

**THE EFFECTS OF EXCHANGE RATE, INTEREST RATE AND INFLATION ON  
THE PERFORMANCE OF MUTUAL FUND IN GHANA: A CASE STUDY OF  
ANIDASO MUTUAL FUND**

By

Kwadwo Nyantakyi Marfo (BA. Sociology and Social Work)

**A DISSERTATION SUBMITTED TO THE DEPARTMENT OF ECONOMICS  
KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY  
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE  
OF MASTER OF SCIENCE ECONOMICS (BANKING & FINANCE OPTION)**

**SEPTEMBER, 2016**

## DECLARATION

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

KWADWO NYANTAKYI MARFO	.....	.....
(PG3745915)	Signature	Date

Certified by:

DR. DANIEL SAKYI	.....	.....
(SUPERVISOR)	Signature	Date

Certified by:

DR. GEORGE ADU	.....	.....
(INTERNAL EXAMINER))	Signature	Date

Certified by:

DR. HADRAT YUSIF	.....	.....
(HEAD OF DEPARTMENT)	Signature	Date

## **DEDICATION**

This work is dedicated to my parents Dr and Mrs Sampson Kofi Amoako Marfo who have been a great source of encouragement throughout the study.

## **ACKNOWLEDGEMENTS**

This work wouldn't have been possible without the arm of GOD and the guidance and support from my supervisor, Dr. Daniel Sakyi who has directed and guided me throughout this study. Special mention must also be made of Theodora Aryee and Samuel Yalley for their immense support.

To all lecturers of the KNUST Department of Economics who have taught, encouraged and guided during my tenure in the school, I say a big thanks. To friends and classmates that contributed in diverse ways to my success in this program, I say a big thank you especially Linda Akoto, Samuel Obeng and Samuel TawiahBaidoo. Finally, my thanks go to my family, for the support, prayer, contributions and bearing with me throughout this program of study.

## TABLE OF CONTENT

<b>DECLARATION .....</b>	<b>I</b>
<b>DEDICATION .....</b>	<b>II</b>
<b>ACKNOWLEDGEMENTS .....</b>	<b>III</b>
<b>TABLE OF CONTENT.....</b>	<b>IV</b>
<b>LIST OF TABLES .....</b>	<b>VII</b>
<b>LIST OF FIGURES.....</b>	<b>VIII</b>
<b>ABSTRACT.....</b>	<b>IX</b>
<b>CHAPTER ONE: INTRODUCTION.....</b>	<b>1</b>
1.1 BACKGROUND TO STUDY .....	1
1.2 PROBLEM STATEMENT .....	3
1.3 RESEARCH OBJECTIVES.....	5
1.4 RESEARCH HYPOTHESES .....	5
1.5 SIGNIFICANCE OF STUDY.....	6
1.6 SCOPE AND LIMITATION OF STUDY .....	7
1.7 ORGANIZATION OF STUDY .....	8
<b>CHAPTER TWO: LITERATURE REVIEW.....</b>	<b>9</b>
2.1 INTRODUCTION .....	9
2.2 THEORETICAL MODELS OF THE STUDY .....	9
2.2.1 THE CAPITAL ASSET PRICING MODEL .....	9
2.2.2 ARBITRAGE PRICING THEORY .....	11
2.2.3 THE MARKOWITZ PORTFOLIO THEORY .....	12
2.3 THEORETICAL REVIEW.....	12
2.3.1 INFLATION .....	12

2.3.2 EXCHANGE RATE .....	13
2.3.3 INTEREST RATE.....	14
2.4 EMPIRICAL REVIEW .....	15
2.5 CONCEPTUAL FRAMEWORK .....	21
2.6 CHAPTER SUMMARY .....	21
<b>CHAPTER THREE: METHODOLOGY .....</b>	<b>22</b>
3.1 INTRODUCTION .....	22
3.2 RESEARCH DESIGN.....	22
3.3 SAMPLE AND SOURCE OF DATA .....	23
3.4 MODEL SPECIFICATION .....	26
3.5 VARIABLE DESCRIPTION AND MEASUREMENT OF VARIABLES .....	23
3.6 ESTIMATION STRATEGY .....	25
3.6.1 UNIT ROOT TEST .....	25
3.7 DIAGNOSTIC AND STABILITY TEST.....	27
3.8 CHAPTER SUMMARY .....	27
<b>CHAPTER FOUR: ANALYSIS AND DISCUSSION OF FINDINGS.....</b>	<b>28</b>
4.1 INTRODUCTION .....	28
4.2 TREND ANALYSIS.....	28
4.3 TESTS OF STATIONARITY .....	31
4.4 LONG-RUN RELATIONSHIP .....	32
4.5 DETERMINANTS OF PERFORMANCE OF MUTUAL FUNDS IN GHANA .....	34
4.6 STABILITY AND DIAGNOSTIC TEST.....	39
<b>CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS... 41</b>	

5.1 INTRODUCTION .....	41
5.2 SUMMARY OF FINDINGS .....	41
5.3 RECOMMENDATION.....	42
5.4 CONCLUSION.....	43
<b>REFERENCE.....</b>	<b>44</b>
<b>APPENDIX.....</b>	<b>49</b>

## LIST OF TABLES

Table 1: Augmented Dickey-Fuller Unit Root Test .....	31
Table 2: Bounds Test Results .....	33
Table 3 : Estimated Long-run Results .....	34
Table 4: Estimated Short-run Results .....	36



## **LIST OF FIGURES**

Figure 1: Trends in Mutual funds and Exchange rate, 2012-2015 .....	28
Figure 2: Trends in Mutual Funds and Inflation, 2012-2015 .....	29
Figure 3: Trends in Mutual Funds and Interest Rate, 2012-2015 .....	30
Figure 4: CUSUM and CUSUMQ.....	40

## **ABSTRACT**

The study examines the effect of key macroeconomic variables, specifically exchange rate, interest rate and inflation, on the performance of mutual funds in Ghana. To achieve this objective, monthly firm-specific data were sourced from Anidaso Mutual Fund for the period 2012 to 2015 while country-specific variables were obtained from the Ghana Statistical Service (GSS), Bank of Ghana (BoG) and the World Development Indicators (WDIs) from the World Bank. The study employed the Autoregressive Distributed lag (ARDL) model for the estimation. The study revealed that generally there was deterioration in inflation, exchange rate, and interest rate over the period 2012-2015 in Ghana. Exchange rate has negative but insignificant impact on the performance of mutual funds in Ghana in both the long- and short-run. Further, there was evidence to support any significant effect of inflation on the performance of mutual funds in Ghana. Again, the long-run effect of interest rate on the performance of mutual funds in Ghana was negative; the short-run effect was also negative. Based on these findings, the study recommended that the government of Ghana must create a conducive macroeconomic environment aimed at reducing interest rates which would enhance the performance of the mutual funds. Again since the interest rate serves as a premise to an extent in fixing the lending rates of financial intermediaries, a low interest rate would lead to a low lending rate which would enable households and firms to invest more into the fund.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background to Study**

Many African countries have as an aim to attain economic growth and foster development and therefore have attached importance to the financial market(i.e. money and capital market). This is the case because stakeholders have realized that a strong financial market can also contribute to economic growth. The decline in aid from foreign sources in the early part of the 1990s exacerbated the establishment of the capital markets in some African countries, including Ghana (Fosu et al., 2014). A capital market is one in which financial assets have a long or indefinite maturity. Some examples of capital market products include treasury bonds, corporate bonds, collective investment schemes etc. Mutual funds which are collective investment schemes has served as an avenue for people to invest into a large pool of funds which attract returns after the stipulated period.

According to Reilly and Brown (2003), a mutual fund has been described as a pool of investment that brings together monies from clients that purchase stocks, which is invested in a portfolio of securities. This results in investors adding a considerable amount of securities to their portfolios at reduced prices than procuring each security individually. In recent times, the mutual fund industry has received considerable attention in the financial markets of many African countries of which Ghana is no exception. Ghana adopted the Financial Sector Adjustment Programme (FINSAP) in 1989, which targeted policies to improve the financial sector. According to Mensah et al. (2012), Africa's equity market has been of less concern to many researchers as compared to other developed markets in

developed economies such as Europe and United States of America, due to its limited time of operation. There are many types of mutual funds which include money market funds, fixed income funds, equity funds, balanced funds, index funds, speciality funds, fund-of-funds. Some of the benefits of mutual funds include diversification, expert management, liquidity, convenience, reinvestment of income and affordability. Fund managers of mutual funds usually invest in marketable securities, with the risk of investing being borne by the investors, who though can be prone to suffer considerable losses when the markets seem not to be doing well, also stand to enjoy the benefits of investing in corporate equities. Like all other investment services, mutual funds are also exposed to risk such as liquidity risk, interest rate risk, exchange rate risk, inflation and sovereign or country risk.

According to Fernando et al., (2003), one of the distinctive characteristic that set mutual funds apart is the relatively higher operational transparency as compared to other financial institutions that also provide financial services to households. Further, mutual funds offer advantages that include diversification of risk and low cost professional management linked with high returns. Fernando et al. (2003) asserted that whereas mutual funds do not take on credit and insurance risk, banks and insurance companies do. They therefore do not need to make provisions which are subjective against non-performing loans or to generate actuarial reserves against which future insurance claims are levied

The Epack Group introduced by Databank in 1994 was the first mutual fund to be introduced in Ghana (Databank Annual Report, 2008). The numbers of licensed mutual funds in the country as at 2015 was 30 (Securities and Exchange Commission, 2015). For

mutual funds in Ghana one can invest with small amounts of money say GH¢5.00 and build on it for the short, medium and long-term. One can also gain substantial gains since it is not fixed like the Treasury bill (Ayeboo, 2012). In recent times some macroeconomic indicators such as inflation rate, interest rate and exchange rate have been on an increasing trend with the end of year inflation and interest rate for the year 2015 being 17.7% (G.S.S, 2015), 22.9% (B.O.G, 2015) and GH¢3.79(B.O.G, 2015) respectively. This is not good because the mutual funds are invested in the capital markets, there is an element of systematic risk it faces and exchange rate, interest rate and interest rate are very critical factors that determines the expected returns

## **1.2 Problem Statement**

Over the years, the mutual fund industry has experienced growth of great significance. Becker and Vangham (2003) posited that this growth may be evidenced by the increased number of schemes, increased mobilization of funds and the increased number of investors in the country. The effectiveness of mutual funds would depend on the stability of macroeconomic variables pertaining in an economy. Uncertainty and Macroeconomic instability has a significant and negative relationship with private investment (Ramey and Ramey, 1995). Financial theory currently has focused on systematic risk arising from inflation, interest rate and other macro-economic variables and how they reflect on the return on individual assets.

