

**EFFECT OF MACROECONOMIC FACTORS ON FINANCIAL PERFORMANCE OF
NATIONAL SOCIAL SECURITY FUND IN KENYA**

**BY
MICHAEL J. G. WANYEKI**

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DECLARATION

I declare that this proposal is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no material written or published by other people except where due reference is made and author duly acknowledged.

Student Name: MICHAEL JOSEPH GACHANJA WANYEKI

Reg. No. KCA/08/00168

Sign: _____ Date: _____

I do hereby confirm that I have examined the master's proposal of Michael J. Gachanja Wanyeki

Sign: _____ Date: _____

Dr. Christine Nanjala

Supervisor

ABSTRACT

Studies have shown that firm's financial performance is influenced by the business cycle. During boom times, firms and households commit larger proportions of their income flow to debt servicing with preference for leverage following a pro-cyclical pattern. Both the demand for leverage and firms' income will rise and fall with the business cycle assuming *ceteris paribus*. However, studies have proven this not be true from the mixed results on the relationship between the macroeconomic variables and performance of the firms. There are a number of studies globally that indicate the existence of a relationship between the macroeconomic variable and the firm's financial performance. The National Social Security Fund (NSSF) is an institutional investor whose profitability depends on how other sectors are performing. The funds for instance made a loss of over Sh. 10 billion in 2016 due to the decline in the performance by listed firms at the Nairobi Security Exchange. The purpose of this study is to investigate the effect of macroeconomic factors on the financial performance of National Social Security Fund in Kenya. The objectives of the study are to determine the effect of foreign exchange rates on the financial performance, establish the effect of the inflation rate on the financial performance, assess the effect of level of interest rates on the financial performance and to establish the effect of the Gross Domestic Product on the financial performance of NSSF. The study adopts a descriptive research design in which the target population is financial publication and the Kenya National Bureau of Statistics library. Secondary data was obtained from the NSSF and Kenya Bureau of Statistics and the Central Bank. Data was analysed using economic model and using tests as Johansen cointegration test, Granger causality test and Vector Autoregressive model with the aid of STATA as the statistical software. A regression model was fitted to the data and the results of the study show that GDP, exchange rates and inflation rates had a positive and significant influence on the NSSF in Kenya. The study also shows that though Interest rates have a positive influence of the financial performance of NSFF in Kenya, its impact is insignificant compared to the rest of the variables in the study. There however exists cointegrating relationship between the variables and the study shows that in the long run interest rates and inflation rates have a negative influence on the financial performance of NSSF in Kenya and become statistically insignificant.

Key Words: Exchange Rates, Inflation Rate, Gross Domestic Product, Interest Rates, National Social Security Fund.

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DEDICATION

I dedicate this work to my parents the late Mr. Jackson N. Wanyeki and Freshia Wanjiru and also to my brothers and sister. I dedicate this work especially my late father for your passion for education that you always wished to see your children excel in education. I dedicate this work to my entire family for the encouragement and support all through. I owe it all to you for your contribution towards my education.

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ABBREVIATIONS AND ACRONYMS

APT:	Arbitrage Pricing Theory
CAPM:	Capital Asset Pricing Model
CBK:	Central Bank of Kenya
DB:	Defined Benefits
DC:	Defined contribution
EBRI:	Employee Benefit Research Institute
GDP:	Gross Domestic Product
IPO:	Initial Public Offering
MPT:	Modern Portfolio Theory
NSE:	Nairobi Security Exchange
NSSF:	National Social Security Fund
RBA:	Retirement Benefits Authority
ROA:	Return on Assets
ROE:	Return on Equity
ROI:	Return on Investments
ADF:	Augmented Dickey Fuller
LR:	Likelihood Ratio
FPE:	Final Prediction Error
AIC:	Akaike Information Criterion
SBIC:	Schwarz Bayesian Information Criterion
HQIC:	Hannan-Quinn Information Criterion
VECM:	Vector Error Correction Model

