



Ashesi University College

The Effects of Macroeconomic Factors On Stock Price Movement in Ghana

Thesis

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April 2016

Ashesi University College

The Effects of Macroeconomic Factors On Stock Price Movement in Ghana

By

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Thesis submitted to the Department of Business Administration, Ashesi University College. In partial fulfilment for the award of Bachelor of Science degree in Business Administration

April 2016

Declaration

I hereby declare that this Thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

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Date: **April 2016**

I hereby declare that the preparation and presentation of the Thesis were supervised in accordance with the guidelines on supervision of thesis laid down by Ashesi University College.

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Supervisor's Name: **Anthony Essel-Anderson**

Date: **April 2016**

Acknowledgement

First of all, I thank the almighty God for granting me grace to write this paper. My deepest gratitude goes to my supervisor, Mr. Anthony Essel-Anderson, who constantly encouraged and guided me to strive for quality and precision from the beginning of the project till the very end.

I would also like to extend my appreciation to Dr. Stephen Armah, Joseph Mensah and Eric Ocran, who all willingly offered me assistance in accurately analyzing the data for this project.

Abstract

The purpose of this study is to identify the effects that macroeconomic factors have on stock price movement in Ghana, using the Arbitrage Pricing Theory (APT) as a framework. Ordinary Least Square Regression (OLS) was employed for the study since it provides an ideal structure for the APT. The macroeconomic variables considered were inflation rate, treasury bill rate, cocoa price, crude oil prices, gold prices, Balance of Payment account (BOP), Gross Domestic Product (GDP) and exchange rate between the periods of 2006 and 2014. The data was obtained from the Bank of Ghana, the Ghana Stock Exchange and the Ghana Statistical Service. The Ghana Stock Exchange All Share Index (GSE-ASI) was used as a proxy for stock price movement in Ghana. After discovering a multicollinearity problem through the Global Validation for Linear Model Assumptions test, a backward stepwise regression was run to eliminate some of the variables (BOP, treasury bill rate, oil and gold prices) as a way of solving the multicollinearity problem. Results from the OLS regression analysis revealed that inflation rate, exchange rate and GDP possess statistically significant explanatory power over the GSE-ASI. Although cocoa prices had a positive relationship with the GSE-ASI, it was statistically insignificant in explaining stock price movement. With regards to the findings, the government should take drastic steps to reduce the depreciation of the cedi, as exchange rate significantly determines stock price movement in Ghana. Investors should buy more local stocks at the back of an improvement in inflation rate, exchange rate and GDP in Ghana.

Keywords: effects, macroeconomic factors, stock price movement

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CHAPTER 1: INTRODUCTION

Background

The topic of ‘movement in stock prices and the reasons for such movement’ is one that has dominated academic papers in recent times. It is common knowledge that diversification of a portfolio can eliminate unsystematic risk. However, systematic risk which is often determined by macroeconomic factors in a country always prevail. Financial theory suggest that some economic factors such as inflation and interest rates should systematically have an effect on stock prices in any country (Ross, Chen, & Roll, 1986). However, the economic conditions in countries differ from one another and hence the magnitude of the effect of such macroeconomic indicators on stock prices may vary across countries. To give more perspective to this discussion, macroeconomic factors and the stock market in Ghana are discussed in the subsequent paragraphs.

The Ghana Stock Exchange (GSE) is the principal stock exchange in Ghana with 42 listed company stocks (Ghana Stock Exchange, 2013). With an average market capitalization of GHS 62 billion, Ghana’s stock exchange market is relatively small as compared to that of developed markets; in terms of number of participant and instruments listed. However it has grown to become a force in the West African sub region in terms of market capitalization (Egu, 2009). A study organized by the IMF in 2006 discovered that Ghana’s stock exchange underperformed in the first 4 years of its inception but took a significant turning point in the 1990’s. In 1994, the market capitalization on the GSE grew to reach a record peak equal to 35% of the country’s GDP (Yartey, 2006).

Some of the main macroeconomic factors in Ghana such as inflation, Gross Domestic Product (GDP) and balance of payment have seen exponential changes in recent years. A report by the IMF shows that Ghana's current debt, which is over 67% of its GDP, exceeds pre-HIPC levels, thus above 60% of GDP (Joy Business, 2015). Ghana's inflation rate has seen a drastic increase of 44% (11.8% to 17%) from 2004 to 2014 as compared to a decrease of 14.5% from 1999 to 2004 (Bank of Ghana, 2004).

It is therefore no surprise that investment companies such as Databank which manages funds that invest in GSE stocks, such as the EPACK, have seen low yields over the years (Jasmine, 2013). In such an alarming situation, it is in the interest of investors to know which particular macroeconomic factors in Ghana have the strongest bearing on the GSE in order to make profitable investments.

Problem Statement

The study of 'the movement in the stock prices and macroeconomic factors' has been undertaken for a number of countries including Ghana (e.g., Adaramola, 2011; Humpe & Macmillan, 2007; Ross et al, 1986; Tagne, 2013). A study by Tweneboah and Adam (2008), revealed that inflation rate and exchange rate in Ghana had the strongest bearing on the stock prices in the short term while interest rates and inflation had the most significant effect on stock prices in the long run (Anokye & Tweneboah, 2008). However, they considered only inflation rate, exchange rate, interest rate, commodity prices (gold, oil and cocoa) and net foreign direct investments as the macroeconomic factors, leaving out other important factors such as GDP and balance of payment.

The same can be said for Douglas Akwasi Adu's research on the study of stock prices on the GSE and macroeconomic movement (Adu, 2012). Just like Adam & Tweneboah (2008), Adu (2012) did not include GDP and balance of payment in the macroeconomic factors considered. Also, the data points used by Adam & Tweneboah (2008) were from 1991 to 2006 which seem back dated.

Not including GDP and balance of payment as part of the macroeconomic factors that affect stock prices in Ghana makes the aforementioned studies very incomplete, as GDP and balance of payment are amongst the most significant macroeconomic factors in Ghana. Empirical evidence by Fama (1981, 1990 and 1991), Levin & Zervos (1996) and Tong Wei et al suggest that economic output (GDP) had a significant effect on movement of stocks, using data from over 24 countries. "Investors care about GDP reports because they provide the most comprehensive scorecard about the overall health of the economy" (Ken, 2015). A country with a fast growing GDP indicates a healthy economy, which signifies that businesses are expected to report better earnings and growth. Consequently, such anticipated higher corporate profits will entice investors to invest in stocks. Conversely, a lower GDP can have an adverse effect on stock prices.

Also, balance of payment (BOP) can affect stock market returns in the long run. A protracted deficit can have a hostile effect on the stock market. When there are more imports than exports over time, it signifies the growth in a country's debts which will hurt domestic producers and the stock market. Investors will realize the slump in domestic production and hence resort to more profitable investments abroad. Ghana's BOP account has not had a good outlook in recent times. The country has realized a cumulative BOP account deficit of 41.38 million dollars from 2006 to 2014. With a "merchandise trade deficit of US\$2,006.1 million and a current account deficit

of US\$2,808.2 million, and it was only hefty capital account inflows...that enabled the country to keep its overall balance of payments deficit to a manageable US\$105.8 million” in 2015 (citifmonline.com, 2016).

This paper, therefore, seeks to fill the gap created by the omission of GDP and balance of payment as part of the macroeconomic factors to consider, as well as the use of outdated data points in the research.

Theoretical framework

The Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) are currently the two main theories that provide an elaborate framework for determining the trade off between risk and return, and inherently, movement in stock prices.