In view of this, studies on how emerging markets such as the mutual fund industry in an economy have been carried out over the years (Kungu, 2013; Erdugan, 2012; Remolona et

al., 1997). The need to know the distinct effects of the macroeconomic variables is therefore imperative because gradually this industry is attracting the attention of individuals and companies globally. In recent times Ghana has experienced macroeconomic instability and this has a high tendency of discouraging potential investors to invest in the fund because of the uncertainty surrounding returns. Exchange rate has been depreciating which caused the Bank of Ghana to come out with foreign exchange policy measures to curb the depreciation. However, these measures rather led to a further depreciation of 6.4% (Bawumia, 2014) which reached its peak of a dollar to GH¢4.37 in June, 2015 (B.O.G, 2015). During the same period, inflation was also on the high side with an end of year rate of 17.9% (G.S.S, 2015) and interest rate also ended at 22.90% (B.O.G, 2015). This indicates a gloomy economic performance of the country. This is however not good in the sense that, for money to perform its functions effectively as a store of value these macroeconomic variables must be stable.

Illeditsch (2011) established that when investors receive a signal with unknown precision, the fear of ambiguity results in increased volatility and portfolio inertia. Knowing the distinct effects would be of importance to firms and individuals who wish to invest in the mutual fund industry, as investment is likely to be more sensitive than other factors of aggregate demand (Bernanke, 2003). Some studies have been done in other countries but in Ghana only a few have been done. Those studies include the role of Mutual Funds in Ghana, Challenges and Prospects (A case study of Databank), Performance of Mutual Funds in Ghana (A case study of Anidaso Mutual Fund managed by New Generation Investment Services).

It is clear from the above that, these studies have not really considered the effect of macroeconomic variables on performance of Mutual Funds. There is therefore a need for a study to consider the effect of the macroeconomic variables on the Mutual Funds performance and this is what the study seeks to fulfil.

### **1.3 Research Objectives**

The main objective of the study examined the effect of exchange rate, interest rate and inflation on the performance of mutual funds in Ghana. Specifically, the study sought to

- Analyse the trend in exchange rate, interest rate and inflation in Ghana
- Examine the long-run and short-run impact of exchange rate on the performance of mutual funds in Ghana.
- Examine the long-run and short-run impact of interest rate on the performance of mutual funds in Ghana.
- Examine the long-run and short-run impact of inflation on the performance of mutual funds in Ghana.

### **1.4 Research Hypotheses**

The study tested the following hypotheses:

### **Hypothesis 1**

H<sub>0</sub>: Exchange rate has no long-run and short-run impact on the performance of mutual funds in Ghana

H<sub>1</sub>: Exchange rate has a long-run and short-run impact on the performance of mutual funds in Ghana

### **Hypothesis 2**

H<sub>0</sub>: Interest rate has no long-run and short-run impact on the performance of mutual funds in Ghana.

H<sub>1</sub>: Interest rate has a long-run and short-run impact on the performance of mutual funds in Ghana

### **Hypothesis 3**

H<sub>0</sub>: Inflation has long-run and short-run impact on the performance of mutual funds in Ghana.

H<sub>1</sub>: Inflation has a long-run and short-run impact on the performance of mutual funds in Ghana

### **1.5 Significance of Study**

This study is relevant in the sense that limited studies have been carried out on the effects of macroeconomic determinants on mutual funds' performance in Ghana and Africa at large. This may probably be due to the illiquidity of the market in Ghana.



Knowing the effects of the macroeconomic variables on the performance of mutual funds will inform fund managers on what to do to get attractive returns on the funds of investors. This is because the returns are not readily known unlike other investments such as treasury bills. Again the empirical results from this study may be used to predict the performance of the mutual fund based on the variations in the major economic indicators.

Concerning significance to policy, the study will help in bringing an understanding to issues related to the mutual fund industry and would help the various financial institutions and policy makers to develop measures and mechanisms that are relevant to this sector of the economy.

Finally, this study will add up to the existing literature and also reference on which further studies can be carried out.

### **1.6 Scope and Limitation of Study**

The study used the Anidaso Mutual Fund as a case study and covered the period 2012-2015 (monthly data). The Price per share is used as a proxy to mutual funds' performance. The selection of Anidaso Mutual Fund is due to the fact that is a pioneer in the field of mutual funds in Ghana, specifically in the Ashanti region. It emerged as the second best performing mutual fund in the country in 2014 (Business & Financial Times, 2014). Another reason why the Anidaso Mutual Fund was chosen was due to the accessibility to data and it is also a balanced fund which is a good representation of mutual funds. A limitation to this study is that it excludes regulatory variables, such as the

effectiveness of legal institutions, corruption due to insider trading, and political instability consequences.

### **1.7 Organization of Study**

The study is structured into five chapters. Chapter one deals with the introduction of the study, statement of research problem, objectives, scope, significance of the study as well as the research hypothesis. Chapter two reviews the various theories which form the basis for the study as well as review of existing studies on factors that influence mutual funds' performance. The third chapter is on the methodology aspect and focuses on the techniques that would be used to achieve the study objectives. Chapter four will concentrate on the results and discussions of the findings from the study while chapter five looks at the summary of major findings, conclusions and recommendations of the study.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

Literature on the effects of exchange rate, interest rate and inflation on the performance of mutual funds in Ghana would be reviewed in this section. Theories for understanding the findings of the study would be expounded here. This section also seeks to review literature that have thrown light on this subject matter by various researchers

#### 2.2 Theoretical Models of the Study

The study has its theoretical model based on the Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT) and the Markowitz Portfolio Theory. These models were selected because they help to bring out a deep understanding between the role of exchange rate, interest rate and inflation and the performance of mutual funds in Ghana.

##### 2.2.1 The Capital Asset Pricing Model

This mode seeks to explain the relationship between risk and expected returns. This is a method that is commonly used to price securities which are considered to be risky. It is

expressed as  $r_a = r_f + \beta \cdot (r_m - r_f)$

Where  $r_a$ = Risk free rate

$\beta$  = Beta of the security

$r_m$ = Expected market return

The rationale behind the model is that investors must be compensated for investing in two ways which are time value of money and risk. The  $r_f$  represents the time value of money in the formula and compensates the investor for placing money in an investment over a period of time. The risk is represented by the other half of the formula and it computes the amount of compensation needed by the investor for taking on additional risk. This is computed by the taking of a measure of risk ( $\beta$ ) that compares the assets returns over a period of time in the market to the market premium ( $r_m - r_f$ ). The first person who became famous with respect to the CAPM model is by Sharpe (1964). Jensen (1967) sought to throw more light on the theory and extended the equation into

$$(r^a - r^f) = \alpha + \beta \cdot (r^m - r^f)$$

The only significant difference that Jensen brought on board was the introduction of alpha which he believed was very important for empirical testing. The author also explained that lower or higher returns can be earned by portfolio manager based on a fixed value of beta. He went further to test a number of mutual funds in the US but he found very minimal evidence to support the existence of significant alphas. Economists still however refer to the alpha as Jensen alpha.

Fama and French (1992) proposed a 3 model factor model to explain much better, returns on portfolio. He said the returns on a portfolio can be better explained with stock capitalization and book-to-market value. He discovered that these factors are really significant and explain into detail the rates of returns on their dataset.

### 2.2.2 Arbitrage Pricing Theory

It is a theory proposed by Ross, S.A. (1976) on the pricing of assets. He said that the expected returns of a portfolio are dependent on macroeconomic factors such as GDP, Inflation and Interest rate. Each of these factors is seen as a separate source of systematic risk. The relation between expected returns and factor sensitivities is defined as follows:

$$E(R) = R_F + \beta_1 RP_1 + \beta_2 RP_2 + \beta_3 RP_3 + \dots + \beta_N RP_N \text{ where:}$$

$E(R)$  = expected rate of return

$R_F$  = risk free asset

$B$  = the sensitivity of the assets return to the particular factor

$RP$  = risk premium

The rationale behind this model is that there are two things that influence the expected return on a financial asset and they are macroeconomic factors and the asset's response to these influences. He said an endless number of security-specific influences include investor confidence, exchange rate, production measures, inflation, market indices or changes in interest rate. It is up to the researcher to choose which ones are appropriate to the asset being analyzed. The model permits the analyst to relate the model to the security being analyzed. It also helps to determine whether there is an undervaluation or overvaluation of the security and whether an investor can gain or lose from the information. It also informs fund managers to test if portfolios are exposed to certain factors.

### **2.2.3 The Markowitz Portfolio Theory**

The rationale behind the maximization of expected returns and portfolio risk is explained by this theory. This theory expounds the fact that an investor's utility is influenced by a function of the first two moments which are mean and variance, (Markowitz, 1952). This model makes the assumption that all investors have a similar characteristic of being risk averse and that if two portfolios tend to have the same expected returns, the investor would prefer to go for the one with a minimal level of risk. This theory also expounds the fact that an investor who wants to reduce his level of risk can hold a portfolio of assets and not one asset only, thus there should be a level of diversification. Fama and French (1996) argued that the Markowitz mean-variance has an assumption of financial or stock returns to be normal. This may however not be necessarily true in the real world situation. In reality, returns may not depict a normal behaviour, and empirical evidence points to the fact that financial returns are not distributed normally. In spite of these flaws of the model, it is commonly used in both academia and real world applications

## **2.3 Theoretical Review**

### **2.3.1 Inflation**

Frimpong and Fosu (2011) said over the past 40 years, there has been an increasing trend towards inflation. They said it reached a peak in the 1970s and the early 1980s during the political turbulent times and it has persisted after 1983 in the era of the economic recovery programme. Inflation is said to have both direct and indirect consequences on every sector of the economy (Asalou and Ogunmuyira, 2011). It ranges from exchange rate, interest rates, unemployment among other variables. Bakaert and Engstrom (2010) stated that

investors become risk averse during inflationary periods and that during periods of recession, the economic uncertainty leads to high risk aversion on the part of investors. The higher risk aversion from the valuation of equity point of view associated with an increasing trend in inflation would lead to equity risk premiums being high and equity values being low. Because of the element of risk aversion on the part of investors, investors would reduce their contributions towards equity mutual funds till the value begins to pick up to the level where it is proportional to the level of risk.

### **2.3.2 Exchange Rate**

Olweny and Omondi (2011) define exchange rate as the price paid for a country's currency relative to another country's currency. Again according to Adler and Dumas (1984), currency risk is also the responsiveness of exchange rate risk to economic reaction. Exchange rate sensitivity plays a role on the rate of returns of foreign investors who tend to invest in the domestic market and domestic investors who tend to be invested in the foreign market. Some mutual funds are Pan African meaning they are invested outside Ghana. If the fund is a Pan-African one, it is invested in other countries other than Ghana and therefore during the daily valuation process, the investment that the funds hold outside Ghana are converted from the local currencies of those countries back to the Ghanaian Cedi. To achieve this, we convert the value of those instruments from their local currencies to a common currency that is internationally recognized and easy to convert to Ghana Cedis. The common currency we use here is the US Dollar (US\$). If the cedi appreciates as against the US (\$) in such a situation, it is likely the share price may fall.

