent with the conclusions reached by some other studies such as Lev (1989) and Bernard and Thomas (1990). Lev (1989) for example asserts that “while earnings appear to be used by investors, the extent of its usefulness is rather limited. This is indicated by the weak and intertemporally unstable contemporaneous correlation between stock returns and earnings.
Table 4.5.3. 1:1 Estimated Long Run Coefficients

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>T- Statistics</th>
<th>P- Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>12.184</td>
<td>0.557533</td>
<td>0.0014</td>
</tr>
<tr>
<td>EPS_t</td>
<td>-0.017304</td>
<td>-0.630129</td>
<td>0.5296</td>
</tr>
<tr>
<td>NAPS_t</td>
<td>2.152918</td>
<td>9.797565</td>
<td>0.0053</td>
</tr>
<tr>
<td>DPS_t</td>
<td>7.263164</td>
<td>5.280961</td>
<td>0.0007</td>
</tr>
<tr>
<td>ROE_t</td>
<td>-2.890038</td>
<td>-0.404257</td>
<td>0.6866</td>
</tr>
<tr>
<td>DERATIO_t</td>
<td>9.31961</td>
<td>1.234246</td>
<td>0.2191</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

4.6 Vector Error Correction Model (VECM)

The Vector Error Correction Model (VECM) was used to estimate the short – run relationship between the selected microeconomic variable and stock price of companies listed on GSE. From the Cointegration test, it was revealed that we have four (4) Cointegrating equations. Table 4.6.1 reveals that the vector error correction model contains a significant Error Correction Term  ECM (-1)). The ECM (-1) is a negative value which is in conformity with theory. The stable of ECM (-1) lies on it value. The higher the coefficient the more stable the long- run relationship.
Table 4.6. 1:1 Error Correction Model (ECM) Short Run Coefficient Estimates