CAPM

CAPM was developed by William F. Sharpe in 1964. The theory acknowledges that there are a number of firm specific risks that can influence the return on stocks (Sharpe, 1964). However, these firm specific risks can be completely eliminated through diversification, leaving only market risk as the only non-diversifiable risk. According to CAPM, the return on a stock should have a direct relationship with a set of indexes as shown below:

$$R_a = r_f + \beta_a (R_m - r_f)$$

Where:

R_a = Return on asset

r_f = Risk free rate

β_a = Beta of asset

R_m = Return on market

This is based on the assumptions that treasury bill rates are risk free and that investors can borrow at the risk free rate (Sharpe, 1964). This model offers a simple way to calculate returns on a stock in relation to the prevailing market risk.

APT

APT was developed by Stephen Ross in 1973. Consistent with CAPM, APT acknowledges that firm specific risk can be fully diversified away, leaving only non-diversifiable risks. However, APT considers multi factors in determining the return on a stock, unlike CAPM that only considers market risk (Ross S. A., 1976). APT assumes that each stock depends partially on prevalent macroeconomic factors (Ross S. A., 1976). The return on a stock should, therefore, follow the relationship below:

$$R_a = a + \beta_1 (r_{\text{factor1}}) + \beta_2 (r_{\text{factor2}}) + \beta_3 (r_{\text{factor3}}) + \dots + \text{noise}$$

Where:

R_a = Return on asset

a = Risk free rate

β = Beta of specific risk factor

r = Premium on specific risk factor

noise = Firm specific risk (will be eliminated by diversification)

APT is subsequently a generalized form of CAPM. In line with this study, APT allows investors to know which macroeconomic factors have the strongest bearing on a particular stock return.

Objectives

The following are the objectives of the study:

- 1) To identify the relationship, if any, between macroeconomic factors (GDP, inflation, exchange rates, commodity prices: gold cocoa oil, balance of payment accounts and interest rates) and the stock price movement in Ghana
- 2) To propose to investors, the predominant macroeconomic factors that they should consider when investing in stocks on the GSE.

Hypothesis of the Study

The prior discussion indicates that the two main groups of risks that affect stock price movement are systematic risks and unsystematic risks (firm specific risk). However, a proper diversification of one's portfolio can completely eliminate firm specific risk. Once firm specific risks are eliminated, systematic risks (e.g., inflation, exchange rate and world commodity prices) remain the only risk factors that affect stock price movement in a portfolio. The extent to which these systematic risk factors affect stock prices varies from country to country due to differences in the stock markets and the economies. This argument leads to the following hypotheses;

H_0 : Macroeconomic factors including GDP and BOP, do not have a significant influence on stock price movement in Ghana.

H_1 : Macroeconomic factors including GDP and BOP, have a significant influence on stock price movement in Ghana.

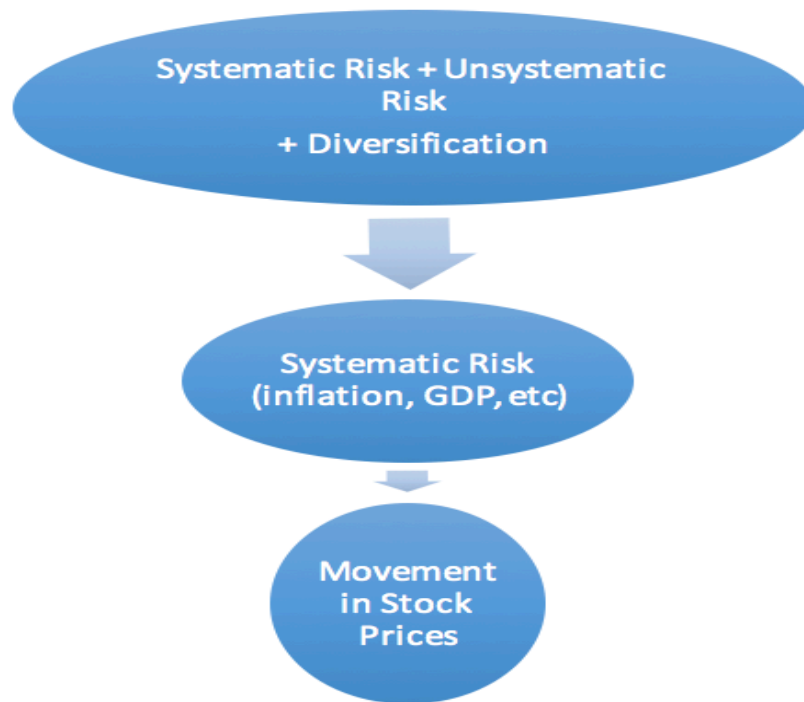
Mathematically,

$$H: (\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8) = 0$$

$$H_1: (\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8) \neq 0$$

Cognitive Map

In unison with existing theory, while both systematic and unsystematic risks lead to movement in stock prices, diversification is able to eliminate unsystematic risk. Hence, making systematic risk the only determinant of stock price movement on the market. This paper therefore seeks to establish the main systematic risks that affect stock prices in Ghana.



Justification of Study

In the wake of the unstable macroeconomic outlook in Ghana, investors are more eager to find sustainable ways of optimally investing in stocks in Ghana, hence, the reason for this study.

This study contributes to existing literature in two main areas. Firstly, the study identifies the main macroeconomic factors that affect stock movement in Ghana, taking into consideration GDP and BOP which were not included in the previous studies. The study seeks to provide a more current and reliable finding to investors using more recent data points (2006 - 2014) especially considering the recent drastic changes in the Ghanaian macro outlook. These findings would, thus,

empower investors to make more informed decisions as to how to invest in equities in Ghana, considering the prevailing macroeconomic position.

Scope of the Study

The research focuses on the GSE-ASI and some macroeconomic factors between the period of 2006 and 2014. The data period was chosen to give a more current and objective finding since Ghana's macro outlook experienced a significant change during that period. The macroeconomic factors to be considered are inflation rate, interest rate, GDP, BOP, commodity prices (gold, oil and cocoa) and exchange rate. The factors considered cover all the significant macroeconomic factors in Ghana based on empirical review by Ross et al (1986) & Adu (2012), and hence it is hoped that the research will provide a true and accurate results.

The scope might create a potential limitation. There may be some macroeconomic factors that have the power to influence stocks in Ghana, but may not have been captured as part of the factors to be considered in this study. This may be due to the fact that the macroeconomic factors chosen for this study are based on empirical review and suggestions.

Methodology

This study is an explanatory research because it seeks to determine the effects of macroeconomic factors on stock prices in Ghana. In this research, the stock price index (GSE) is considered as the dependent variable while the macroeconomic

variables consisting of inflation rate, interest rate, exchange rate, commodity prices (Gold, Oil, Cocoa), GDP and BOP are the predictor or independent variables. This study considers quarterly data of all the aforementioned variables over the period of 2006 to 2014.

Quarterly data of the factors under consideration (selected macroeconomic factors and stock prices between 2006 & 2014) were collected from secondary sources such as the GSE website, and the Bank of Ghana website. The quantitative data were analyzed based on a multivariate regression model to identify the relationship that exists between macroeconomic factors and stock price movement.

Outline of Dissertation

The rest of this report is organized as follows: Chapter 2 presents the literature review where related works and theories will be discussed. Chapter 3 presents the methodology used in the research. Chapter 4 analyzes and discusses the data collected. Chapter 5 highlights the key findings and provide relevant recommendations.