The Modern portfolio theory states that systematic risk cannot be diversified in anyway and companies should therefore find a means of paying shareholders a premium as a result of this risk. Diversification in efficient markets can help take away exchange rate risk. Ali, Rehman, Yilmaz, Khan, and Afzal (2010) for instance posited that, an efficient foreign exchange system and stock markets arbitrage forces emphasises consistently the pricing of risks between the foreign exchange and stock markets

### **2.3.3 Interest Rate**

Interest rates play a pivotal role in the pricing of securities and allocation of capital by businesses and investors. Things become complicated when it comes to mutual fund as a result of the diverse nature of portfolios. However, when it comes to debt-oriented funds, the impact of changing interest rates is relatively clear (Boyte-White, C. 2015). Studies have reported the time varying dimensions of interest rates and the inverse effect interest rates sensitivity has on prices of equities e.g. (Titman and Warga, 1989). A rise in interest rate also affects investing decisions, thus investors change the composition of their investment portfolios, generally from equities to fixed income securities (Syed and Anwar, 2012). The value of a mutual fund investment is determined by its net asset value (NAV), which is the total market value of its entire portfolio divided, including any interest or dividends earned, by the number of shares outstanding. Because the NAV is based in part on the market value of the fund's assets, rising interest rates can have a serious impact on the NAV of a bond fund holding newly undesirable assets. If interest rates drop and older bonds begin trading at a premium, the NAV may jump significantly (Boyte-White, 2015).



Changes in interest rate can be either disastrous or delightful for individual considering short term discount of mutual fund shares (Boyte-White, 2015).

## **2.4 Empirical Review**

Chen and Qin (2016) researched on the behaviour of Investor Flows in Corporate Bond Mutual Funds. A large sample of corporate bonds spanning the period 1991-2014 were used. Their study proved that flows were responsive to both macroeconomic conditions and fund's performance. The authors also showed that flows can forecast the performance of the fund. They also concluded that the predictability of a fund cannot be attributed to the momentum of a return or pressure in price but is rather explained by persistence in performance.

Cici and Palacios (2015) researched on how the use of derivative instruments such as options can affect performance and risk. It was observed that the use of the derivative tool was consistent with the generation of income. Hedging motives was also found to relate systematically to education, experience and gender characteristics of portfolio managers and on the average does not lead to performance benefits. In effect it was concluded that some fund managers use options in order to lower risk.

In a dissertation by Kariuki (2014) on the effects of macroeconomic variables on financial performance of mutual funds industry in Kenya, he found out that macroeconomic factors indeed had a role to play in fund performance, specifically interest rate, inflation, exchange rate, GDP and money supply and that these macroeconomic factors influenced it in either a

positive or negative way. From the regression model, it was found out that money supply, interest rate, inflation and GDP positively and significantly influence the performance of the fund whilst exchange rate negatively but significantly influence the performance of the fund

Njau (2013) conducted a research on the effect of selected macroeconomic variables on the financial performance of Private Equity firms in Kenya. The Returns on Investment (ROI) was considered to be the dependent variable whilst inflation rate, GDP growth rate, bank lending rates and exchange rates were considered to be the independent variables. He concluded that GDP growth rate, inflation rate and bank lending rates have the most positive effect on the performance of equity firms whilst exchange rate of the dollar against the Kenya shilling showed a negative relationship.

In a study conducted by Sharpe (1966), he conducted a research to find out what factors influence the performance of mutual funds to a significant effect using some basic techniques like histograms and graphs. The main theoretical model used by the author was the Capital Asset Pricing Model. A ten year, 34 open-end mutual fund history was used in this research. He found out that factors such as the level of riskiness, expense ratios and performance of the fund in the previous year's account for the over performance of returns on mutual funds.

Dahlquist et al (2000) conducted a study on the performance of Swedish mutual funds. The authors used the simple regression technique from which  $\alpha$  was obtained and used as excess returns measure. Fixed effects were then used by the authors from which coefficients of the determinants of the excess returns were obtained. Past performances, flows, turnover, size, proxies for expenses on transactional and management cost were the six factors in the second model. Large equity funds were found to perform worse whereas larger bond funds were found to perform better. Fees and cost which are high tend to decrease excess returns on funds. Funds that are handled very well and professionally perform better than those that are handled anyhow taking into consideration the disparities in expense ratios.

Christesen (2005) investigated the performance of Danish mutual funds using simple regression CAPM and multi factor regression to account for the factors which give rise to the reasons for the funds main investment strategy. The author discovered that Danish mutual funds in general followed the market and did not outperform the market.

Ottem and Bam (2003) looked at how the location of a manager can influence the returns of a mutual fund. He investigated local UK and US funds investing into the local US capital market. He predicted an underperformance of UK funds due to asymmetric information. The author used simple and multi-factor regression to find Jensen  $\alpha$ . The second thing he did was to find the relationship between the  $\alpha$ -coefficient and variable for the location of a particular fund manager. Results cannot confirm these expectations with evidence after certain adjustments had been made.

The work of Guedj and Papastaikoudi (2003) studied if mutual fund families can affect the performance of mutual funds. Their study proved that if a fund is associated with a family of funds (number of mutual funds consolidated under one AMC); their study evidenced the fact that results were more persistent in this scenario than those for single funds. His study also proved that the persistency depended on the number of funds belonging to a family. An asset management company would therefore channel a large amount of resources into funds that perform better and this influences the investors to join the family of funds. The methodology incorporated a model with four factors to explain the systematic part of mutual fund returns and also explained the non-systematic part using one factor. The intuition for such persistence is the flow of fund within the mutual fund family, thus those who perform very well give funds to those who do not perform very well to create an impressive picture to attract investors.

The work of Blake and Morey (1999) researched on the influence of a rating system known as Morningstar which rates US mutual funds according to their performance, on the performance of mutual fund adjusted for risk (Jensen's alpha). The writers used the alphas for both the CAPM model and the Cahart (1997) 4-factor model. Techniques using both some parametric and non-parametric tests were used and the subsequent results were obtained; Morningstar grading system is used to determine funds that are not performing. The difference in risk-adjusted returns on mutual funds ranked highest (with rate 5) as against next-to-highest as well as median rated (rated 4 and 3 respectively) were found to be insignificant. The authors also proved that the use of historical average returns to forecast the future of mutual funds does as well as the Morningstar procedure.

Oehler et al. (2007) examined the determinants of the European Private Equity Market. The author used 23 countries as his data set for the periods 1992-2003. He used the fixed and random models and he concluded that the level of interest rate, stock market growth, GDP growth and Private Equity divestments are positively and significantly related to Private Equity. IPO investments were found out to determine PE financings or PE investments to a significant effect. Unemployment was found to play a significant role in European PE markets.

Romainand Pottelsberghe (2004) conducted a study on the macro economic impact of PE among the Organization for Economic Development Countries (OECD). A theoretical model was developed which took cognizance of variables that affect the demand and supply of venture capital. The factors which were considered here included technological opportunity, interest rate, growth rate of business, GDP growth, the level of entrepreneurship and the impact of corporate income tax rate, labour market rigidities, the growth rate of business, number of triadic patents, research and development capital stock, An empirical analysis was conducted where a data panel set was used incorporating 16 Organization for Economic Development Countries (OECD) spanning the period of 1990-2000. A regression analysis was made where the independent macroeconomic determinants of PE investment were unemployment rates, market capitalization, GDP growth rate and interest rates. The author concluded that short and long term interest rate and GDP growth have a positive impact on PE financial performance.

The Arbitrage Pricing Theory (APT) was used by Elton and Gruber (1988) to study equity returns in Japan in respect to macroeconomic variables such as money supply, industrial production, crude oil prices and money supply. The author concluded with the fact that there exists a positive relationship between equity prices and short term interest rates.

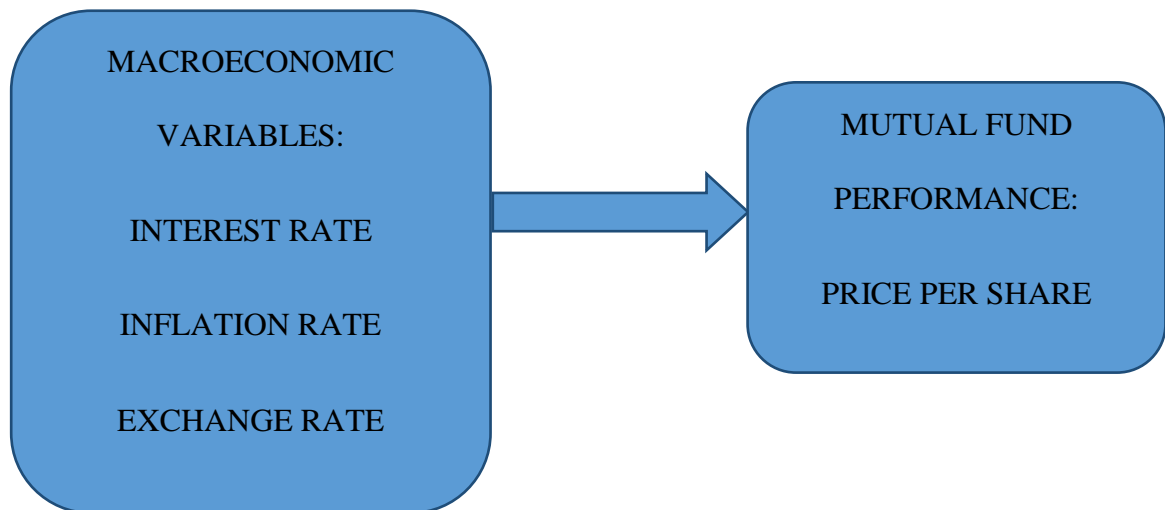
In a study conducted by Smirlock and Yawitz (1985), they found out that movement in interest rates affect equity prices in two ways. Empirically, it analyzed the interaction amongst interest rate exogeneity, the specific monetary policy regime and announcement effects. The study discovered that interest rates are inversely related to stock prices. Thus the effects of interest rate on capitalization and expectations would influence the prices of equities.

A study was conducted by Adams and Tweneboah (2008) using the Johansen's multivariate co-integration test and Innovation accounting techniques as instruments in examining the role of macroeconomic variables on stock price movement in Ghana. Databank Stock index was used as a measure of stock price performance and Consumer Price Index, Treasury Bill Rate and Exchange Rate as macroeconomic variables. The author concluded with the fact that co-integration exists between macroeconomic variables and stock index in Ghana.

In totality we can see that literature gives credence to the fact that macroeconomic factors such as exchange rate, inflation rate, interest rate, GDP, money supply, unemployment rate, dividend yields and so forth affect the value of financial assets.

## 2.5 Conceptual Framework

The conceptual framework underlines the relationships under study ie. amongst the macroeconomic variables and mutual fund performance. This study examines the relationship between these three macroeconomic factors namely interest rate (91 day Treasury bill rate), exchange rate (cedi/dollar rate), inflation and the performance of the Anidaso Mutual Fund (Price per share)



## 2.6 Chapter Summary

This chapter provided theoretical foundation to help understand the current study. Also, the empirical literature on investment and fund management were explored to inform what could be expected from the current empirical work. Last a conceptual framework was presented as summary of the expected relationship between inflation, exchange rate, and interest rate and the performance of mutual funds in general.