<table>
<thead>
<tr>
<th>Repessor's</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>T- Statistics</th>
<th>P- Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(PRICE(-1))</td>
<td>0.000141</td>
<td>0.001633</td>
<td>1.506948</td>
<td>0.1322</td>
</tr>
<tr>
<td>D(PRICE(-2))</td>
<td>-0.002157</td>
<td>0.001686</td>
<td>-0.624168</td>
<td>0.5327</td>
</tr>
<tr>
<td>D(PRICE(-3))</td>
<td>-0.002461</td>
<td>0.001683</td>
<td>-1.890164</td>
<td>0.0591</td>
</tr>
<tr>
<td>D(PRICE(-4))</td>
<td>0.001052</td>
<td>0.001642</td>
<td>0.826527</td>
<td>0.4087</td>
</tr>
<tr>
<td>D(EPS(-1))</td>
<td>-0.003182</td>
<td>0.073496</td>
<td>-1.809458</td>
<td>0.0707</td>
</tr>
<tr>
<td>D(EPS(-2))</td>
<td>0.001357</td>
<td>0.071409</td>
<td>1.809458</td>
<td>0.0594</td>
</tr>
<tr>
<td>D(EPS(-3))</td>
<td>0.132988</td>
<td>0.075343</td>
<td>0.231240</td>
<td>0.0002</td>
</tr>
<tr>
<td>D(EPS(-4))</td>
<td>-0.301333</td>
<td>0.070773</td>
<td>-0.453010</td>
<td>0.0046</td>
</tr>
<tr>
<td>D(DPS(-1))</td>
<td>0.094651</td>
<td>0.062139</td>
<td>0.231240</td>
<td>0.0002</td>
</tr>
<tr>
<td>D(DPS(-2))</td>
<td>0.232875</td>
<td>0.050922</td>
<td>0.314102</td>
<td>0.0013</td>
</tr>
<tr>
<td>D(DPS(-3))</td>
<td>-0.268120</td>
<td>0.045375</td>
<td>-0.453010</td>
<td>0.0046</td>
</tr>
<tr>
<td>D(DPS(-4))</td>
<td>-0.372450</td>
<td>0.037190</td>
<td>-0.453010</td>
<td>0.0046</td>
</tr>
<tr>
<td>D(ROE(-1))</td>
<td>0.031972</td>
<td>4.653637</td>
<td>0.128269</td>
<td>0.8980</td>
</tr>
<tr>
<td>D(ROE(-2))</td>
<td>-0.192500</td>
<td>4.252857</td>
<td>-0.453010</td>
<td>0.0046</td>
</tr>
<tr>
<td>D(ROE(-3))</td>
<td>0.596917</td>
<td>3.622551</td>
<td>0.608467</td>
<td>0.5430</td>
</tr>
<tr>
<td>D(ROE(-4))</td>
<td>-0.008303</td>
<td>0.253147</td>
<td>-1.042591</td>
<td>0.3485</td>
</tr>
<tr>
<td>D(NAPS(-1))</td>
<td>0.301261</td>
<td>0.061341</td>
<td>0.231240</td>
<td>0.0002</td>
</tr>
<tr>
<td>D(NAPS(-2))</td>
<td>-0.123843</td>
<td>0.345210</td>
<td>-0.453010</td>
<td>0.0046</td>
</tr>
<tr>
<td>D(NAPS(-3))</td>
<td>0.028741</td>
<td>0.011235</td>
<td>0.402351</td>
<td>0.0013</td>
</tr>
<tr>
<td>D(NAPS(-4))</td>
<td>0.086245</td>
<td>0.022153</td>
<td>0.16335</td>
<td>0.0025</td>
</tr>
<tr>
<td>D(DEratio(-1))</td>
<td>-0.158740</td>
<td>0.10541</td>
<td>-0.41251</td>
<td>0.1256</td>
</tr>
<tr>
<td>D(DEratio(-2))</td>
<td>-0.068121</td>
<td>0.02105</td>
<td>-0.31052</td>
<td>0.0012</td>
</tr>
<tr>
<td>D(DEratio(-3))</td>
<td>0.269842</td>
<td>0.00145</td>
<td>0.35120</td>
<td>0.0054</td>
</tr>
<tr>
<td>D(DEratio(-4))</td>
<td>-0.468110</td>
<td>0.00541</td>
<td>-0.60125</td>
<td>0.0118</td>
</tr>
<tr>
<td>ECM(-1)</td>
<td>-0.35441</td>
<td>0.007491</td>
<td>-5.015470</td>
<td>0.4308</td>
</tr>
</tbody>
</table>

R-Square = 0.727775          Durbin-Watson Stat. = 2.004991
Adjusted R-Squared = 0.679664  Mean dependent var. = 0.007521
S.E. of regression = 0.245819  S.D. dependent var. = 0.147560

Source: Computations based on researchers own calculation from field data
From table 4.6.1, the estimated coefficient of ECM(-1) is (-0.3455) at 5% significant level which concludes that, in the absence of changes within the dependent variable, the deviation of the model in the long – run equilibrium is 35% corrected in each year. The coefficient of determination ($R^2$) is 0.727775 which shows that 73% of the variation in stock price is accounted by the variation in the explanatory variables. The value of Durbin Watson statistics is 2.004991, which shows the absence of serial correlation.

4.6 Toda – Yamamoto Long – run Causality Test

Having established that there is a long – run association between Stock Price, EPS, DPS and ROE, our next objective is to determine the direction of causality between the variables. In other words how the variables response to each other contemporaneously. The Granger causality test based on Toda-Yamamoto to ascertain the long – run causal effect within the variables. The MWALD test reported in Table 4.6.1 uses lag four (4) following a chi-square distribution with (4) degrees of freedom. The test estimates shows that Divided Per Share (DPS) has a bidirectional causal relation with Stock Price (SP) 5% significant level. This is an indication that DPS and SP move together in the long – run. This position is confirmed by the literature. Bhattacharrya (1979) for example concluded that, the payment of cash dividends functions as a signal of expected cash flows of firms and thus positively influences the value of the firm. The results also reveal that there is a unidirectional causal relation running from Stock Price to NAPS at 5% significant level.
Table 4.6.2: Toda – Yamamoto Long – run Causality Test Results