CHAPTER 2: LITERATURE REVIEW

Introduction

Pricing of stocks is mainly based on the risk of the portfolio and the expected return to the portfolio. This is based on the assumption that investors are rational and that they maintain portfolios that maximize returns at a given level of risk or minimize risk for a given portfolio return. Considering the fact that diversification eliminates firm specific risk, macroeconomic risks or systematic risk becomes the only significant influence on the expected returns on stocks. To understand the movement of stocks, there is a need to review the way stocks are priced to serve as a framework for the study.

There are a number of different financial asset pricing theories which give an explanatory foundation for the differences in the value of assets at a given risk level. However, CAPM and APT are the main theories that provide a rigorous groundwork for calculating the trade-off between risk and return, and consequently, the pricing of assets (Ross, Burmeister, & Roll, 1998) . This chapter, therefore, reviews the theoretical framework for pricing assets as well as reviews existing literature on the influence of macroeconomic factors on stock price movements.

Capital Asset Pricing Model (CAPM)

CAPM was developed by William Sharpe in 1964. William Sharpe wrote that “Through diversification, some of the risk inherent in an asset can be avoided so that its total risk is obviously not the relevant influence on its price...” (Sharpe, 1964). He

further explained that once firm specific risk is eliminated through diversification, the diversifiable risk which affects the return to a stock is the market risk. The CAPM was built on a model portfolio which was developed by Markowitz (1959).

Markowitz model is based on the assumption that investors are risk averse and that they are more concerned about the mean and variance of their investment return when choosing a portfolio (Markowitz, 1959). This therefore implies that investors will choose a portfolio that will minimize their risk at a given level of return or they will maximize return at a given level of risk. The CAPM formula is given as:

$$R_a = r_f + \beta_a (R_m - r_f)$$

Where:

R_a = Return on asset

r_f = Risk free rate

β_a = Beta of asset

R_m = Return on market

CAPM provides a very simple and intuitive way of measuring return and its relationship with risk, although empirical evidence based on this model is very poor (Fama & French, 2004).

In developing CAPM, William Sharpe based the model on two main assumptions:

1. Investors can borrow and lend at a common pure interest rate (Sharpe, 1964)
2. There is “homogeneity of investor expectations: investors are assumed to agree on the prospects of various investment” (Sharpe, 1964)

The aforementioned assumptions put investors on an equal pedestal, with the only difference being the amount of money they invest and the level of risk they are willing to take.

Empirical studies on CAPM have proven that the model is flawed in a number of ways. A notable flaw is that the relationship between beta and average return is flatter than what CAPM predicts (Fama & French, 2004). As a result, “CAPM estimates of the cost of equity for high beta stocks are too high (relative to historical average returns) and estimates for low beta stocks are too low” (Fama & French, 2004). CAPM also infers that market risk is the only non diversifiable risk that affects stock returns. However, research has shown that there are other macroeconomic factors that have strong influences on stock return such as inflation and interest rates (Ross, Chen, & Roll, 1986).

Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Theory was developed by Stephen Ross in 1973. The APT was developed as an alternative to the CAPM developed by William Sharpe (Ross S. A., 1976). Although the APT also acknowledges that firm specific risk can be diversified away, it recognizes that there are multi factors that serve as risks aside the market risk (Ross, Burmeister, & Roll, 1998). Hence, APT solves the limitation of CAPM as a single factor model.

One important aspect of the APT is the principle of arbitrage. It argues that in an efficient market, any two assets with similar risks and return should sell for the same price across markets and hence when there is a disparity in prices of equivalent assets, there is room for riskless profit, thus arbitrage (Ross S. , 1977). Investors will consequently buy the asset at a cheaper price and sell for a higher price in another market. This continuous arbitrage operation by investors will eventually lead to an

equilibrium of the prices of assets across markets. The Arbitrage Pricing Theory is expressed as:

$$R_a = a + \beta_1 (r_{\text{factor1}}) + \beta_2 (r_{\text{factor2}}) + \beta_3 (r_{\text{factor3}}) + \dots + \text{noise}$$

Where:

R_a = Return on asset

a = Risk free rate

β = Beta of specific risk factor

r = Premium on specific risk factor

noise = Firm specific risk (will be eliminated by diversification)

With APT being an extended multi factor form of the CAPM, it presents more advantages over the traditional CAPM in terms of the number of factors to consider and the less rigorous assumptions (Adu, 2012). Considering the fact that most African economies are very fragile and more likely to be influenced by macroeconomic factors, the APT provides an ideal framework for measuring the impact of macroeconomic factors on the stock prices in African countries (Adu, 2012).

One major shortcoming of the APT is that it does not specify the type and the number of macroeconomic factors to consider in measuring returns to an asset (Ross, Burmeister, & Roll, 1998). This, however, might be viewed as a strength since it gives room for the researcher to choose the macroeconomic factors that are peculiar to the country of study in order to present a more relevant results (Adu, 2012). Even though APT and CAPM do not offer satisfactory explanations to risks and returns on assets, the APT is by far a better explanatory model of stock returns than the CAPM since it allows room for multi factors in the analysis (Groenewold & Fraser, 1997).

The Arbitrage Pricing Theory and Individual Macroeconomic Variables

One of the empirical studies vital to the APT theory is “Economic Forces and the Stock Market” written by Stephen Ross, Nai-FU Chen and Richard Roll (1986) of Yale, Chicago and California Universities respectively. The then existing theory failed to touch on activities or factors that were most likely to affect all assets, and hence, Stephen Ross et al, sort to fill that gap (Ross, Chen, & Roll, 1986).

The study by Ross et al (1986) acknowledges that diversification of a portfolio is able to eliminate firm specific risk, and hence only general macroeconomic factors will influence the pricing of large stock market aggregates. It further proposed that any systematic variable that has a bearing on the dividends will also influence stock market returns (Ross, Chen, & Roll, 1986). After a statistical test, most of the macroeconomic factors considered seemed to have a significant influence on stock market returns. The most notable factors were industrial production, changes in risk premium and inflation (Ross, Chen, & Roll, 1986). Ross et al, concluded by saying that, stock market returns are highly exposed to macroeconomic factors and are consequently priced in harmony with such exposures.

Another school of thought proposed by Cutler, Summers and Poterba states that “share prices react to announcements about corporate control, regulatory policy, and macroeconomic conditions that plausibly affect fundamentals” (Cutler, Poterba, & Summers, 1989). Contrary to Ross et al (1986), Cutler et al (1989) believe that macroeconomic factors only account for less than 5% of the variations in stock returns based on their findings. Their results may be attributed to the fact that the macroeconomic variables considered slightly differ from that of Ross et al (1986).

Also, the method employed did not include new information about future changes in macroeconomic conditions (Cutler, Poterba, & Summers, 1989).

Empirical Evidence on ‘The Effects of Macroeconomic Factors on Stock Price Movement’ from Developed Countries

Developing on the empirical review made by Roll and Ross (1986) and Cutler et al (1989), a number of studies have been organized into the topic of ‘Macroeconomic factors and stock prices’. Most of these studies have been concentrated in the developed markets. One of these studies is by Joseph Tagne Talla who looked at the impact of macroeconomic factors on the stock market prices of the Stockholm Stock Exchange in Sweden (Talla, 2013). Tagne considered variables based on monthly data from 1993 – 2012. He employed the multivariate regression model and the Granger causality test in analyzing the data. In his findings, he discovered that inflation and currency depreciation had a negative effect on the stock prices because “additional funds flow due to inflation, increase the supply in the stock market while demand aside remains unaffected” (Talla, 2013). He also discovered that although interest rates had a negative relationship with stock prices movement, its influence was not significant in the results. Conversely, money supply had a positive correlation with stock prices but was insignificant in the findings (Talla, 2013).