## CHAPTER THREE

### METHODOLOGY

#### 3.1 Introduction

This section presents the techniques employed in achieving the objectives of this study. It includes the research design, data source, empirical model and the variables used in explaining the performance of mutual funds' performance in Ghana.

#### 3.2 Model Specification

In order to achieve the set objectives and based on theoretical and empirical findings, the study adopts the model as specified below:

$$PRICE = f(EXC, INF, TBR, NAV) \quad (3.1)$$

Where PRICE is the price per share and is being used as a proxy for the performance of mutual funds in Ghana. EXC is the exchange rate, INF is inflation, TBR represents T-bill rate a proxy for interest rate; and NAV is the net asset value.

The estimable form of equation (1) is expressed as:

$$\ln PRICE = \beta_0 + \beta_1 EXC_t + \beta_2 INF_t + \beta_3 TBR_t + \beta_4 NAV_t + \mu_t \quad (3.2)$$

Where  $\ln$  is the natural logarithm,  $\beta_i$  are the parameter coefficients,  $\mu$  is the white noise and  $t$  is the time trend. All other variables are as previously defined.



### **3.3 Variable Description and measurement of variables**

#### **Mutual fund Performance**

The study measures mutual fund performance using the price per share. Price per share is the ratio of the value of a company that measures its current share price relative to its per-share earnings. The price per share is measured in Ghana cedi. For this study “PRICE” denoted mutual fund performance.

#### **Exchange Rate**

Exchange rate represents how a country’s currency is valued in another country. It is the unit price of a domestic currency expressed in terms of a foreign currency. The higher the exchange rate the value of a domestic currency decreases or depreciates. This effect serve as a disincentive to investors as they lose confidence in economy thus affecting the performance of mutual funds. Exchange rate can also induce investors to invest in the local economy when the price of foreign goods and services becomes high due to high exchange rate. In this case mutual fund performance is more likely to increase. The study uses the official exchange rate of the GH/US\$.

#### **Inflation**

Inflation refers to persistent increase in the general prices of goods and services in a country. Inflation results in high standard of living as it reduces the purchasing power of the currencies as goods and services become more expensive. This results in low demand for goods and services which in effect lowers investments and as such productivity in

general. This study expects a negative impact of inflation on mutual fund performance. Inflation rate was measured using the consumer price index.

### **Treasury Bills**

Treasury bill rates are short term debt instruments issued by the government and usually have a maturity period of less than a year. This is used as a proxy for interest rate as it forms the basis for pricing interest rate in Ghana.

### **Net asset Value**

Net asset value (NAV) represents the value of an entity's assets less the value of its liabilities. In other words it represents the value of an entity's assets minus the liabilities often in relation to open-end or mutual funds, since shares of such funds registered with the Securities and Exchange Commission are redeemed at their net asset value.

## **3.4 Sample and Source of Data**

Considering the inability to use the entire population of Mutual funds in Ghana in this study, a case study was done with the Anidaso Mutual Fund. The choice of this case study is because the Mutual fund was one of the Pioneer Funds to be set up in Ghana, especially in the Ashanti Region, and is currently doing well, as it emerged as the second best performing mutual fund in the year 2014 (Business and Financial Times, 2014), compared to other mutual funds. Also, the choice of this Mutual Fund is based on the fact that it is a balanced fund that is it invests in both the money and Capital markets, which is a good

representation of Mutual Funds. The study covers a 4 year period from January 2012 to December 2015. This choice of years is because it was within this period that the Case under review that is Anidaso Mutual Fund had very structured data on its monthly performance.

The data was obtained from the Ghana Statistical Service, Bank of Ghana, and the World Bank world Development indicators, ANIDASO Mutual fund quarterly and Annual reports. These sources are archival in nature and involve using previously compiled information to answer research questions (Cozby 2003), involve reviewing, understanding, and explaining past events.

### **3.5 Estimation Strategy**

#### **3.5.1 Unit root Test**

One prerequisite of estimating time series models is the test of stationarity that is whether the means and variances are constant overtime. The Unit root test is one way of testing stationarity among time series variables. The test is very essential since it avoids the situation of having spurious regression leading to inconsistencies in the resulting estimates (Bhattacharai and Armah, 2005). The Augmented Dickey-Fuller test (Dickey & Fuller, 1979) and the Phillips-Perron stationarity tests are employed to check for the presence of stationarity in the variables.

### 3.5.2 Autoregressive Distributed Lagged Model

The study employs the autoregressive distributed lag (ARDL) estimation technique proposed by Pesaran and Shin (1999) and later expanded by Pesaran, Shin, and Smith (2001). This technique has desirable characteristics compared to the residual-based technique by Engle and Granger (1987) and Full-Maximum Likelihood (FML) test (Johansen, 1988, 1990). First of all, the ARDL can be used even when the covariates are integrated of order one, order zero, or fractionally integrated. Thus, the ARDL does not impose the restrictive assumption that all variables must be integrated of the same order. Secondly, the ARDL works better with small sample sizes; and given the fact that the sample used in this study is relatively small makes this approach more preferable (Pesaran & Shin, 1999). Third, the ARDL estimator produces unbiased estimates of long-run relationships even when some of the independent variables are endogenous. Fourth, the ARDL uses a single reduced-form equation to estimate the long-run relationship—no need for the specification of system equations.

$$\begin{aligned} \text{LnPRICE}_t = & \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta \text{LnPRICE}_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta \text{LnEXC}_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta \text{LnINF}_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta \text{LnTBR}_{t-i} + \sum_{i=0}^n \alpha_{5i} \Delta \text{LnNAV}_{t-i} \\ & + \sigma_1 \text{LnPRICE}_{t-1} + \sigma_2 \text{LnEXC}_{t-1} + \sigma_3 \text{LnINF}_{t-1} + \sigma_4 \text{LnTBR}_{t-1} + \sigma_5 \text{LnNAV}_{t-1} + \varepsilon_t \quad (3.3) \end{aligned}$$

Where PRICE is the price per share and is being used as a proxy for the performance of mutual funds in Ghana. EXC is the exchange rate, INF is inflation, TBR represents T-bill rate a proxy for interest rate; and NAV is the net asset value.  $\alpha_0$  is a constant;  $n$  is the lag length,  $\varepsilon_t$  is the idiosyncratic error term,  $\alpha_1 - \alpha_6$  and  $\sigma_1 - \sigma_6$  are the regression coefficients of the short- and long-run relationships respectively, and  $\Delta$  is the difference.

### **3.5.3 Diagnostic and Stability Test**

The study also performs other diagnostic test to examine the reliability of the model employed. This includes the White (Heteroskedasticity) test, the normality test of the residuals the Breusch Geoffrey test (Serial correlation), the Cusum and Cusum Square tests.

### **3.6 Chapter Summary**

This chapter introduced the various techniques employed to examine the effect of interest rate, inflation and exchange rate on mutual funds' performance in Ghana. It presents the research design, data source as well as the estimation technique. The empirical model is explicitly presented in this chapter together with diagnostic test such as heteroscedasticity, normality of residuals, and serial correlation tests which are conducted to assess the validity of the model employed. The instrument used in analysing the data is also presented in this chapter.

## CHAPTER FOUR

### ANALYSIS AND DISCUSSION OF FINDINGS

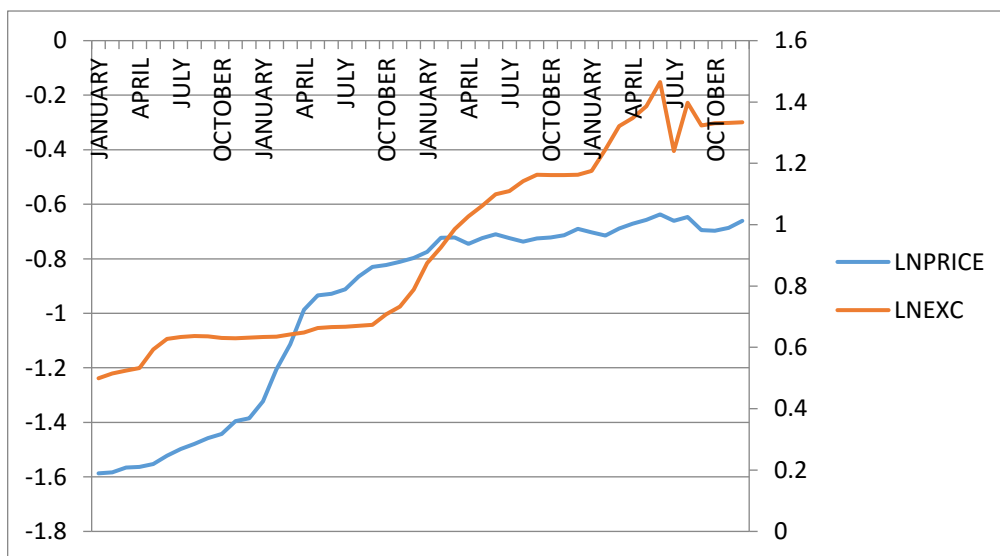
#### 4.1 Introduction

This chapter provides analysis of the data used in this study as well as elucidation of the results from the empirical estimations. The results reported here are analysed by means of tables and graphs; further the results from this study are compared to existing literature on the determinants of price.

#### 4.2 Trend Analysis

This section provides a monthly trend analysis of the main covariates—inflation, exchange rate, interest rate and mutual funds' performance in Ghana. This is to give an overview of how these variables have behaved during the study period.