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Chi – Sq.</th>
<th>P- value</th>
<th>Causality</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP does not Granger Cause DPS</td>
<td>17.7297</td>
<td>0.0004</td>
<td>SP ↔ DPS</td>
</tr>
<tr>
<td>DPS does not Granger Cause SP</td>
<td>14.4294</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>SP does not Granger Cause EPS</td>
<td>23.0891</td>
<td>0.9503</td>
<td></td>
</tr>
<tr>
<td>EPS does not Granger Cause SP</td>
<td>7.2256</td>
<td>0.2205</td>
<td>SP ↔ EPS</td>
</tr>
<tr>
<td>SP does not Granger Cause ROE</td>
<td>2.7266</td>
<td>0.0808</td>
<td></td>
</tr>
<tr>
<td>ROE does not Granger Cause SP</td>
<td>10.6799</td>
<td>0.4893</td>
<td>SP ↔ ROE</td>
</tr>
<tr>
<td>SP does not Granger Cause NAPS</td>
<td>12.1434</td>
<td>0.0049</td>
<td>SP → NAPS</td>
</tr>
<tr>
<td>NAPE does not Granger Cause SP</td>
<td>3.6240</td>
<td>0.8894</td>
<td></td>
</tr>
<tr>
<td>SP does not Granger Cause DEratio</td>
<td>32.4210</td>
<td>0.0415</td>
<td>DEratio → SP</td>
</tr>
<tr>
<td>DEratio does not Granger Cause SP</td>
<td>11.3012</td>
<td>0.0074</td>
<td></td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

This means that, passed information on the Ghanaian Stock Price can be used to predict NAPS of a stock, which is consistent with the Efficient Market Hypothesis (EMH). As depicted in Table 4.6.2 also, Return on Equity and Earnings per share of shares is insensitive to the movement of share price in the long-run as there is no causal relationship between these indicators and market prices of shares. Finally, stock price has bi-directional causality with NAPS which is an evident that lagged value of the trading volume contributes to upcoming stock prices and stock prices could be a parameter to estimate lagged trading volume.

4.7 Model Diagnostic Error Test.

Table 4.7.1 presence diagnostic test run on the residuals of the long-run equilibrium equations. The table indicates no evidence of Serial Autocorrelation; the Breusch-Godfrey probability value is 0.0524, which reports that the null hypothesis of no serial Autocorrelation is accepted. The white test for Heteroscedasticity also indicates the null hypothesis of homoscedasticity is accepted. The test for checking the model specification i.e. the Ramsey RESET for model specification also
indicates that the model has no evidence of any misspecification. It can also be deduced from the table that, the errors are normally distributed since the p–value for the Jacque bera test is greater than the significant value of 0.05.

Table 4.7. 1: Diagnostic tests of Serial Correlation, Model misspecification, heteroscedasticity

<table>
<thead>
<tr>
<th>Test</th>
<th>Statistic</th>
<th>P- Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ljung–Box Serial Correlation Test</td>
<td>5.4335</td>
<td>0.0524</td>
</tr>
<tr>
<td>Ramsey RESET Test: Model Misspecification</td>
<td>0.8932</td>
<td>0.3934</td>
</tr>
<tr>
<td>Log likelihood ratio</td>
<td>4.2156</td>
<td>0.3776</td>
</tr>
<tr>
<td>White Heteroscedasticity Test :</td>
<td>1.6322</td>
<td>0.2351</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>9.0123</td>
<td>0.1350</td>
</tr>
<tr>
<td>Normality Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jacque Bera Value</td>
<td>4.38</td>
<td>0.1407</td>
</tr>
</tbody>
</table>