Similarly, Andreas Humpe and Peter Macmillan organized a study to determine if macroeconomic variables can explain long term stock market movements using data from United States (US) and Japan (Humpe & Macmillan, 2007). They applied cointegration analysis in order to determine the long term relationship between factors such as industrial production, consumer price index, money supply,

long term interest rates and stock prices in US and Japan (Humpe & Macmillan, 2007). The findings from the study revealed that US stock prices were positively correlated with industrial production and negatively correlated with consumer price index and long term interest rates. There was an insignificant relationship between money supply and US stock movement (Humpe & Macmillan, 2007). However, Japan stock prices were positively affected by industrial production and negatively by the money supply. Unlike the US, there was a significant correlation between money supply and Japan stock prices (Humpe & Macmillan, 2007). The paper attributed the difference in the results to the slump in the Japanese economy and the consequential liquidity trap.

These findings from the different empirical evidences support the need to organize this study specific to each country as the degree of macroeconomic factors differ across countries.

Empirical Evidence on ‘The Effects of Macroeconomic Factors on Stock Price Movement’ from Developing Countries

Due to the varying nature of macroeconomic factors in developing nations as compared to the developed nations, some researchers thought it best to organize a similar research in the developing nations. One of such researchers is Anthony Olugbenu Adaramola who looked at the ‘Impact of macroeconomic indicators on stock prices in Nigeria’ (Adaramola, 2011). He considered secondary data on the stock prices of selected firms and six macroeconomic factors between 1985 and 2009 (Adaramola, 2011). The empirical findings from his study revealed that apart from inflation and money supply, all the other macroeconomic factors, thus oil price,

exchange rate, interest rate and GDP, had significant impacts on the stock prices in Nigeria (Adaramola, 2011). His choice of macroeconomic factors was mainly based on theory and peculiar economic characteristics on Nigeria. His findings were contrary to empirical evidence from developed countries which determined inflation and money supply as factors that had significant effects on the stock prices.

Adaramola also discovered that the Nigerian Stock market was highly sensitive to international oil prices as oil is a significant source of revenue for the Nigerian economy (Adaramola, 2011). He concluded his study by urging investors to consider the trends in global oil prices to aid them in making investment decisions.

In support of Ross et al (1986), Douglas Akwasi Adu examined the long term and short term effects of macroeconomic factors on stock market returns in Ghana using the APT model (Adu, 2012). The macroeconomic variables considered were money supply, rate of inflation, treasury bill rate, exchange rate, world crude oil prices, world cocoa prices and gold prices. Based on the Ordinary Least Square regression analysis, the findings revealed that only four out of the seven selected macroeconomic variables (i.e. inflation rate, treasury bill rate, money supply and world crude oil prices) had a significant power on the Ghana Stock Exchange. His findings support the claim made by Ross et al (1986) that macroeconomic variables hold a significant explanatory power for stock returns in most countries and emerging markets in general (Adu, 2012).

Similarly, Tweneboah & Adam (2008) organized a parallel study on the Ghana Stock Exchange using data from 1991 to 2006. Unlike Adu (2012), Adam & Tweneboah considered foreign direct investments, treasury bill, consumer price index and exchange rate, using Johansen's multivariate cointegration test and innovation accounting techniques (Anokye & Tweneboah, 2008). The results from the study

showed that inflation rate and exchange rates were the most important factors to consider in the short run while interest rate and inflation rate were the most significant in the long run.

Empirical Evidence Suggesting the Significant Influence of GDP and BOP on Stock Price Movement

Gross Domestic Product (GDP) and Balance of Payment (BOP) are two important indicators that signify the health of a nation. A research by Levin and Zervos (1996) on 'stock market development and long-run growth' clearly indicates the importance of economic output (GDP & BOP) in this study. Levin and Zervos (1996) considered data from forty-one (42) different countries to determine the influence of economic output on stock prices. Their research discovered that economic output had a strong relationship with markets that were very liquid. "... without liquid markets or other financial arrangements that promote liquidity, less investment may occur in the high-return projects" (Zervos, 1996). Other findings by researchers such as Fama (1981, 1990 & 1991), Leigh (1997), Gjerd & Seatterm (1999) and Tong et al, all support the claim that economic output and growth do influence stock price movement.

However, other studies by researchers such as Taylor et al (1991) and Filler (2000) found out that economic growth did not have a significant relationship with stock prices. This may be due to the difference in the countries studied as well the varying nature of the economies of such nations.

Conclusion

In a nut shell, empirical evidences have shown that Arbitrage Pricing Theory is a better and a more convenient explanatory model than the CAPM for determining the factors that affect stock pricing, since the model considers other significant factor aside market risk. Also, most empirical studies surrounding the relationship between macroeconomic factors and stock prices have indicated varying results and findings, clearly underpinning the need to organize this study for each country in order to determine the most relevant and significant macroeconomic factors that influence stock pricing specific to that country.

CHAPTER 3: METHODOLOGY

Introduction

The purpose for this study is to identify the relationship between macroeconomic variables and stock market movement in Ghana. This chapter describes the research method, data collection and analysis procedure as well as limitations to the research. This chapter is important in scientific research as it lays down the procedure for the study in order to give other researchers the ability to understand the findings as well as replicate it, if needed.

Research Design

To begin with, this research is a quantitative research as it involves a systematic empirical inquiry into how macroeconomic factors affect stock price movement in Ghana, using mathematical and computational techniques. The use of statistical data and mathematical techniques is essential because it is hoped that the findings yield an unbiased result that can be extrapolated to some extent. Hence, the process of measurement of the macroeconomic factors and the stock price movement is vital since it provides the fundamental connection between the two variables.

This research can be categorized under explanatory research because it seeks to find the effects of macroeconomic factors on stock price movement in Ghana. As an explanatory research, this study is further intended to identify the effect as well as the interaction between the independent variables and the dependent variable, thus macroeconomic factors and stock price movement respectively.

Hypothesis

This paper seeks to fill in the gap evident in the research by Tweneboah & Adam (2008) and Adu (2012). Empirical studies by renowned researchers such as Fama (1981, 1990 and 1991) and Levin & Zervos (1996) have proved that economic growth or output has a significant influence on stock price movement, using data from forty-one different countries. However, studies by Tweneboah & Adam (2008) and Adu (2012) did not include GDP and BOP as part of the macroeconomic factors to be considered. As a result, a hypothesis is tested to establish whether the inclusion of GDP and BOP as part of the macroeconomic factors to be considered, do indeed have a significant influence on stock price movement.

This is generally based on the argument that proper diversification is able to wholly eradicate firm specific risks in a given portfolio. Hence, a well diversified portfolio is only exposed to systematic risk factors such as inflation rate, exchange rate, treasury bill rate, BOP and GDP. Nevertheless, the degree to which these individual systematic factors influence stock prices varies across countries due to disparities in the stock markets and the economies. The hypotheses, therefore, is defined as:

H₀: Macroeconomic factors including GDP and BOP, do not have a significant influence on stock price movement in Ghana.

H₁: Macroeconomic factors including GDP and BOP, have a significant influence on stock price movement in Ghana.