DEFINITION OF OPERATIONAL TERMS

- Exchange rate:** Refers to the ratio at which one country's currency exchanges for another country's currency. It is the expression of a country's currency in terms of another country's currency.
- Gross Domestic Product:** Refers to the monetary measure of the market value of all final goods and services produced in a country for a period of time, expressed as either quarterly or annually.
- Inflation:** Refers general increase in the level of prices in an economy that is sustained over a period of time.
- Interest rate:** Refers to the amount of a loan that is charged and repaid as interest to the borrower, which is expressed as an annual percentage of the loan outstanding in any given time.
- Macroeconomic factors:** Refers to a general trend or characteristic or condition that applies to a broad aspect of an economy or comes from a large aspect of an economy rather than a certain population.
- Performance:** Refers to the actual results or production or output of an organization when measured against its intended or expected outputs.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

As years go by, retirement benefits continue to gather more and more interest as far as income replacement in old age is concerned. Pension funds have continue to form the main source of income after retirement and therefore governments continue to lay more and more emphasis on the need to secure proper management of retirement benefits for their citizens in a bid to curb poverty rates witnessed especially in old age post retirement. Millions of people in the world continue to rely on pension funds as the principal sources of income in retirement (Sze 2008). A number of studies have extensively tried to cover this fact. For instance in Kenya, retirement income accounts for 68% of the total income for people in retirement (Hinz, Kakwani and Sun 2006). It further accounts for 44% of total retirement income for retirees in Austria, 80% in France and 45% in Australia. 82% of retirees in the United States of America depend on pension income (EBRI, 2007). Closer home we see that in South Africa, 75% of the elderly population rely on pension income (Alliance Global Investors, 2007). It is clear and evident that pension funds are pertinent to the health of an economy, if its citizens are going to achieve financial freedom in retirement, hence must be managed efficiently.

In previous studies, it has been proven that pension assets is an integral part of the well being and progress of any economy. According to Alliance Global Investors (2007), pension assets in Australia amount to AU\$ 1trillion which is equivalent to 20% of the GDP. In 2003, the pension assets of Canada were worth CAD 1.3 trillion which was equivalent to 30% of the GDP and in Belgium pension assets were worth 140 billion Euro in 2004. Pension assets in China amounted

to RMB 714 billion, equivalent to 24% of GDP in 2003, while in the United Kingdom pension assets accounted for 14% of the GDP amounting to GBP 1.9 trillion in the same year. In the United States of America, pension assets were valued at US\$ 14.5 trillion which represented 37.7% of the country's GDP. In Kenya pension assets amounted to KSH 130 billion in 2006, which was an equivalent of 30% of the GDP (RBA, 2007) while in South Africa, the pension assets had a value of ZAR 1098 billion in 2004 (Alliance Global Investors, 2007). We therefore see that indeed pension funds have an important contribution to the GDPs of various economies world over. It therefore follows in the same breath of importance to note that the same economy influences the performance of pension funds and therefore must be managed effectively.

By channeling accumulated retirement savings into investments in financial assets pension funds fulfill an important role in the economy by subsequently transforming these assets into a predictable post -employment income. Their huge contribution to capital markets stimulates commerce activity through financial intermediation. Pension funds generate return themselves and therefore may act as a substitute for banks and alternative investment avenues. Pension funds significantly contributes to the Kenya financial markets as sources of capital (Omondi, 2008). In 2007, pension funds invested a sum of Ksh. 223 billion in the Kenyan financial sector of which Ksh. 77 billion, representing 22% of the outstanding domestic debt was invested in treasury bills and bonds (Omondi 2008). The returns in these long term asset classes do have a major contribution in determining the level of post retirement income that retirees would therefore get from defined contribution or defined benefits schemes, though the two plan set ups have different approaches as far as benefits structure is concerned.