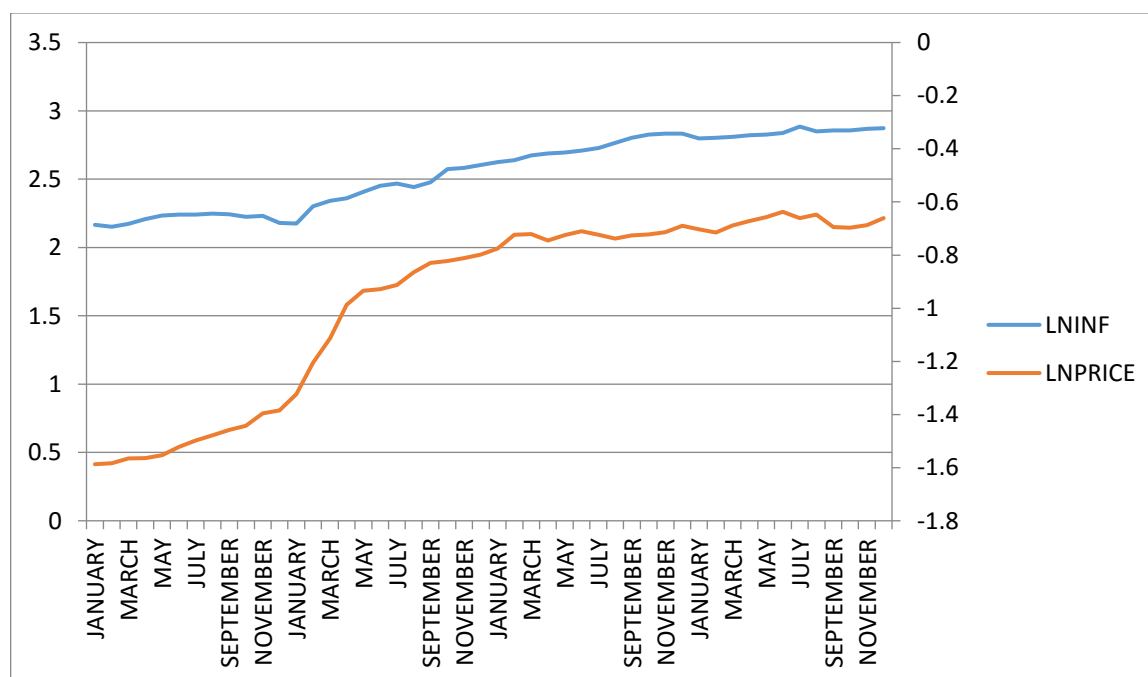
**Figure 1: Trends in Mutual funds and Exchange rate, 2012-2015**



**Source:** Author's (2016)

Figure 1 shows that exchange rate has generally seen an upward trend since 2012 to about May 2014; between this period, the exchange rate rose from about GH¢1.60 per dollar to around GH¢1.90 per dollar. Thereafter, there was some moderate stability until May 2013 where the cedi began to see some depreciation, rising from about GH¢2.00 to a record high of GH¢4.4 in May 2015. Subsequently, the cedi began to appreciate against the dollar till it hit around GH¢3.50 in July 2015, rose again in August and began to fall again. it is important to note that as at December 2015, one required about GH¢3.8 to buy a dollar.

**Figure 2: Trends in Mutual Funds and Inflation, 2012-2015**



**Source:** Author's (2016)

On the part of inflation, the country experienced the lowest inflation of 6.3% in May 2012. Thereafter, inflation has been on the rise reaching it highest in five year of 17.9% in July 2015. Given that the country has pursued inflation targeting over the last decade, it is quite

disappointing to see such an upward trend in general prices of goods and services. The high inflation has been attributed to high cost of utilities, high borrowing by government, and depreciation of the cedi.

**Figure 3: Trends in Mutual Funds and Interest Rate, 2012-2015**

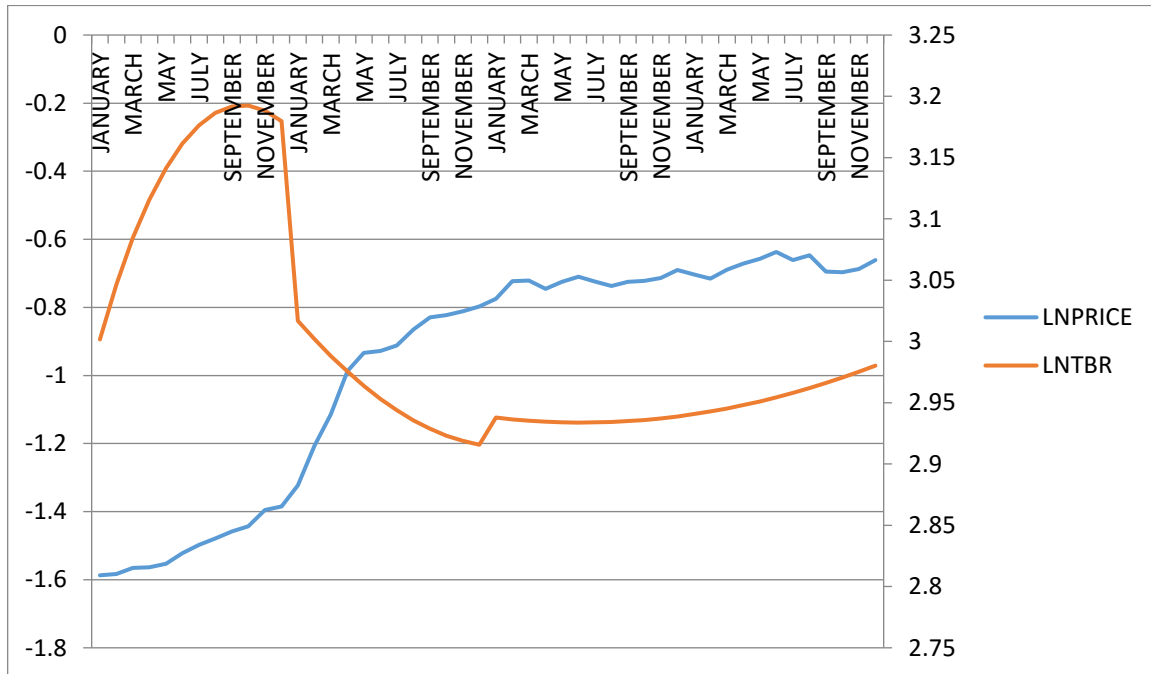


Figure 3 shows the trends in interest rate and mutual funds' performance. The lowest interest rate during the period 2012-2015 was 10.90% in January, 2012. It is noteworthy to mention that despite the upward trend in interest rate, there has been occasional downward trajectory such as in December 2013 and 2015 where interest rate stood about 18.80% and 22.90% respectively.



The upward trends in inflation, interest rate, and exchange rate create an unfavourable investment environment for fund managers because they have to pay high returns to investors in order to attract enough money to operate their funds.

### 4.3 Tests of Stationarity

The success of time series analysis is dependent on first knowing the stationarity property of the variables in question. It is preferred that the variables are stationary; however, in the absence of this desirable property, other equally important techniques are available for estimation. In this section, the stationarity property of each variable used in this study is tested using the Augmented Dickey-Fuller (ADF) unit root test. Table 4 provides details of the results of this test.

**Table 1a: Augmented Dickey-Fuller Unit Root Test**

	Levels		First Difference		Order of Integration
	Without Trend	With Trend	Without Trend	With Trend	
LnPRICE	-1.7516	-0.1564	-4.2643***	-4.4908***	<i>I</i> (1)
LnEXC	-0.0814	-1.7072	-10.5809***	-10.4981***	<i>I</i> (1)
LnINF	-0.7050	-3.2942	-10.0028***	-9.8911***	<i>I</i> (1)
LnTBR	-3.8856***	-3.5582**	-	-	<i>I</i> (0)
LnNAV	-1.8331	-1.3033	-4.0474***	-4.2707**	<i>I</i> (1)

**Source: Author's (2016)**

**Note:** (1) Null hypothesis: variable has a unit root. '\*\*\*' and '\*\*' mean statistically significant at 1% and 5% respectively.

The ADF unit root test was conducted under two premises: when the relationship includes a (1) constant or intercept; and (2) trend and intercept. The results of the ADF unit root test in Table 4 shows that with the exception of interest rate (TBR) which was stationary at levels, all the other variables had unit root. For this reason, the unit root test was conducted on the variables in first difference. The results show that in first difference, all variables were stationary; thus price, exchange rate, inflation, net asset value, and outstanding number of shares were all integrated of order one,  $I(1)$ .

In order to check for consistency in the stationarity results, the study also uses the Phillips-Perron test to investigate the stationarity properties. The results are presented in Table 4.2.

**Table 1b: Phillips-Perron Unit Root Test**

	Levels		First Difference		Order of Integration
	Without Trend	With Trend	Without Trend	With Trend	
LnPRICE	-1.9541	-1.0565	-3.5218**	-3.9429**	$I(1)$
LnEXC	-0.3543	-2.2346	-9.8890***	-9.7756***	$I(1)$
LnINF	-0.8606	-1.1745	-5.7139***	-5.7359***	$I(1)$
LnTBR	-4.0026**	-3.4554**	-	-	$I(0)$
LnNAV	-1.7452	-0.9657	-4.0172***	-4.2707***	$I(1)$

**Source: Author's (2016)**

**Note:** (1) Null hypothesis: variable has a unit root. '\*\*\*' and '\*\*' mean statistically significant at 1% and 5% respectively.

The PP test results were quite similar to that obtained for the ADF test. Except for interest rate (TBR) which was found to be stationary at levels with regard to the model with only

constant and with both constant and trend. Hence all integrated of order zero,  $I(0)$ . All other variables were found to be non-stationary at the levels. However at first difference with reference to the model with only constant and constant and trend the other variables, thus price, exchange rate, inflation, net asset value, and outstanding number of shares were found to be stationary. Hence all integrated of order one,  $I(1)$ .

#### 4.4 Long-run Relationship

The long-run relationship between the variables is examined in this section using the ARDL bounds test technique. This test is conducted based on the null hypothesis that there is no long-run relationship between the variables. The results are presented in Table 2.

**Table 2: Bounds Test Results**

Critical Value Bounds	Lower Bound	Upper Bound	F-statistic
10%	2.45	3.52	5.94
5%	2.86	4.01	
1%	3.74	4.68	

**Source: Author's (2016)**

The  $F$ -statistic of 5.94 is greater than both the lower and upper bounds of 3.74 and 4.68 respectively. It can thus be concluded with 99% confidence that there exist a long-run relationship between price, which is the proxy the performance of mutual funds, and exchange rate, inflation, interest rate, net asset value, and outstanding shares.

#### 4.5 Determinants of Performance of Mutual Funds in Ghana

In this section, the study seeks to empirically test the three hypotheses put forward in chapter one: whether exchange rate, interest rate, and inflation do not have any effect on the performance of mutual funds in Ghana. Given the fact that some of the covariates were integrated of order  $I(0)$  while others  $I(1)$ , the Autoregressive Distributed lag (ARDL) estimation technique is employed for best results as explained in the methodology. The empirical results, both the long and short run are presented in Table 3 and 4.

**Table 3: Estimated Long-run Results**

Variable	Coefficient	Standard Error	Probability
<i>LnEXC</i>	-0.0385	0.1761	0.8282
<i>LnINF</i>	0.5958	0.3088	0.0418
<i>LnTBR</i>	-1.1301	0.4186	0.0106
<i>LnNAV</i>	0.2844	0.1455	0.0488
<i>Constant</i>	-0.3965	1.9413	0.8393

Source: Author's (2016)

In the long-run the study finds that a one percent increase in exchange rate causes a 0.0385 percent decline in mutual fund performance. However, the result was insignificant. The insignificance of the results may be attributed to the fact that perhaps significant proportion of the portfolio of mutual funds is invested in local portfolios which are not foreign denominated. This is contrary to the findings of Adam and Tweneboah (2008) who concluded that there exist such a significant relationship.