Mathematically,

$$H_0: (\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8) = 0$$

$$H_1: (\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8) \neq 0$$

Data & Data Collection Method

The nature of the data that is used for this study are mostly secondary, as they were obtained from secondary sources. For consistency and a more credible result, quarterly data was collected to provide enough data points over the stipulated period. The quarterly data on macroeconomic factors collected include Inflation rate, interest rate, world gold prices, world cocoa prices, world oil prices, Gross Domestic Product (GDP), Balance of Payment (BOP) and the USDGH exchange rate. The data on inflation rate, USDGH exchange rate, GDP, BOP and interest rate was collected from Bank of Ghana and Ghana Statistical Service. The world crude oil prices and the world cocoa prices was collected from the World Bank Indicators website. Finally, the data on the GSE-All Share Index was obtained from the Ghana Stock Exchange. The monthly data collected cover the period between 2006 and 2014. This data period was chosen to provide a more recent and relatable finding.

The Model

The methodology for this research is generally based on the Arbitrage Pricing Theory (APT) as described in the literature review. The APT was developed by Stephen Ross in 1973 as an alternative to the Capital Asset Pricing Model (Ross S. A., 1976). The APT recognizes that there are multi variables that potentially influence the return on a stock aside the market risk. The APT equation is given as:

$$R_a = a + \beta_1 (r_{\text{factor1}}) + \beta_2 (r_{\text{factor2}}) + \beta_3 (r_{\text{factor3}}) + \dots + \text{noise}$$

Where:

R_a = Return on asset

a = Risk free rate

β = Beta of specific risk factor

r = Premium on specific risk factor

noise = Firm specific risk (will be eliminated by diversification)

The equilibrium model of the APT was used as it requires the arbitrary choice of a range of macroeconomic variables that empirically have the most effect on stocks as proposed by Ross, Chen and Chan (1986). This is also referred to as Macroeconomic APT Model (Ross, Chen, & Roll, 1986). This model is ideal for this study because it assumes a linear relationship between stock movement and macroeconomic variables as shown above.

Data Analysis Tools

Ordinary Least Square Regression

Based on similar empirical studies into the relationship between macroeconomic variables and stock price movement, the Ordinary Least Square Regression(OLS) was used for this study. Groenewold & Fraser (1997) and Douglas Akwasi Adu (2012), just like most researchers of this topic, applied the OLS in their data analysis because the tool provides an ideal framework for examining the relationship between a continuous response variable (Y) and a continuous explanatory variable(X) (Hutcheson, 2011). The tool uses an equation of the line of best fit which links the X variables to the Y variables. The OLS regression with multiple explanatory variables can be equated to the APT equation, thus:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2$$

where:

α = Y intercept

β = Slope of the line

Y = Stock price movement

X = The various macroeconomic variables

Using Stata and R Studio, an OLS regression of quarterly data of the chosen macroeconomic factors was ran in line with the APT as the broader framework. The regression was run against the GSE-All Share Index which serves as the proxy for stock price movement in Ghana. The OLS multiple regression is based on five assumptions (5) commonly known as the Gauss-Markov assumptions (Wooldridge, 2009). These assumptions are:

- i. MLR. 1: The model should be linear in the parameters thus,

$$Y = B_0 + B_1 x_1 + B_2 x_2 + \dots + u$$

- ii. MLR.2: Random Sampling- There is a random sampling of n observations
- iii. MLR.3: No perfect colinearity- In the sample, none of the independent variables is constant and there is no exact linear relationship among the independent variables.
- iv. MLR.4: Zero conditional Mean- The error u has an expected value of zero given any values of the independent variables.

$$E(u|x_1, \dots, x_k) = 0$$

- v. MLR.5: Homoscedasticity: The error u has the same variance given any values of the explanatory variables.

$$\text{Var}(u|x_1, \dots, x_k) = \sigma^2$$

Where:

MLR = Multiple Linear Regression assumption

These assumptions were verified or tested before the OLS regression was run. All the assumptions need to be present in order to validate the accuracy of the OLS regression. The tool that was used to test for the assumptions is the Global Validation of Linear Model Assumptions. This test was developed by Pena and Slate (2006). It provides an ideal avenue to test for the linear assumptions as well as calculate for skewness and kurtosis (Kabacoff, 2011).

Stepwise Regression

In case one of the Gauss-Markov assumptions for linear regression is violated, the backward stepwise regression is used to develop an improved model for the OLS regression. The backward stepwise selection works by continually removing one variable after the other in order to result in a model that is ideal for the regression and meets the assumptions for OLS (Wooldridge, 2009). This is a good tool for solving the problem of perfect correlation or multicollinearity which is often associated with time series data such as in this research.

Operational Selection and Definition of Variables

This study seeks to identify the relationship between macroeconomic factors and stock price movement in Ghana. Hence, eight (8) macroeconomic factors have

instinctively been chosen as the most likely factors to have significant explanatory power on stock movement on the Ghana Stock Exchange. The basis of these choices is highly line with previous studies on this topic such as Adu, 2012; Chen et al., 1986; Porteba, 1989; Roll and Ross, 1980; Tweneboah & Adam, 2008; Talla, 2013; whose works have shown that these variables have a strong bearing on the stock movement across nations. Also, the choice of some of these variables is related to their peculiar association with the Ghanaian economy. The chosen factors are described below:

Inflation rate

Inflation measures the rise in price of goods and services. Hence, a higher inflation rate reduces the purchasing power of each unit of currency. In line with most existing theory such as that of Adu (2012) and Chen et al. (1986), inflation has a negative correlation with stock movement. Tweneboah & Adam concluded that inflation rate has a significant influence on stock price movement in Ghana, both in the short term and the long term (Anokye & Tweneboah , 2008). On the contrary, Adaramola recorded that inflation did not have a significant impact on the stock prices in Nigeria (Adaramola, 2011).

Gross Domestic Product (GDP)

Gross Domestic Product measures the final value of all goods and services produced in a country within a given period of time. Most investors care about the GDP of a country because it is an indicator of the general health of the country. When GDP data is good, it further increases the performance of the stock market in that country over the long term (Ken, 2015). A study by Levin and Zeros (1996) as well as

Fama and French (1981) showed that output growth rate or GDP growth rate had a significant correlation with stock movement. On the contrary, a study by Bashira (2011) on Iran and Armenia showed that GDP did not have a significant relationship with the stock market in those countries.

Balance of Payment (BOP)

The balance of payment is a way through which countries measure their transactions with international countries over a period of time. A BOP deficit tends to increase the country's debt and hence, affects production in the country. Investors will generally tend to invest elsewhere when they realize domestic production has fallen. Ghana has recently reported an alarming current debt of over 67% of its GDP (Joy Business, 2015).

USDGH Exchange Rate

The US dollar is the most traded currency in Ghana, hence its inclusion in the macroeconomic variables in this study. The dollar to cedi exchange rate is very important as it determines the cost of imports and exports as well as other foreign transactions in the country. It is therefore expected that the exchange rate will have a negative relationship with the stock price movement in Ghana. Existing literature shows that foreign exchange rate has a strong correlation with stock price movement in Ghana (Adaramola, 2011; Tweneboah & Adam, 2008). On the contrary, Adu (2012) expressed that foreign exchange rate does not have a significant effect on stock price movement in Ghana.

Interest rates

Interest rates in a country tend to influence domestic economic activities. In that, low interest rates encourage capital expenditures by individuals and businesses because their cost of borrowing will be low. These expenditures often improve the economy in a country through increased employment, increased production and trade. It is therefore expected that; interest rates will have a negative correlation with stock market movement in Ghana. The 91-day Treasury Bill will be used as a proxy for the interest rates in Ghana since Treasury Bill serves as the opportunity cost of holding shares (Adu, 2012). Existing literature by Adu (2012) and Adaramola (2011) supported the findings that interest rates do have a strong influence on stock price movement.