Like in all other sectors of the economy, the performance of the pension funds depends on general performance of the economy. As the country economy performs better, companies in that country

are expected to proportionately perform better financially. The economic performance is measured on the basis of the stability in macroeconomic variables, which includes the consumer price index, unemployment, Gross Domestic Product, interest rates and stock market index among other factors. The stability and gradual improvement of these economic variables are the basis for business growth over time (World Bank Group, 2015). Various researchers have found significant relationships between macroeconomic variables and the performance of pension funds in various countries (Beber *et al.*, 2008). The studies looked at multi-factor models as well as single-factor models which incorporated macroeconomic variables as explanatory factors of variation in equity returns. For favorable and sustainable business growth, it is expected that the macroeconomic variables will remain stable and favorable. This is the expectation that informs policy formulation both at macro and micro levels of the economy. Further to this is that, both potential and existing investors hope that these variables remain stable for there to be a favorable investment and operating environment for both institutional which incorporates pension fund managers as well as retail investors. This stability of the elements informs the stability of the returns on investments.

Kenya has faced challenges in some of the key macroeconomic variables in the past. A case in point is the period from 2011 to 2012, when the country experienced high unexpected rates of inflation, high interest rates as well as a weakened local currency. In response to this, the CBK adjusted the base lending rates upwards with the intention of taming the increased inflation and regularize the local currency performance against international pairs. This in effect impacted on the performance of various investments in the economy since consumption increased as funding shifted from investment activities into consumption. As shown in a study done by Nyamute (1998) the economy's state does affect the way an economy's securities market performs with regards the price movements. In periods of depression or recession in the economy, investments, which

include investments in the stock market, have unfavorable returns and therefore the demand for these investments, in this case stocks will come down and subsequently resulting to a declining trend in their trading prices. The same sequential occurrence takes place in periods of economic boom where the general trend in prices will take an upward direction in response to increased demand in the market due to better economic performance.

Some of the largest institutional investors in Kenya are the Pension funds which control fairly significant amounts of capital. The asset classes where these pension schemes invest in include property, equities, bonds, fixed and call deposits, private equity among others. The scope of this study is therefore aimed at determining the effect of some selected macroeconomic variables on the returns realized by pension funds, specifically the general returns realized by the NSSF.

1.1.1 Macroeconomic Variables

Macro-economic variables have been defined as the economic variables that affect an economy at a broad level, national or regional and affect a big and extensive population or group, Brinson *et al.* (2009). These variables include; gross domestic product, inflation, interest rates and exchange rates. Further to this, the other factors that have an impact to the economic performance is the regulatory and legal elements as well as various risks involved in the investment activities (Ilo, 2012). Interest rates, GDP, inflation, fiscal deficits, exchange rates and the balance of trade accounts are some of the major variables that influence the investment markets.

Governments, businesses and consumers and also by extension pension funds keenly monitor the behavior of these variables because they have an impact on the various financial performances pertinent to the various stakeholders respectively. Kwon & Shin (2008) tells us that, the performance of firms in a country is highly influenced and affected by the economic status. This

status is really the performance depicted from the economic variables which mainly include interest rates, inflation rates, gross domestic product, exchange rates as well as market risk. Due to the long term investment objective for most pension funds, the expectation of the fund managers is that the economic environment will remain stable to allow for favorable investment operations over the period of investment, Sharma and Singh (2011)

It is now widely understood that financial performance react in response to and that macroeconomic variables have explanatory power over performance in prices and returns, Pearce, Roley (1985) and Wasserfallen (1989). This has been a topic of debate in the past as to whether news about the economic performance or indications had an impact on the firm's financial performance. In their study, Flannery and Protopapakis (2002) indicated that the volatility as well as the returns in the stock market are influenced by the behavior in macroeconomic. McQueen and Roley (1993) again highlight that the general state of the economy will determine how the equities market respond to macroeconomic effects.