From the results, it was observed that inflation (INF) has a positive and statistically significant relationship impact on mutual fund performance. We thus reject the null hypothesis that inflation has no effect on the performance of mutual funds in Ghana. Specifically as inflation increases by one percent, mutual funds' performance also increases by 0.5958 percent. The results confirm aprior expectation. This result may be because firms invest funds in growing stocks as such a rise in price tends to increase firms overall investment in real terms. Hence this stimulates the performance of mutual funds. This is consistent with the study of Kariuki (2014).

Furthermore, the study finds that interest rate is negatively and significantly related to price in the long-run. A one percent increase in interest rate was found to cause a decline in price by 1.1301percent at 1%percent significance level. This means that rising interest rates result in less superior performance of mutual funds in Ghana, and vice versa.This relationship could be explained from the standpoints that high interest rates lead to high cost of borrowing which leaves individuals and businesses with little surplus funds for investment in financial assets.In addition, this could be symptomatic of the fact that mutual funds in Ghana invest more in debt instruments compared to equity; andas a result, increases in interest rates negatively affect the value of debt investments in their portfolio leading to less healthy performance. This result is consistent with studies of Romain and Pottelsberghe (2004) and Adams and Tweneboah (2008)

In addition, the results in Table 3 it was found that there exists a positive relationship between net asset value (NAV) and the performance of mutual funds in Ghana and this is statistically different from zero. Specifically it was found that a one percent increase in net asset value will lead to a 0.2844 increase in price at 5% level of significance. It is important to mention that the performance of mutual funds is computed from their net asset value (NAV), and as such an improvement in NAV is good for fund managers as it is a sign of good performance. This result is consistent with studies by Kariuki (2014); Cici and Palacios (2015)

The study further analyses the short-run dynamics among the variables included in the model. The results are presented in Table 4.

**Table 4: Estimated Short-run Results**

<b>Variable</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>Probability</b>
D(LNPRICE(-1))	0.2080	0.0886	0.0247
D(LNEXC)	-0.0077	0.0354	0.8277
D(LNINF)	-0.2104	0.1032	0.0492
D(LNTBR)	-0.3073	0.1036	0.0054
D(LNTBR(-1))	-0.3764	0.1014	0.0007
D(LNNAV)	0.4358	0.0578	0.0000
ECM(-1)	-0.2018	0.0648	0.0037

**Source:** Author's (2016)

Theoretically, the error correction term (ECM<sub>-1</sub>) measures the speed of adjustment of convergence to the long-run equilibrium of an endogenous variable in response to a shock in an explanatory variable. In Table 4, it is evident that coefficient of the ECM is negative, and therefore confirms the establishment of a cointegration amongst the variables as discussed in the previous section. Again, the negative and significant coefficient of the ECM shows that the estimated model is stable. The ECM explains how price, exchange rate, inflation, interest rate and net asset value converge to equilibrium long-run after a short-run shock. The result as presented in Table 4 shows a low speed of convergence to the long-run equilibrium after a short-run shock. Specifically, equilibrium in the long-run will adjust by approximately 21% every year after any short-run shock.

Table 4 shows that the short-run relationship between price and its lag difference is positive. This implies that the lagged coefficient of price influences the current values of price in the short-run. Specifically it was revealed that a one percent increase in the immediate past values of price causes a 0.2080 percent increase in the current values of price at 5% level of significance.

Again, the short-run result shows that exchange rate has no statistically significant positive impact on price. It was revealed that a one percent increase in exchange rate causes a 0.0077 percent decline in price in the short-run. However, the effect was insignificant. This is consistent with the long-run results as well as consistent with the study of Adam and Tweneboah (2008).

Inflation was also found to be negatively and significantly related to price in the short-run. Specifically, it was revealed that a one percent increase in inflation causes a 0.2104 percent decline in price at 5% level of significance. This result obtained might be due to the fact that in the short-run individuals and firms might prefer to invest in debt-oriented instruments relative to equity oriented instruments. This is because returns on equity investments can be realised in the long-term. Kariuki (2014) confirms similar results.

The short-run result also suggests that interest rate is negatively and significantly related to price. It was revealed that for both the current and immediate past coefficients of interest rate were found to hinder prices. Specifically the current value of interest rate was in the short-run found to cause a 0.3073 percent decline in price at 1% level of significance. Similarly, a one percent increase in the lagged coefficient of interest rate causes a 0.3764 percent decline in interest rate at 1% level of significance. This result was consistent with the long-run results. Romain and Pottelsberghe (2004) and Adams and Tweneboah (2008) confirm similar results.

Finally the short-run results revealed that the net asset value was positively and significantly related to price. Specifically, in the short-run a one percent increase in net asset price turned to cause a 0.4358 percent increase in price at 1% level of significance. An increase in the net asset value of mutual funds will imply that fund managers and investors acquire more returns, hence causing an improvement in performance. This is consistent with the long-run result obtained. Kariuki (2015); Cici and Palacios (2015) confirm similar results.



#### 4.6 Stability and Diagnostic Test

The study further conducts a diagnostic and stability test to check if the model is stable and free of any econometric problems. The results are presented in Table 5.

**Table 5: Diagnostics and Stability Test**

Test Statistic	Results
Serial Correlation	2.1947 (0.1274)
Functional Form	2.4974 (0.2175)
Normality	0.9952 (0.6079)
Heteroscedasticity	3.3690 (0.5636)
CUSUM	Stable
CUSUMSQ	Stable

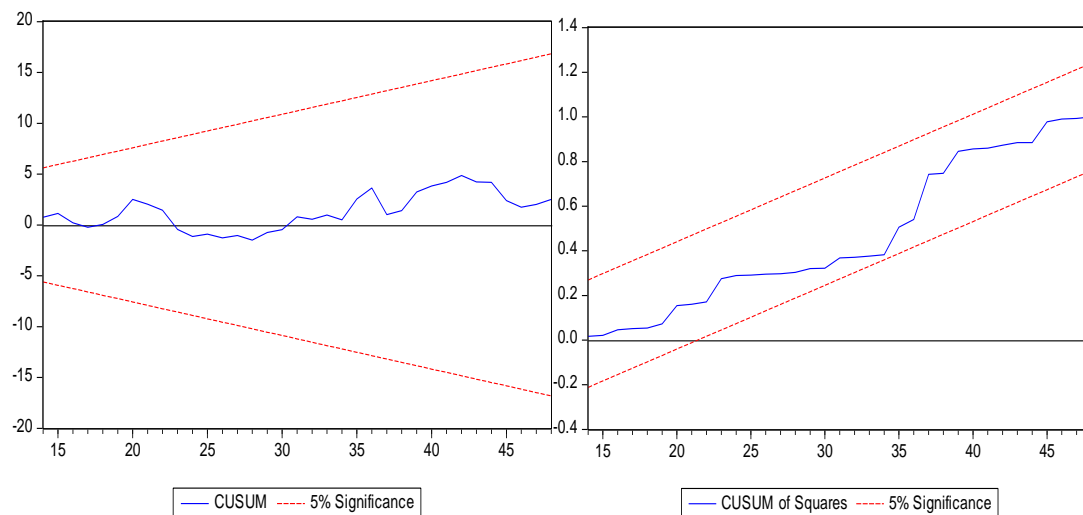
**Source:** Author's (2016)

**Note:** In parentheses are probability values

The result shows that, there is the absence of serial correlation and heteroskedasticity in the model. Specifically, the probability value of the serial correlation test of 0.1274 causes the non-rejection of the null hypothesis which states that the model has no autocorrelation. The

probability value of the heteroskedasticity test of 0.5636 causes the non-rejection of the null hypothesis. In addition, the probability values of the functional and normality test are all insignificant implying such issues are absent from the model. Again, to test if the estimated model is stable over the sample period, plots of the CUSUM and CUSUMQ as suggested by Brown et al. (1975) and further suggested by Pesaran et al. (2001) are performed within the ARDL framework. The CUSUM and CUSUMQ residual lines lie within the 5% critical value bounds, suggesting that, the estimated mode is stable throughout the sample period. In order words this test is used to examine the stability of the parameters used in the estimation. If the cumulative sum goes outside the 5% critical lines (i.e. the two dotted red lines), the parameters are said to be unstable (See Figure 3). Thus the parameter estimates could be relied upon for inference making and policy prescription.

**Figure 1: CUSUM and CUSUMQ**



## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter presents the summary of the findings obtained from the empirical investigation. Relevant conclusions are drawn based on these results and appropriate recommendations made with a view to improving the performance of mutual fund managers in Ghana.

#### **5.2 Summary of Findings**

The main objective of this study was to ascertain the impact of three key macroeconomic variables, i.e. inflation, exchange rate, and interest rate, on the performance of mutual funds in Ghana. A time series estimation technique was employed to help achieve this objective. The Augmented Dickey-Fuller unit root test was employed to investigate the stationarity property of the variables. The results showed a mixed order of integration of the variables, thus  $I(0)$  and  $I(1)$ . For this reason, the ADRL bounds test approach to cointegration was adopted to investigate the long-run as well as the short-run dynamics.

The study revealed the following findings:

Exchange rate was found to have a negative but insignificant effect on the performance of mutual funds in Ghana in both the long-run and short-run. This may be perhaps because significant part of the portfolio of mutual funds is invested in locally denominated assets.

Inflation has a positive impact on the performance of mutual funds in Ghana in the long-run. However in the short-run it was found to be negative. Further, interest rate has significant negative relationship with the performance of mutual funds in Ghana in the long-run and short-run.

A rise in net asset value (NAV) leads to superior performance of mutual funds in Ghana. It is important to mention that the value of mutual funds is computed from their net asset value, as such improvements in NAV is good for fund managers as it is a sign of good performance.

### **5.3 Recommendation**

Based on the findings from this study, some policy recommendations have been prescribed to help improve the performance of mutual funds in Ghana. The following recommendation is therefore put forward:

Given the critical role that financial intermediaries play in the economic success of a country, it is important for national governments to create a conducive macroeconomic environment aimed at reducing interest rates to enhance mutual fund performance. Financial intermediaries to an extent use the interest rate to determine its banking rates, thus if the interest rate is low, the bank lending rate would also be low. This would have the effect of reducing the cost of doing business thus making it possible for businesses and

households to have surplus funds for investment because financial intermediaries to some extent rely on the interest rate to determine the lending rate.

#### **5.4 Conclusion**

This study sought to ascertain the effect of inflation, exchange rate, and interest rate on the performance of mutual funds in Ghana. Using the ARDL bounds test approach to cointegration the results revealed that interest rate had the most profound effect on the performance of mutual funds in Ghana. It was thus recommended that the government of Ghana should put measures in place to create conducive macroeconomic environment because when treasury bill rates go down, the performance of mutual fund rises. Again, since the interest rate serves as a premise for determining the lending rate of financial intermediaries, when the government reduces the interest rate, the lending rate would also reduce which would lead to a lower cost of business and enable households and companies to invest into the fund.