World Crude Oil Prices

Although Ghana produces oil to some extent, the country imports most of the crude oil used domestically. It is therefore important to include crude oil prices in this study as the world crude oil prices affect industrial production, and hence, corporate profitability. Crude oil prices have tumbled in recent months to a significant low of about \$40 per barrel due to over supply and the continuous pumping of oil onto the world market (Hsu, 2015). This has been good for oil importing countries since the cost of importing is lower than before. It is therefore expected that crude oil prices will have a negative correlation with stock price movement in Ghana. Studies by Adu (2012), Adaramola (2011) and Chen et al. (1985) revealed that crude oil prices have a significant influence on stock price movement.

World Cocoa and Gold Prices

Ghana is a major exporter of gold and cocoa. The export of these products contribute significantly to the foreign exchange earnings in Ghana. Changes in cocoa and gold prices affect business activity and profitability in Ghana and hence it is expected that the price of these commodities will have positive correlation with stock prices in Ghana. Existing literature by Adu (2012) reveals that world gold and cocoa prices do not have a significant influence on stock price movement in Ghana.

Limitations

One major limitation with the methodology is that, the tool for analysis (OLS) simplifies the relationship between the dependent and the independent variables into a linear equation. This may not always be so as the relationship between the variables may be more complicated and may not be fully explained by a linear relationship given by the OLS. Secondly, the OLS may lead to poor predictions if the chosen dependent variables are significantly correlated. Thirdly, only eight macroeconomic factors are considered in this study although there may be other variables that may affect the stock price movement in Ghana.

However, existing literature shows that the OLS, regardless of its flaws, is ideal for this kind of study as it provides the ideal framework for examining the stipulated variables. Also, the chosen macroeconomic variables are adequate and are the most significant for this study based on empirical studies and suggestions by Chen et al. (1986) and Ross (1976).

CHAPTER 4: FINDINGS & DISCUSSIONS

Introduction

The purpose of this chapter is to present the analysis of the variables in focus and provide the necessary interpretations of the various empirical tests.

Results of Descriptive Statistics

Table 1

Summary of Statistics of Variables

Variable	Obs	Mean	Std.Dev.	Min	Max
GSE-ASI	36	4296.369	3007.581	974.53	10890.8
WCocoaP	36	2575.796	542.6955	1545.06	3497.63
WGoldP	36	1152.486	370.4343	558	1768.96
USDGHS	36	1.576944	0.6347005	0.91	3.2
INF-YOY	36	12.64528	3.730404	8.4	20.7
TBR-91Day	36	17.15306	6.583559	9.41	27.8
CrudeOil(Brent)	36	89.46861	23.39425	41.58	133.05
BOP	36	-1.149447	609.3695	-1256.5	1363.84
GDP	36	7868.134	2529.718	4463.39	12271.18

Source: Author's estimates from Stata

Descriptive analysis was run on the eight macroeconomic variables and the GSE-All Share Index, as shown in the table above. Quarterly data was collected on the various variables between the periods of 2006 and 2014. From the results, it was realized that GDP (in millions of dollars) had the highest mean of 7868.134 with a maximum value of 12271.18 and a minimum value of 4463.39. Balance of payment (BOP) had the lowest mean of -1.149447 with a maximum value of 1363.84 and a minimum value of -1256.5. The negative mean for the Balance of Payment indicates that Ghana's imports have significantly been higher than its exports. Inflation rate

stood at an average of 12.64528% over the period while treasury bill rates stood at 17.15306% over the period. For the commodities; world cocoa, gold and crude oil prices recorded average prices of 2575.796, 1152.486 and 89.46861 US Dollars respectively whereas the USDGHS exchange rate stood at an average of 1.576944 over the period in focus.

Taking a look at the standard deviations, the USDGHS exchange rate had the lowest standard deviation of 0.6347005 and the GSE All share Index had the highest standard deviation of 3007.581.

The Econometric Model

The Econometric model for running the Ordinary Least Square regression is given by:

$$\text{GSE-ASI} = \beta_0 + \beta_1 \text{WCocoaP} + \beta_2 \text{WGoldP} + \beta_3 \text{USDGHS} + \beta_4 \text{INF-YOY} + \beta_5 \text{TBR-91day} + \beta_6 \text{CrudeOil(Brent)} + \beta_7 \text{BOP} + \beta_8 \text{GDP} + \mu \dots \dots \dots \text{equation 4.1}$$

Where:

GSE-ASI = The Ghana Stock Exchange All Share Index prices

β_0 = Constant or intercept

WCocoaP = World Cocoa Prices (US Dollars per Tonne)

WGoldP = World Gold Prices (US Dollars per Ounce)

USDGHS = Exchange rate for the cedi against the US dollar

INF-YOY = Year on Year inflation rate for Ghana

TBR-91day = 91-Day Treasury Bill Rate in Ghana

CrudeOil(Brent) = World Brent Crude Oil prices (US Dollars per barrel)

BOP = Balance of Payment for Ghana (in millions of US dollars)

GDP = Gross Domestic Product for Ghana (in millions of US Dollars)

μ = unobservable variables/ error term

Test for the OLS Assumptions

Before using the OLS for estimating the parameters in the econometric model above, there was a need to satisfy the five Gauss-Markov assumption for multiple linear regressions. These assumptions are stated below:

MLR.1: The model should be linear in the parameters

MLR.2: The observations used should follow a random sampling

MLR.3: Absence of a perfect colinearity

MLR.4: There should be a zero conditional mean

MLR.5: Homoscedasticity

Where:

MLR = Multiple Linear Regression assumption

The Global Validation of Linear Model Assumptions, written by Pena and Slate (2006), was used to test for the presence of the OLS assumptions as shown in the table below:

Table 2

Global Validation of Linear Model Assumptions

ASSESSMENT OF THE LINEAR MODEL ASSUMPTIONS				
USING THE GLOBAL TEST ON 4 DEGREES-OF-FREEDOM:				
Level of Significance = 0.05				
Call:				
gvlma(x = fit)				
	Value	p-value	Decision	
Global Stat	6.6517	0.15548	Assumptions acceptable	
Skewness	0.1431	0.70522	Assumptions acceptable	
Kurtosis	1.6384	0.20055	Assumptions acceptable	
Link Function	4.2848	0.03845	Assumptions NOT satisfied!	
Heteroscedasticity	0.5855	0.44417	Assumptions acceptable	

Source: Author's estimates from R Studio

From the table above, it is clear that the link function assumption is violated.

This can be attributed to the presence of multicollinearity problem amongst the independent variables. A presence of a multicollinearity problem would make the Ordinary Least Square regression very biased and unfit for the model. In such a case, the independent variables would be highly correlated, thus, have a correlation very close to 1. The presence of multicollinearity within the chosen independent variables is shown below using the Variance Inflation Factor:

Table 3

Variance Inflation Factor

VIF values							
WCocoaP	WGoldP	USDGHS	INF-YOY	TBR-91 day	Crude oil(Br	BOP	GDP
2.345795	7.136395	3.267059	7.259897	6.013281	2.555626	1.245821	6.51124
Square Root of VIF values > 2							
WCocoaP	WGoldP	USDGHS	INF-YOY	TBR-91 day	Crude oil(Br	BOP	GDP
FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	TRUE

Source: Author's estimates from R Studio

As a general rule, variables with a value $\sqrt{Vif} > 2$ have a multicollinearity problem. From the table above; world gold prices, inflation rate, treasury bill rate and GDP possess a multicollinearity problem, thus they are highly correlated. To solve this problem and to give a more accurate OLS results, a number of the independent variables were dropped from the regression since their behavior is generally exhibited by another independent variable in the model.