1.1.2 Financial Performance

Financial performance would basically be defined as the extent to which a firm is able to meet its financial objectives while conducting its financial activities. This also involves measuring the degree to which these objectives have been achieved against the firm's policies and operations and presenting the results in monetary terms (Nzuve, 2016). Using these measures, firms can gauge their general financial health as well as make comparisons between them and industry or sector counterparts. Again the same measures can be used to make comparisons between industries as well as sectors in aggregation over a period of time (Prasanna, 2002). By looking at the relationship of items in the firm's balances sheet and profit and loss account, one would be able to analyze the

financial strengths and weaknesses of the firm. Basically, the financial performance analysis process involves the collection of data or information, the analysis of it and giving of reports regarding the performance of an organization, a group, a system, or even an individual or component.

Some of the various financial performance measures there have been include; the return on assets which determines the ability of a firm to make use of its assets. Another is the return on equity which shows what gains investors will get on their investments while the return on sales shows how much a company is able to earn in relation to its sales. Financial measures are easy to calculate and their definitions are agreed on worldwide which make's financial measures an easy tool to use in the measure of a firm's financial performance. The use of financial measures has traditionally been the tool used to evaluate the success organizations (Tangen, 2003).

Liquidity which is another measure of financial performance, measures an organization's or business ability to smoothly meet their financial obligations, without disruptions in the normal, ongoing operations of the business, as the obligations become due. Basically this explains how easy a business is able to pay its daily operational bills without major disruptions both in its structure as well as it operations. An organizations structural liquidity is the relationship between its assets and liabilities as depicted in its balances sheet while its operational liquidity basically refers to its cash flow measures. Solvency which also falls under liquidity measures, checks the level of debt in use in the firm in relation to the amount of shareholders equity capital invested in the firm (Kharawish, 2011).

Another measure of financial performance is Profitability which measures the extent to which a firm realizes a profit. Analysis on profitability looks at a firms' revenues in relation to its expenses

and how well or otherwise a business is able to generate profits in consideration of its size in terms of investments. According to Hansen & Mowen, 2005, the four useful measures of profitability for a firm are the rate of return on assets abbreviated as ROA, the operating profit margin the rate of return on equity abbreviated as ROE and its net income. This study will measure the performance of NSSF in terms of returns on investments (ROI) and ROA on grounds that most of the pension funds income is majorly from investments in the stock market, government securities, corporate bonds, deposits and property investments.

1.1.3 Macroeconomic Variables and Firm's Financial Performance

Many studies show that a firm's financial performance conforms to the influence by the business cycle (Calomiris et al 1997; Kaufman 1998). This means that, firms and households do commit more of their income funds flow to debt servicing during boom times. This happens with inclination towards the demand for leverage as the government increases spending and reduces taxes during the boom period and vice versa during the recession, an economic activity known as a pro-cyclical pattern. The demand for leverage as well as the firms' income will shift accordingly with the rise and fall in the business cycle assuming *ceteris paribus*. However, studies have proven this not be true from the mixed results on the relationship between the firm's financial performance and macroeconomic variables. The studies on this relationship have concentrated on three macroeconomic variables; the inflation rate, the long-term interest rate and the growth rate of money supply. Interest rates changes and GDP growth have been established to have the most positive influence on the banks income growth (Laker, 1999). In his study of the influence of macroeconomic variables on stock performance using regression models, Ciftci (2014) found that the impact of some macroeconomic variables differed between industries whereas in others,

macroeconomic variables had a homogenous impact. For instance while the crude oil impacted negatively on the stock returns of consumer goods, services, financial and health. There was no evidence found to suggest that interest rate affected stock returns.

In another study, Nousheen and Arshad (2013) investigated the impact of firm specific factors and the macroeconomic factors on profitability of the firms in the food sector. They found that profitability of the food sector was shaped by firm specific factors including debt of equity, tangibility, growth and size and not the macroeconomic variable namely, food inflation. One limitation is that this study only considered one macroeconomic variable making their findings not suitable for generalization.