## REFERENCES

- Adjasi, C., and Biekpe, B. (2005). Stock market returns and exchange rate dynamics in selected African countries: A bivariate analysis. *The African Finance Journal*, 2(6), 17-28 Retrieved from <http://dx.doi.org/10.1353/jda.0.0032>.
- Adler, M., and Dumas, B. (1984). Exposure to currency risk: Definition and measurement. *Financial Management*, 13(Summer), 41-50. <http://dx.doi.org/10>
- Ali, I., Rehman, K., Yilmaz, A., Khan, M., & Afazal, h. (2010). Causal relationship between macroeconomic indicators and stock exchange prices in Pakistan. *African Journal of Business Management*, 4(3), 312-319.
- Ahmed, E. M. A. (2011). The long run relationship between money supply, real GDP, 186 and price level: Empirical evidence from Sudan. *Journal of Business Studies Quarterly*. 2(2), 68-79.
- Ayeboo, G.X. (2012) Financial literacy for all mutual funds in Ghana. Accessed on 22<sup>nd</sup> April, 2016.
- Baltagi, B. H. (2011). *Econometrics*, 5th Edition. New York: Springer Science+BusinessMedia
- Bawumia, M. (2014). Bank of Ghana measures on cedi depreciation not working. Article retrieved from [www.citifmonline.com/Ghana](http://www.citifmonline.com/Ghana) on 26<sup>th</sup> March, 2016
- Becher, D. A., Jensen, R. G., and Mercer, J. M. (2008). Monetary policy indicators as Predictor of stock returns (2008). *The Journal of Financial Research*. 31(4). pp. 357-379. Retrieved from <http://dx.doi.org/10.1111/j.1475-6803.2008.00243.x>.
- Becker S. and Vaughan G. (2001) "Small is beautiful." *Journal of portfolio management*, Vol 27(4), pp.9-18
- Blake C., Morey M., (1999) 'Morningstar Ratings and Mutual Fund Performance', SSRN Working Paper Series

- Boyte-White C. (2015). How Interest rates affect mutual funds
- Brown, R. L., Durbin, J. & Evans, J. M. (1975). Techniques for Testing the Constancy of Regression Relationships Over Time. *Journal of the Royal Statistical Society, Series B*, 37, 149–192.
- Chen Y., & Qin Nan., (2016) ‘The behavior of Investor Flows in Corporate Mutual Bonds’, *Journal of Management Science*
- Cici G., & Palacios G.F., (2015) ‘On the use of options by mutual funds: Do they know what they are doing?’ *Journal of Banking & Finance*, Vol. 50, pp.157-16
- Dahlquist M., Engstrom S., Soderlind P., (2000) 'Performance and Characteristics of Swedish Mutual Funds', *The Journal of Financial and Quantitative Analysis*, Vol. 35, No. 3, pp. 409-423;
- Delia-Elena D., &Alexandru, A. (2011), “The relationship between mutual funds-inflation rate and benchmark interest rate. USA vrs Romani
- Dexia Asset Management, *Inflation and equity returns: what’s the link?*,2010, [www.dexia-am.com](http://www.dexia-am.com)
- Driver, C., Moreton, D. (1991), “The Influence of Uncertainty on UK Manufacturing Investment.” *Economic Journal* 101, 1452-1459.
- Elton, E.J. & Gruber, M.J. (1988), A multi-risk index model of the Japanese stock market
- Engle, R. F.&Granger, C. W. J. (1987). Co-integration and error correction representation: estimation and testing. *Econometrica*, 55, 251–276.
- Erdugan, R. (2012) The effects of economic factors on the performance of the Australian Stock Market (Doctoral dissertation, Victoria University Melbourne).
- Fama E., French K., (1992) ' The Cross-Section of Expected Stock Returns', *The Journal of Finance*, Vol. 47, No. 2, pp. 427-465;

Fernando, D., Klapper, L.F., Sulla, V., & Vittas, D. (2003). The Global Growth of Mutual Funds-Policy Research Paper 3055. Washington DC.

Frimpong, M.J. & Oteng-Abayie, E. (2011). "On the Predictability of Inflation rate in Ghana : A Box Jenkins Approach

Fosu, O. G., Bondzie, E. A. & Okyere, A.G. (2014). Does foreign direct investment really affect Ghana's economic growth?. *International Journal of Academic Research and Management Science*, 3(1). ISSN: 2226-3624. Retrieved from 192 <http://dx.doi.org/10.6007/ijarems/v3-i1/602>

Greene, W. H. (2008). *Econometric Analysis*, 6th Edition, Upper Saddle River, NJ: Prentice-Hall

Guedj I., Papastaikoudi J., (2003) 'Can Mutual Fund Families Affect the Performance of Their Funds'

Illeditsch, P. K., 2011, "Ambiguous information, portfolio inertia and excess volatility", *Journal of Finance* 66, 2213–2247.

Issahaku, H., Ustarz, Y., and Domanban, B.P. (2013). Macroeconomic variables and stock market returns in Ghana. Any causal link? *Asian Economic and Financial Review*.3(8).pp. 1044-1062. Retrieved from <http://dx.doi.org/10.1787/888933143526>

Jensen M., (1967) 'The Performance of Mutual Funds in the Period 1945-1964', *The Journal of Finance*, Vol. 23, No. 2, pp. 389-416;

Johansen, S. (1988). Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, 12, 231-254.

Johansen, S. (1990). Maximum Likelihood Estimation and Inference on Cointegration – With Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, 51, 169–210.

Kariuki, E.C., (2014) 'Effect of Macroeconomic Variables on Financial Performance of Mutual Funds Industry in Kenya' (Masters dissertation)



Kuwornu, J.K.M. (2012). Effect of macroeconomic variables on the Ghanaian stock market returns: A cointegration analysis. *Agris on-line papers in economics and informatics*, 4(2),pp.1-12. Retrieved from <http://dx.doi.org/10.1787/888933143526>.

Lyubomyr, S. (2007) The determinants of the Mutual funds performance in Ukraine (Masters dissertation, National University, “Kyiv-Mohyla Academy”)

Markowitz, H.M. (1952). "Portfolio Selection". *The Journal of Finance* 7 (1): 77–91

Mensah, M., Awunyo-Victor, D. & Sey, E.W. (2012). Challenges and prospects of the Ghana Stock Exchange. *Developing Country Studies*. 2(10). ISSN 2224-607X (Paper) ISSN 2225-0565. Retrieved from the Business Source Complete database.

Njau, D.K. (2013). The effect of selected macroeconomic variables on the financial performance of Private Equity firms in Kenya (Masters dissertation)

Oehler, A., Pukthuanthong, K., Rummer, M., & Thomas, W. (2007). *Venture Capital in Europe: Closing the Gap to the U.S.* Rochester, New York.

Olweny, T., & Omondi, K. (2011). The effect of macro-economic factors on stock return volatility in the Nairobi stock exchange, Kenya. *Economics and Finance Review* 1(10), 34-48.

Otten R., Bams D., (2003) 'The performance of Local versus Foreign Mutual Fund Managers', EFMA 2003 Helsinki Meetings Paper;

Pesaran M.H. & Shin Y. (1999). An autoregressive distributed lag modelling approach cointegration analysis. In: Strøm S. editor. *Econometrics and economic theory in the twentieth century: the Ragnar Frisch Centennial Symposium*, Cambridge: Cambridge University Press.

Pesaran, M.H., Shin, Y., & Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16, 289-326.

Ramey, Garey, and Valerie A. Ramey, 1995, “Cross-Country Evidence on the Link between Volatility and Growth,” *American Economic Review*, Vol. 85 (December), pp. 1138–51.

Reilly Frank K. and Brown Keith C, 2003.*Investment Analysis And Portfolio Management*.

Remolona, E.M., Kleiman, P. & GruensteinBocain, D. (1997). Market Returns and Mutual fund flows. *Economic Policy Review*.3(2).

Romain, A., and Pottelsberghe, B. V. (2004).*The economic impact of venture capital*(Working Papers CEB No. 04-014.RS). ULB -- UniversiteLibre de Bruxelles.

Ross, S.A. (1976). "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory* (December 1976):341-60.

Sharpe W., (1964) 'Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk', *The Journal of Finance*, Vol. 19, No. 3, pp. 425-442;

Sharpe W., (1966) 'Mutual Fund Performance', *The Journal of Business*, Vol. 39, No. 1, Part 2: Supplement on Security Prices, pp. 119-138;

Smirlock, M. and Yawitz, (1985) 'Asset returns, discount rate changes and market efficiency', *Journal of the American Finance Association*

Titman, S. and Warga, A. (1989) Stock returns as predictors of interest rate and inflation, *Journal of Financial and Quantitative Analysis*/Volume 24/Issue 01, pp 47-58

Wermers R., (2000) 'Mutual Fund Performance: An Empirical Decomposition into Stock-Picking Talent, Style, Transactions Costs, and Expenses', *The Journal of Finance*, Vol. 55, No. 4, pp. 1655-1695.

Wooldridge, J. M. (2013). *Introductory Econometrics: A Modern Approach*. Mason, OH: South-Western–Cengage Learning.

## APPENDIX

### Summary Statistics

	<b>LNPRICE</b>	<b>LNEXC</b>	<b>LNINF</b>	<b>LNTBR</b>	<b>LNNAV</b>
<b>Mean</b>	-0.966608	0.916490	2.554776	2.996937	4.886353
<b>Median</b>	-0.786382	0.831442	2.613679	2.953802	5.025412
<b>Maximum</b>	-0.637249	1.464967	2.884801	3.192448	5.232830
<b>Minimum</b>	-1.586996	0.499259	2.151762	2.915671	4.314786
<b>Std. Dev.</b>	0.343138	0.308863	0.261820	0.090541	0.314608
<b>Skewness</b>	-0.807005	0.260047	-0.239952	1.291303	-0.817251
<b>Kurtosis</b>	1.939212	1.486075	1.459663	3.070313	1.997493
<b>Jarque-Bera</b>	7.460599	5.124936	5.205893	13.34960	7.353239
<b>Probability</b>	0.023986	0.077114	0.074055	0.001262	0.025308
<b>Sum</b>	-46.39717	43.99154	122.6293	143.8530	234.5449
<b>Sum Sq. Dev.</b>	5.533949	4.483636	3.221843	0.385295	4.651963
<b>Observations</b>	48	48	48	48	48

### ARDL ESTIMATION OUTPUT

Dependent Variable: LNPRICE

Method: ARDL

Date: 10/04/16 Time: 11:16

Sample (adjusted): 3 48

Included observations: 46 after adjustments

Maximum dependent lags: 2 (Automatic selection)

Model selection method: Schwarz criterion (SIC)

Dynamic regressors (2 lags, automatic): LNEXC LNINF LNTBR LNNAV

Fixed regressors: C

Number of models evaluated: 162

Selected Model: ARDL(2, 0, 1, 2, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNPRICE(-1)	1.006169	0.093258	10.78914	0.0000
LNPRICE(-2)	-0.208014	0.088623	-2.347189	0.0247
LNEXC	-0.007772	0.035454	-0.219228	0.8277
LNINF	-0.210446	0.103283	-2.037569	0.0492
LNINF(-1)	0.330711	0.110474	2.993576	0.0050
LNTBR	-0.307300	0.103633	-2.965276	0.0054
LNTBR(-1)	-0.297290	0.158154	-1.879754	0.0685
LNTBR(-2)	0.376477	0.101475	3.710054	0.0007
LNNAV	0.435866	0.057854	7.533916	0.0000
LNNAV(-1)	-0.378454	0.062330	-6.071766	0.0000
C	-0.080038	0.406301	-0.196993	0.8450

R-squared                      0.998563    Mean dependent var                      -0.939711

Adjusted R-squared	0.998152	S.D. dependent var	0.324389
S.E. of regression	0.013945	Akaike info criterion	-5.502451
Sum squared resid	0.006806	Schwarz criterion	-5.065168
Log likelihood	137.5564	Hannan-Quinn criter.	-5.338642
F-statistic	2431.619	Durbin-Watson stat	1.969926
Prob(F-statistic)	0.000000		

\*Note: p-values and any subsequent tests do not account for model selection.