The Step Wise Regression

In order to drop some of the variables from the equation as a way solving the problem of multicollinearity and improving the model, the step wise regression method was employed. The result of the backward Step Wise regression is shown below:

Table 4

The Backward Step Wise Selection

GSE-ASI				
	Df	Sum of Sq	RSS	AIC
none			60650549	526.14
WcocoaP	1	3989214	64639763	526.43
GDP	1	10165015	70815565	529.71
USDGHS	1	22982277	83632827	535.7
INF-YOY	1	41456774	102107323	542.89
Coefficients:				
(Intercept)	WcocoaP	USDGHS	INF-YOY	GDP
3624.2236	0.7565	-2166.7636	414.4345	-0.3939

Source: Author's estimates from R Studio

From the table above, it is evident that cocoa prices, GDP, USDGHS exchange and inflation rate remain the predominant factors ideal for the OLS model regression based on the Backward Stepwise selection. Treasury bill rate, BOP, gold prices and oil prices were dropped from the model in order to solve the problem of multicollinearity and present an improved model for the OLS regression.

Improved Econometric Model

Based on the results from the backward stepwise regression, the new and improved econometric model is given by:

$$\text{GSE-ASI} = \beta_0 + \beta_1 \text{WCocoaP} + \beta_2 \text{USDGHS} + \beta_3 \text{INF-YOY} + \beta_4 \text{GDP} + \mu \dots \text{equation 4.2}$$

Where:

GSE-ASI = The Ghana Stock Exchange All Share Index prices

β_0 = Constant or intercept

WCocoaP = World Cocoa Prices (US Dollars per Tonne)

USDGHS = Exchange rate for the cedi against the US dollar

INF-YOY = Year on Year inflation rate for Ghana

GDP = Gross Domestic Product for Ghana (in millions of US Dollars)

μ = Unobservable variables/ error term

Another Global Validation of Linear Model Assumptions was run to confirm that the new model in equation 4.2, satisfies the Gauss-Markov assumptions for multiple linear regressions as shown in the table below:

Table 5

Global Validation of Linear Model Assumptions

ASSESSMENT OF THE LINEAR MODEL ASSUMPTIONS			
USING THE GLOBAL TEST ON 4 DEGREES-OF-FREEDOM:			
Level of Significance = 0.05			
Call:			
gvlma(x = fit2)			
	Value	p-value	Decision
Global Stat	4.1617	0.3846	Assumptions acceptable
Skewness	0.2999	0.584	Assumptions acceptable
Kurtosis	2.5508	0.1102	Assumptions acceptable
Link Function	0.7226	0.3953	Assumptions acceptable
Heteroscedasticity	0.5884	0.4431	Assumptions acceptable

Source: Author's estimates from Stata

Evidently, the new model in equation 4.2 satisfies the OLS assumptions for a multiple linear regression.

Interpretation of Final Equation with the Substituted Coefficients

Substituting the coefficients from the regression into equation 4.2 gives:

$$\text{GSE-ASI} = 3624.2236 + 0.7565\text{WCocoaP} - 2166.7636\text{USDGHS} + 414.4345\text{INF-} \\ \text{YOY} - 0.3939\text{GDP} \dots\dots\dots \text{equation 4.3}$$

It can be inferred from the equation above that world cocoa prices and inflation rate have a positive effect on GSE-ASI. In that, a one-unit increase in cocoa and inflation rate will cause the GSE-ASI to increase by 0.7565 and 414.434 units respectively. On the other hand, USDGHS exchange rate and GDP have a negative relationship with the GSE-ASI. Thus, a one-unit increase in USDGHS exchange rate

and GDP will result in a decrease in the GSE-ASI by 2166.7636 and 0.3939 units respectively.

It is important to note that the USDGHS exchange rate has the most significant effect on the GSE-ASI as a one-unit increase in the exchange rate will result in the GSE-ASI price reducing by 2166.7636 units.

The constant value of 3624.2236 indicates that the GSE-ASI will assume that price (3624.2236) if the independent variables are zero or do not have any bearing on the GSE-ASI.

Testing of Hypothesis

The general rule of thumb is that an independent variable is significant at a 95% confidence level if its t-statistics is above 2 or below -2. Also, an independent variable is significant at a 95% confidence level if the P-value is less than 0.05. If an independent variable is found to be significant, we therefore, reject the null hypothesis and accept the alternative hypothesis. After running a robust multiple regression using R Studio on the four (4) independent variables in quarterly data form, as shown in the table 4.6 below, it was realized that the USDGHS exchange rate and GDP had a t-statistic below -2 while inflation rate had a t-statistic above 2. This makes exchange rate, GDP and inflation rate the only significant independent variables as cocoa prices had a t-statistic between -2 and 2, hence rendering the variable insignificant. This result is also supported by the P-value from the regression where exchange rate, GDP and inflation rate had a p-value lower than 0.05 while cocoa prices had a p-value above 0.05.

Hence, we reject the null hypothesis and accept the alternative hypothesis in the case of exchange rate, GDP and inflation rate (thus $\beta_2, \beta_3, \beta_4 \neq 0$). Whiles, we accept the null hypothesis and reject the alternative hypothesis in the case of cocoa prices.

Discussion of OLS Regression Results

From the OLS output on R Studio, the R-square for the regression was found to be 0.8084. This means that 80.8% of the variations in the dependent variable (GSE-ASI) are explained by the independent variables. This makes the OLS a good estimator for the regression. The results from the OLS regression is shown below:

Table 6

Ordinary Least Square Regression Results

Residuals:					
Min	1Q	Median	3Q	Max	
-3476.1	-718.2	-83	615.7	3715.2	
GSE-ASI	Coef	Std. Err	t	P> t 	
Intercept	3624.2236	1650.1672	2.196	0.03568	*
WCocoaP	0.7565	0.5298	1.428	0.16331	
USDGHS	-2166.7636	632.1957	-3.427	0.00174	**
INF-YOY	414.4345	90.0315	4.603	0.000067	***
GDP	-0.3939	0.1728	-2.279	0.02968	*
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					
Residual standard error: 1399 on 31 degrees of freedom					
Multiple R-squared: 0.8084, Adjusted R-squared: 0.7837					
F-statistic: 32.7 on 4 and 31 DF, p-value: 1.017e-10					

Source: Author's estimates from Stata

The table above clearly indicates that the GSE-ASI has a positive relationship with world cocoa prices and inflation rate in Ghana while GDP and exchange rate

have a negative relationship with the GSE-ASI. It can also be inferred that exchange rate, GDP and inflation rate possess significant explanatory power for stock price movement in Ghana as they have P-values lower than 0.05. Although cocoa prices were positively related to stock price movement on the GSE, they were found to possess weak explanatory power over stock price movement in Ghana at a confidence level of 95%.

The findings from this research are highly in line with that of most previous research. With an R-square of 80.8%, this research supports the findings of Chen et al who established that stock prices are highly exposed to macroeconomic factors and are often priced in harmony with them (Ross, Chen, & Roll, 1986). On the contrary, the statistically insignificance of the world cocoa prices do support the argument that the main source of stock return or movement in emerging markets is due to local risk factors, rather than global risk factors, as proposed by Maysami et al. (2004) and proved by Adu (2012).