In yet another study, Barnor (2014) looked at the effect of macroeconomic variables of inflation, exchange rate, interest rate and money supply on the stock market return in Ghana. Performing a time series analysis, he found that interest rate and money supply had significant negative effect on the stock market returns while exchange rate positively influenced the stock market returns. Inflation rate did not have a significant effect on the stock market returns. The mixed results from these studies is a pointer to the need for a further research to determine the effect of macroeconomic variables on the financial performance of the individual firms and pensions funds in particular.

1.1.4 Overview of National Social Security Fund (NSSF)

National social security fund in Kenya form serves workers and the citizenry as the first pillar of social protection. After Ghana, Kenya became the second country in Africa to institute a pension scheme that would serve the general population's social security needs. In 1965, the National Social Security Fund in Kenya was established. This was done through an Act of Parliament (Cap

258). The Scheme was originally formed as a provident fund and so operates as such, paying lump sum benefits rather than commutation of a section of the benefits as a cash payout and converting the rest into a pension as would be the case in a pension fund. Due to gross mismanagement over the years and the low contribution rates in the fund, NSSF has been rendered irrelevant in the purpose for which it was formed, which was to serve as the workers first pillar of social protection. All employees are required to participate in the scheme and employers with one or more regular employees are required to make deductions from workers remunerations into the fund as a mandatory requirement. NSSF's current coverage of workers who contribute to it stands at approximately 3 million (Chitembwe, 2007).

The initial contributions structure to the NSSF required that a member contributes 5% of their monthly earnings capped at Kshs. 200 and the employer would match the same. This was however revised under the NSSF Act of 2013 which requires that members contribute 6% of their monthly earnings that fall between the lower earnings limit and upper earning limits as prescribed. The same is then matched by the employer. Initially, the social security fund covered teachers, the military, civil servants, members of parliament and judiciary employees, (Kakwani et al., 2006). However, after its transformation into an autonomous state corporation in 1987, coverage was extended and opened up all Kenyans above the age of 18 years. Some of the benefits that members get from the scheme include income replacement in retirement, permanent disability compensation, survivor benefits, pension income to dependants in the event of death of a participant, disability pension for the military personnel and a last expense benefit per member paid to surviving beneficiaries.

The NSSF in Kenya has in a number of ways been beneficial to the country both at the individual level as well as the economy level. Through its fund managers, the Fund actively participates in

the Nairobi Stock Exchange with a large chunk of the fund invested in various securities at the bourse. This large contribution to the NSE helps in stabilizing activities and operations in the stock market. NSSF has also invested in the property market where it owns commercial plots and buildings from which it collects rent. By ensuring that the rates charged as rent are fair and standard in the property market, NSSF in effect stabilizes property rental costs while giving returns to the members' savings. The NSSF in Kenya plays a big role of mobilizing savings and indeed implementing a savings culture in the country by facilitating the collection of monthly contributions from the working population and consolidating the same in a common fund. This process creates money circulation in that the funds collected are injected back to the economy as investments in various asset classes, thereby helping in the reduction of excess liquidity in the economy (Chitembwe, 2007).

1.2 Statement of the Problem

According to CAPM, macro-economic variables are not diversifiable since they form the systematic risk component in a portfolio. Potential investors in any sector seek to establish the profitability of the sector prior to investment. The key factors that would affect the variability of the expected returns ought to be taken into consideration and appropriate measures taken to mitigate any inappropriate conditions. There are a number of studies globally that indicate the existence of a relationship between the macroeconomic variable and the firm's financial performance (Rao, 2016; Gatuhi, 2015; Baba & Nasieku, 2016; Zoa, 2015; Sami & Jamalludin, 2014). These factors have been changing from time to time and vary from one business environment to another hence affecting the performance of various economic sectors with great variation (Nzuve, 2015). Professional investors coupled with investment advisers have focused on