#### ARDL Bounds Test

Date: 10/04/16 Time: 11:16

Sample: 3 48

Included observations: 46

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	5.941635	4

#### Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

#### Test Equation:

Dependent Variable: D(LNPRICE)

Method: Least Squares

Date: 10/04/16 Time: 11:16

Sample: 3 48

Included observations: 46

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPRICE(-1))	0.220537	0.090809	2.428576	0.0204
D(LNINF)	-0.185454	0.111511	-1.663103	0.1052
D(LNTBR)	-0.315972	0.104046	-3.036830	0.0045
D(LNTBR(-1))	-0.379095	0.100619	-3.767627	0.0006
D(LNNAV)	0.431730	0.056500	7.641243	0.0000
C	-0.145824	0.411683	-0.354214	0.7253
LNEXC(-1)	-0.021563	0.035725	-0.603578	0.5500
LNINF(-1)	0.143756	0.075598	1.901583	0.0655
LNTBR(-1)	-0.211273	0.082252	-2.568604	0.0146
LNNAV(-1)	0.051278	0.042141	1.216805	0.2318
LNPRICE(-1)	-0.198934	0.064731	-3.073240	0.0041

R-squared	0.857452	Mean dependent var	0.020051
Adjusted R-squared	0.816724	S.D. dependent var	0.032427
S.E. of regression	0.013882	Akaike info criterion	-5.511434
Sum squared resid	0.006745	Schwarz criterion	-5.074150

Log likelihood	137.7630	Hannan-Quinn criter.	-5.347625
F-statistic	21.05318	Durbin-Watson stat	1.948938
Prob(F-statistic)	0.000000		

ARDL Cointegrating And Long Run Form

Dependent Variable: LNPRICE

Selected Model: ARDL(2, 0, 1, 2, 1)

Date: 10/04/16 Time: 11:17

Sample: 1 48

Included observations: 46

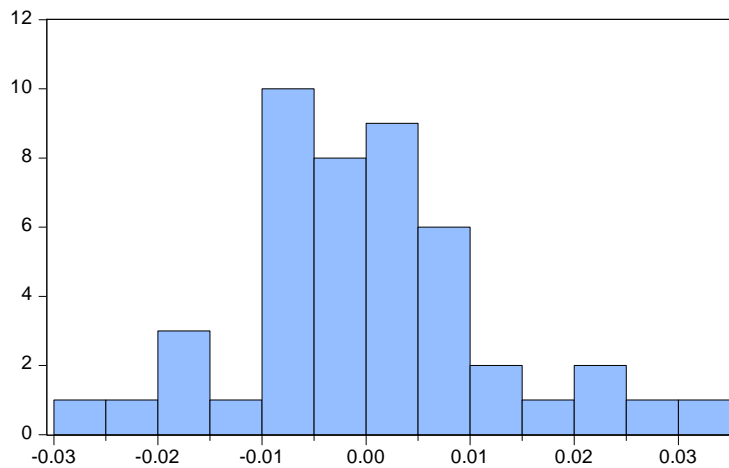
Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPRICE(-1))	0.208014	0.088623	2.347189	0.0247
D(LNEXC)	-0.007772	0.035454	-0.219228	0.8277
D(LNINF)	-0.210446	0.103283	-2.037569	0.0492
D(LNTBR)	-0.307300	0.103633	-2.965276	0.0054
D(LNTBR(-1))	-0.376477	0.101475	-3.710054	0.0007
D(LNNAV)	0.435866	0.057854	7.533916	0.0000
CointEq(-1)	-0.201845	0.064839	-3.113026	0.0037

$$\text{Cointeq} = \text{LNPRICE} - (-0.0385 \cdot \text{LNEXC} + 0.5958 \cdot \text{LNINF} - 1.1301 \cdot \text{LNTBR} + 0.2844 \cdot \text{LNNAV} - 0.3965)$$

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXC	-0.038507	0.176102	-0.218662	0.8282
LNINF	0.595831	0.308822	1.929369	0.0418
LNTBR	-1.130140	0.418690	-2.699228	0.0106
LNNAV	0.284439	0.145587	1.953745	0.0488
C	-0.396533	1.941344	-0.204257	0.8393



Series: Residuals	
Sample 3 48	
Observations 46	
Mean	2.59e-16
Median	-0.000674
Maximum	0.030705
Minimum	-0.029904
Std. Dev.	0.012298
Skewness	0.269554
Kurtosis	3.478156
Jarque-Bera	0.995267
Probability	0.607968

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.194712	Prob. F(2,33)	0.1274
Obs*R-squared	5.400283	Prob. Chi-Square(2)	0.1672

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 10/04/16 Time: 11:19

Sample: 3 48

Included observations: 46

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPRICE(-1)	0.064000	0.115511	0.554057	0.5833
LNPRICE(-2)	0.001049	0.095249	0.011017	0.9913
LNEXC	-0.011642	0.035473	-0.328195	0.7448
LNINF	0.024229	0.101121	0.239603	0.8121
LNINF(-1)	-0.044032	0.109398	-0.402494	0.6899
LNTBR	-0.047654	0.105542	-0.451511	0.6546
LNTBR(-1)	0.126706	0.164724	0.769201	0.4472
LNTBR(-2)	-0.059927	0.102265	-0.585995	0.5619
LNAV	-0.029020	0.058715	-0.494252	0.6244
LNAV(-1)	-0.013543	0.060828	-0.222643	0.8252
C	0.274920	0.418957	0.656203	0.5162
RESID(-1)	-0.046094	0.209708	-0.219800	0.8274
RESID(-2)	-0.419429	0.200337	-2.093613	0.0441
R-squared	0.117397	Mean dependent var	2.59E-16	
Adjusted R-squared	-0.203549	S.D. dependent var	0.012298	
S.E. of regression	0.013492	Akaike info criterion	-5.540375	
Sum squared resid	0.006007	Schwarz criterion	-5.023585	
Log likelihood	140.4286	Hannan-Quinn criter.	-5.346783	
F-statistic	0.365785	Durbin-Watson stat	2.143031	
Prob(F-statistic)	0.966692			

---



---

Heteroskedasticity Test: Breusch-Pagan-Godfrey

---

F-statistic	3.369060	Prob. F(10,35)	0.5636
Obs*R-squared	22.56157	Prob. Chi-Square(10)	0.5125
Scaled explained SS	16.18409	Prob. Chi-Square(10)	0.0945

---

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 10/04/16 Time: 11:20

Sample: 3 48

Included observations: 46

---



---

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002536	0.005553	0.456603	0.6508
LNPRICE(-1)	0.001962	0.001275	1.539163	0.1328
LNPRICE(-2)	-0.002138	0.001211	-1.765175	0.0863
LNEXC	-0.001110	0.000485	-2.291550	0.0281
LNINF	-0.003559	0.001412	-2.520875	0.0164
LNINF(-1)	0.005701	0.001510	3.775722	0.0006
LNTBR	-0.000961	0.001416	-0.678717	0.5018
LNTBR(-1)	-0.003556	0.002162	-1.645212	0.1089
LNTBR(-2)	0.003496	0.001387	2.520911	0.0164
LNAV	-0.002379	0.000791	-3.008281	0.0048
LNAV(-1)	0.001585	0.000852	1.860751	0.0712

---



---

R-squared	0.490469	Mean dependent var	0.000148
Adjusted R-squared	0.344889	S.D. dependent var	0.000235
S.E. of regression	0.000191	Akaike info criterion	-14.08779
Sum squared resid	1.27E-06	Schwarz criterion	-13.65051
Log likelihood	335.0192	Hannan-Quinn criter.	-13.92398
F-statistic	3.369060	Durbin-Watson stat	2.183691
Prob(F-statistic)	0.003639		

---



---

Ramsey RESET Test

Equation: UNTITLED

Specification: LNPRICE LNPRICE(-1) LNPRICE(-2) LNEXC LNINF LNINF(-1) LNTBR LNTBR(-1) LNTBR(-2) LNAV LNAV(-1) C

Omitted Variables: Squares of fitted values

---



---

	Value	df	Probability
t-statistic	2.497401	34	0.2175
F-statistic	6.237010	(1, 34)	0.9175

---



---

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.001055	1	0.001055
Restricted SSR	0.006806	35	0.000194
Unrestricted SSR	0.005751	34	0.000169

Unrestricted Test Equation:  
 Dependent Variable: LNPRICE  
 Method: ARDL  
 Date: 10/04/16 Time: 11:20  
 Sample: 3 48  
 Included observations: 46  
 Maximum dependent lags: 2 (Automatic selection)  
 Model selection method: Schwarz criterion (SIC)  
 Dynamic regressors (2 lags, automatic):  
 Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNPRICE(-1)	0.397244	0.258872	1.534517	0.1342
LNPRICE(-2)	-0.025029	0.110455	-0.226595	0.8221
LNEXC	0.041320	0.038468	1.074139	0.2903
LNINF	-0.037374	0.118666	-0.314952	0.7547
LNINF(-1)	0.097315	0.139104	0.699583	0.4889
LNTBR	-0.056810	0.139292	-0.407847	0.6859
LNTBR(-1)	-0.078065	0.171647	-0.454799	0.6521
LNTBR(-2)	-0.002893	0.178976	-0.016163	0.9872
LNNAV	0.190018	0.112259	1.692671	0.0997
LNNAV(-1)	-0.168701	0.102144	-1.651590	0.1078
C	-0.245422	0.384681	-0.637989	0.5278
FITTED^2	-0.226752	0.090795	-2.497401	0.0175
R-squared	0.998785	Mean dependent var		-0.939711
Adjusted R-squared	0.998393	S.D. dependent var		0.324389
S.E. of regression	0.013006	Akaike info criterion		-5.627400
Sum squared resid	0.005751	Schwarz criterion		-5.150363
Log likelihood	141.4302	Hannan-Quinn criter.		-5.448699
F-statistic	2541.893	Durbin-Watson stat		1.833480
Prob(F-statistic)	0.000000			

\*Note: p-values and any subsequent tests do not account for model selection.