The results from this research clearly underpin the importance of GDP as shown in the findings of Levin and Zervos (1996) who proposed that economic output such as GDP has a significant influence on stock price movement in countries. The statistical significance of GDP from this results highly contradicts the findings of Filler (2000) and Taylor et al (1991) who proposed that economic growth did not have a significant influence on stock prices. Contrary to expectation, GDP had a surprisingly negative relationship with stock price movement in Ghana, although it was significant. The reason for this negative relationship is the disparities in the proportion of listed companies in Ghana (MSCI Barra Research, 2010). For example, the telecommunication industry, which contributes to economic output in Ghana, is not represented on the GSE. Hence, an increase in economic output will not reflect on

the GSE. Also, multinational companies like Tullow Oil and Ecobank, which are listed on the GSE, may earn most of their profits outside Ghana. Consequently, economic output will have a negative relationship with stock price movement on the GSE.

In line with Adaramola (2011) and Tweneboah & Adam (2008), exchange rate had a significant influence on stock price movement. These results are contrary to that of Adu (2011) who concluded that exchange rate did not have a significant influence on stock price movement in Ghana. The difference in the results may lie in the disparities within the nature of the data used as well as the time period considered.

Surprisingly, inflation rate had a rather positive relationship with the stock price movement in Ghana, as a negative relationship was rather expected based on empirical review. Contrary to the findings of Adaramola (2011) who looked at the Nigerian Stock Exchange, inflation rate statistically has a significant effect on stock price movement in Ghana. The results from this study are rather in unison with the findings of Talla (2013), Adu (2012) and Tweneboah & Adam (2008) who looked at the Swedish and Ghanaian stock markets respectively. Their results showed that inflation rate had a statistically significant influence on stock price movement in the respective countries.

Unfortunately, the effect of BOP on stock price movement in Ghana could not be measured in this paper since the variable was dropped from the equation to solve the problem of multicollinearity as shown in table 4 above. Although the effect of BOP on stock price movement is one of the central points of this research, keeping the variable in the regression would have resulted in a biased and unreliable results.

In comparing the findings of this research to previous ones, the problem of dynamic significance of the various variables using the APT model is highly evident. Indeed, Poterba et al. (1989), after reviewing the research done by Chen et al (1986) and applying a different method, came to an opposite conclusion that macroeconomic factors do not possess significant explanatory power over stock prices as they account for only 5% of variations in stocks, using data for America. Even considering Adu (2012) and Tweneboah & Adam (2008) who organized a similar research on the Ghana Stock Exchange, different findings were realized from their research.

This goes to support the problem of changing significance using the APT model. These disparities in results further raises issues with the methodology, nature & size of variables, the geographic location, and sophistication of stock markets among others, and how they impact the research using the APT model (Adu, 2012).

Limitations

One major limitation with the analysis lies within the nature of the data collected on the variables. Ghana reports its Balance of Payment and Gross Domestic products in a quarterly manner, hence, monthly data could not be used for the study, but rather quarterly data from 2006 to 2014 for all the variables. This limitation resulted in a sample size of 36, which may not be large enough to determine a more accurate effect that the selected macroeconomic factors have on stock prices in Ghana.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

Summary of Findings

Four variables, namely; treasury bill rate, world gold prices, world oil prices and BOP were omitted from the regression in order to solve the problem of multicollinearity in the OLS regression. Some of the independent variables were highly correlated and hence there was a need to drop them in order to make the OLS unbiased.

The results from the Ordinary Least Square regression clearly indicates that macroeconomic variables possess a high explanatory power over the stock price movement in Ghana based on the R-square. The R-square shows that 82% of the variations in the GSE-ASI is explained by the selected macroeconomic factors.

Out of the selected four (4) macroeconomic variables, two had a positive influence on the GSE-ASI, thus, inflation rate and world cocoa prices. The other two variables, being GDP and exchange rate, had a negative influence on the GSE-ASI.

With a respective t-statistics of -3.427, 4.603 and -2.279 as well as P-values of 0.00174, 6.68e-05 and 0.02968; only exchange rate, inflation and GDP had statistical significance in explaining the movement in stock prices on the GSE-ASI. World cocoa prices was found to possess a weak or an insignificant explanatory power over stock price movement on the GSE-ASI.

In the case of exchange rate, inflation rate and GDP, the null hypothesis was rejected while the alternative hypothesis (thus $\beta_2, \beta_3, \beta_4 \neq 0$), was accepted since these variables had a statistical influence over the GSE-ASI. In the case of world cocoa prices, the null hypothesis was accepted while the alternative hypothesis was rejected since the variable did not have a statistical influence on the GSE-ASI.

Conclusion

Studies by Adaramola (2011), Adu (2012), Chen et al. (1984), Humpe & Macmillan (2009), and Tweneboah & Adam (2008) among other researchers have all concluded that macroeconomic factors have a significant explanatory power over stock prices movement in all countries.

However, the findings from such researchers as mentioned above, may be misleading as the techniques employed; specifically, OLS, Cointegration and Granger causality, may be inadequate for such inferences (Owoye.O., 1995). Nevertheless, these findings have proved to be accurate over the years.

Therefore, the overarching conclusion is that, the results from this study, further cements and supports the stance of the aforementioned researchers, thus, macroeconomic factors do indeed possess significant explanatory power over stock prices in Ghana. The inclusion of GDP as a measure of economic output was justified in the research since the variable had a significant influence on the GSE-ASI.

Recommendations

With respect to the findings from this research, a number of recommendations have been made for investors, government and exchange authorities.

Investors

The research found out that inflation rate, GDP and especially exchange rate have a strong influence on stock prices in Ghana. With the exception of inflation rate

and cocoa prices, all the other variables were negatively correlated with the stock market price.

‘Ceteris Paribus’ – with all things being equal, an improvement in these variables should indicate a high likelihood of an increase in stock prices on the GSE-ASI (Adu, 2012). Investors should therefore buy more shares in anticipation of an improvement in macroeconomic factors; paying close attention to inflation rate, GDP and exchange rate. The vice versa applies.

An optimal investment strategy with this outlook will likely increase the returns on local shares in terms of capital gains.

The Government

Exchange rate had a negative relationship with the GSE-ASI and also had the most significant influence on the GSE-ASI. With the USDGHS exchange rate being the most traded in Ghana, further depreciation of the cedi as experienced last year, will tremendously limit the stock market returns and growth.

Consequently, the government should take steps to check the depreciation of the cedi on the market. This can be achieved through proper fiscal and monetary policies in the country as well as promoting local production to boost the demand for the local currency. In addition, “the government should set realistic macroeconomic targets to limit chronic deviations which normally render fundamental analysis almost impossible in order to improve public confidence in government decisions” Adu (2012).

The Stock Exchange Authorities

The Ghana Stock Market is not well developed in comparison to other stock markets. This is due to the limited number of listed companies and industries alike as well as the absence of derivative tools needed to optimize investments. It is quite sad that none of the companies in the telecommunication industry, arguably the most competitive industry in Ghana, is listed on the GSE.

The Ghana Stock Exchange should work with the government to provide tax incentives for listed companies in order to encourage companies to list on the GSE, as a way of increasing liquidity. The Exchange should also take strides to incorporate complex and necessary securities such as derivatives into the system to provide better avenues for investor to invest locally. In line with Adu (2012), steps should be taken to increase public awareness about the Ghana Stock Market as a way of attracting more investors both locally and abroad.

These recommendations, if implemented, would ominously contribute to the development of the financial markets in Ghana.

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