such relationships across various countries. National Social Security Funds is one of the major investors in the Kenyan economy in government's treasury bills, the stock exchange and in other private sectors. Year in year out, there are reports that the pension fund has made some losses as a result of rising costs or due to exchange rates. The effects of the capital markets which is a reflection of the performance of the economy directly affects the performance of the pension fund. For instance in 2016, the fund lost Ksh. 10 billion attributed to the bear run at stocks market resulting from the decline in the share price of companies it invested in mainly the Kenya Commercial Bank and National Bank. We therefore see that various factors have different effects on the performance of firms and specifically the NSSF. How these factors affect the NSSF would be our main concern in this study with keen focus on the macroeconomic factors and their impact. It would be interesting to determine the effect of macroeconomic factors on financial performance of the NSSF in Kenya.

Various studies have been done in Kenya related to the study. Kariuki (2014) did a study on the effect of macroeconomic variables on financial performance of mutual funds industry in Kenya where he found money supply, GDP, inflation rates, interest rate and exchange rates to be the factors that influenced the financial performance of the funds. In a study of the effect of selected macroeconomic variables on the financial performance of private equity firms in Kenya Kung'u (2013) found that return on investment was influenced by macroeconomic variables with systematic risk having minimal impact but GDP coming out as main influence on the same. Osoro and Ogeto (2014) did a study that looked at how the financial performance of manufacturing firms that were listed on the NSE were affected by various macroeconomic factors. The factors they considered in this study included interest rate, exchange rates, inflation rate and fluctuations in the GDP. Their findings depicted that only foreign exchange, inflation rates and interest rates had a

significant effect on the financial performance of the firms. While these studies are beneficial to the research, none of the studies has been done on the effect of macroeconomic factors on the financial performance of NSSF, hence a knowledge gap. As important as it is to the fund managers of the NSSF in Kenya to know the effects of the various macroeconomic factors on the NSSF, the research will also strive to bridge the research gap and make a significant contribution to the empirical evidence in this particular area.

1.3 Objective of the Study

The objective of the study is to establish the effect of macroeconomic factors on the financial performance of NSSF in Kenya between 1965 and 2016.

1.3.1 Specific Objectives

The following are the specific objectives of the study:

- i). To determine the effect of foreign exchange rates on the financial performance of NSSF
- ii). To establish the effect of the inflation rates on the financial performance of NSSF
- iii). To assess the effect of level of interest rates on the financial performance of NSSF
- iv). To establish the effect of the Gross Domestic Product on the financial performance of NSSF

1.4 Research Questions

The following are the research questions:

- i). What is the effect of foreign exchange on the financial performance of NSSF?
- ii). What effect does inflation rate have on the financial performance of NSSF?

- iii). How has level of interest rate affected the financial performance of NSSF?
- iv). What is the effect of the Gross Domestic Product on the financial performance of NSSF?

1.5 Significance of the Study

The findings of the study will help the pension funds managers and NSSF in particular to have a better forecast or prediction of the impact that the macroeconomic variables would have on financial performance of the firms.

It is expected that the findings of this study will be of use to the retirement benefits regulator the RBA, both in development of the retirement benefits sector in terms of betterment of the returns to the various participating schemes as well as policy formulation that will ultimately contribute in the realization of the schemes' objectives.

The findings of this study will provide useful information to trustees who manage pension funds. This information coupled with the provisions of the scheme Investment Policy Statements and the RBA limits, will act as a guide in investment decision making being that the trustees will have a better understanding of the scheme investments in relation to the macroeconomic environment.

The empirical findings of this study as proposed will also contribute towards enrichment of knowledge and information in the field of financial markets and the retirement benefits funds in Kenya.