Source: Computations based on researchers own calculation from field data

4.8 Parameter Stability

The Cumulative Sum (CUSUM) of plot based on the recursive residuals are given in Figure 4.8.1. The plot does not show evidence of statistically significant breaks. The graph below shows the test of stability in GSE market price changes in relation with respect to market oriented variables thus DPS, EPS, ROE, NAPS and DEratio over time. It shows that the parameters of the estimated Johasen- Juselius model are stable over the selected period and useful for policy decision.
Figure 4.8. 1: CUSUM test for stability
CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction
This section delivers a summary of all findings, conclusions and perhaps recommendations from the study based on the results obtained. To achieve the main objectives of the study, The study examines the long-run equilibrium relationship and the direction of causality between stock prices at Ghana Stock Exchange (GSE) and a set of five stock market oriented factors technically can be defined as microeconomic variables. Unit root test is performed using ADF and KPSS test. Johansen and Juselius (1990) Cointegration test was used to establish long – run relationship between stock price and microeconomic variables. In order to determine the existence of causality, Granger Causality test proposed by Toda and Yamamoto (1995), was employed to investigate the long-run equilibrium relationship as well as causal relationships between the GSE all share price index (GSI) and the five microeconomic variables (i.e.Earnings per share. Dividend per share, Return on equity, Net asset per share and Debt to equity ratio ). The study reveals Divided Per Share (DPS) has a bidirectional causal relation with Stock Price (SP). This position is confirmed by the literature. Bhattacharrya (1979). The results also reveal that there is a unidirectional causal relation running from Stock Price to NAPS, which is consistent with the Efficient Market Hypothesis (EMH). The Vector Error Correction Model (VECM) to estimate the short – run relationship between the selected microeconomic variable and stock price of companies listed on GSE. , the estimated coefficient of ECM(-1) is (-0.3455) at 5% significant level which concludes that, in the absence of changes within the dependent variable, the deviation of the model in the long – run equilibrium is 35% corrected in each year. This tool gives informed decision to investors the directional behaviour of the selected
market oriented variables to the changes in stock price of companies listed on Ghana Stock Exchange (GSE).

5.2 Conclusions

Using selected key market oriented ratios from the annual financial statements of fifteen (15) companies listed on the Ghana Stock Exchange over a period of eleven years from 1997 to 2013, this study sought to determine whether stock prices are influenced by microeconomic results (as captured by annual published financial statements) of companies listed on the Ghana Stock Exchange.

The results of the study show that stock prices are influenced by microeconomic variables. Based on the above stated findings, the following conclusions can be reached:

- The annual financial statements issued by firms listed on the Ghana Stock Exchange are used by the public to make investment decisions.
- The figures released in published financial statements of the companies listed on the Ghana Stock Exchange influence the value of the companies concerned.
- Market prices of shares of companies listed on the Ghana Stock Exchange are influenced by the performance of the listed companies as captured by the annual financial statements.
5.3 Recommendations

Following the findings of the study, the following recommendations are made:

1. The disclosure requirements of listed companies should be strengthened to ensure that full disclosure is made of corporate performance so as to provide investors with detail relevant information for investment decisions since investors use the financial statements.

2. Compliance with International Financial Reporting Standards by all listed companies should be emphasized by the Ghana Stock Exchange as well as the Securities and Exchange Commission to ensure that published financial statements represent faithfully, what they purport to represent. This is necessary to help investors make accurate decisions by placing reliance on the financial statements.

3. The Ghana Stock Exchange should strive to improve the present way of disclosing the financial reports of the listed companies. A more continuous and prompt disclosure of financial results should help investors and dealers to revise their positions more frequently and in a more informed manner. Additionally the Stock Exchange should strive to keep the quarterly published financial statements and make them available to investors and researchers for use.

4. Research should be focused on improving the information content of financial statements and ensuring accurate measurement of corporate performance so as to make the financial statements more reliable and useful.
5.4 Limitations of the Study

The main limitation of this study is difficulty of accessing data. The study originally intended to use quarterly financial statements, but this had to be abandoned due to the challenge in obtaining quarterly financial results of the listed companies. Another challenge was the short period within which the study had to be concluded.
REFERENCES