1.6 Justification for the Study

Retirement benefits funds diverse activities have positive and beneficial impacts to individuals as well as the economy at large. For instance when pension funds substitute and/or complement other financial institutions like investment and commercial banks as institutional investors and player in the market, in effect they induce capital and contribute to the development of financial market. These schemes also act as competing channels for household expenditure and savings as well as corporate financing. This way they spur up competition creating improved and enhanced efficiency in securities markets. The efficiency caused in the primary borrowing market following the completion created by pension schemes results in lower spreads between lending and depositing rates, and hence lower costs to access capital. This kind of influences should then ultimately have a positive and higher long-term growth in the economy.

It is therefore obvious that the performance of pension funds is paramount in the well being of an economy for any country. However, the same pension funds depend on the performance of the economy as they make their profits by investing in other sectors such as the capital markets, government securities and the real estate among others which are susceptible to macroeconomic factors. There is therefore need to investigate the effect of macroeconomic factors on the financial performance of NSSF.

1.7 Scope of the Study

The scope of this study is limited to the NSSF in Kenya and the Kenya Bureau of Statistics. All the variables will be done annually for the periods between 1965 and 2016. The year 1965 was when the NSSF was incepted and it would be interesting to know how the pension fund had been performing vis a viz the macro economic factors.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews related literature with regard to macroeconomic variables and organizational performance. The chapter also presets the theoretical and conceptual framework.

2.2 Theoretical Framework

This study is anchored on three theories namely: The Deflation Theory, the Modern Portfolio Theory (MPT) and the Arbitrage Pricing Theory (APT).

2.2.1 Deflation Theory

The Deflation theory proposed by Fisher (1933) submits that the general level of prices in the market is affected by inflation in that, a decrease on inflation rates results to the decrease in price levels. It further indicates that firms' profitability are therefore affected by inflation since when the price levels fall, this leads to the reduction of business net worth to even the eventuality of bankruptcies in extreme cases. This situation causes businesses to develop concerns of reduced earnings or losses and therefore spontaneously result to the reduction in production, trade activity and employment of labor. This happens repeatedly creating cycles that eventually have an effect on the value of money by causing disturbances and alterations in interest rates. Both internal and external disturbances best referred to as micro and macro - economic factors are blamed for an economy's over indebtedness which exists between lenders and borrowers or both that could then result to higher rates of loan defaults.

According to this theory, if the only channel through which the persistent increase in price levels is transmitted from the monetary policy is exclusively through financing, then inflationary pressures could be managed without policy adjustments if there exists alternative and sustainable sources such as external financing. This is however not always the case in practice. Practically it is necessary that there is some fiscal adjustments because either the fiscal policy has exerted too much pressure for price increases through aggregate demand channels or the available alternatives for financing are insufficient. Both challenging incidences could occur concurrently which arrives at the same results. Indeed, good amount of sustainable fiscal adjustments has proven to be effective in successful disinflation

This therefore shows that in order for a country to achieve significant reductions in inflation rates, adequate fiscal adjustments would be required (Phillips, 1999). In relevance to this study, from the theory we derive that, a reduction in inflation rates will result to reduced revenue in the firm and hence reduced profitability that may ultimately lead to poor or underperformance of the firm or even bankruptcy. Contrary to this is the expectation that the purchasing power of money is reduced by the increased inflation rates which in effect would then lead to a reduction in real sales and escalated operation costs as well as interest rates in an economy. Opposing this theory, McGuire, Paul & Conroy (1998) argued that the most important macroeconomic variable was inflation since it affected all the other economic variables. An Increase in the inflation rates would have an effect on exchange rates due to currency depreciation as illustrated by purchasing power parity. An economy's growth in GDP and the overall financial performance of businesses is negatively affected by the loss of the economy's money purchasing power and its value erosion (Pandey, 2009). This will also have effect on the retirement funds body which mainly invests its funds in real estate and capital markets which are susceptible to inflation.

2.2.2 Modern Portfolio Theory

Developed by Harry Markowitz, the Modern Portfolio Theory abbreviated as MPT assumes that most investors want to optimize the return to risk ratio whereby, they will remain as cautious as possible and take as minimal risk as possible and expect to achieve the highest return possible. The theory posits that an investor could enjoy the benefits of diversifying investments into more than one asset class, since they would then experience reduced volatility and concentration of exposures in a single security (Markowitz, 1959).

It has been illustrated that for an investment firm to effectively maximize returns and minimize risk, then proper distribution of the portfolio into a number of asset classes will be paramount. Indeed it is now standard practice that pension scheme fund managers diversify their portfolios to be able to achieve risk return optimal trade off (Cumming, 2009). The modern portfolio theory attempts to optimally place each asset into a balanced portfolio. It is a finance theory that seeks to describe the perfect asset mix for an ideal and well diversified portfolio that would then meet an investor's expected return for a given possible minimum risk. In the MPT, the expected return is a combination of various assets returns that weigh in to the overall portfolio in different magnitudes, otherwise better understood as weighted average of different assets returns. Portfolio selection entails a two stage process that begins with observation and experience in the first stage which then ends with forecast into the future performance of selected securities. The second stage picks from the point the first stage ends which is the beliefs about the future performances of securities and ends with the actual selection of the portfolio mix. The fund manager or investor requires to maximize the discounted value of the future returns in the choice of the portfolio. Since the future is not known with certainty, the return discounted must be the "expected" or "anticipated

return. The theory attempts to smoothen out variances existing in potential returns to the portfolio, through pairing or getting a combination of different uncorrelated assets, while assuming the rationality of investors in the market and its efficiency as affirmative (Markowitz, 1952).

2.2.3 Arbitrage Pricing Theory

With a market characterized with limited resources, pension scheme fund managers must continuously review and adjust accordingly the available investment options so as to meet their obligation of maximizing return on investments for the shareholders. This process may thus involve the practice of taking advantage of market inefficiencies by identifying disvalued or overvalued assets, and using that opportunity presented to realize a higher than average return on investment without having to take any additional risk or investment for that matter. This is referred to as the practice of arbitrage between two available opportunities. The arbitrage pricing theory abbreviated as APT is an asset pricing theory which illustrates that the relationship between the expected return on a financial asset or investment and macroeconomic factors is linear where the magnitude of change for each variable is represented by a respective beta coefficient. The linear relationship model is used to derive the correct asset value or price by showing how various factors affect and influence the expected rate of return on the asset as well as the extent to which the asset expected return is sensitive to these factors. The model derived rate is then used in discounting future cash flows so as to arrive at the current asset value equal to the discounted value at the end of the period. With arbitrage, one is able to correct this value in the event that it changes along the way (Dybvig and Ross, 2003).

Ross (1976, 1977) applied APT in his study that looked at seven macroeconomic factors in the US market in a bid to explain the stock returns. These variables were risk premium, terms

structures, consumption, industrial production, inflation, market return and oil prices. The findings illustrated that there exists a significant relationship between the selected macroeconomic variables and the US market stock return especially with industrial production, twists in the yield curve and changes in risk premium.

APT is hinged on the fact that the absence of arbitrage by extension implies a near linear relationship between the expected returns and the coefficients of various risk factors (Shanken, 1992). The APT model is stated as follows:

$$r_s = r_f + \beta_1 r_1 + \beta_2 r_2 + \dots + \beta_n r_n + \varepsilon$$

Where:

r_s = return on asset or investment

r_f = risk free return on asset or investment

β = coefficient of change for the respective returns

r = the variable influencing returns on asset or investment

ε = the error term accounting for temporary market deviation

n = the final value in the sequence of terms in the equation

2.3 Empirical Review

2.3.1 Exchange Rate and Financial Performance

Jorion (1991) found that the degree of foreign involvement of a firm directly impacts on the extent of exposure to the firm. This he established from his study where he picked a sample of firms from the Fortune 500 and used a two-factor model which would later become the practice in the control of market risk exposure as well as foreign exchange estimation criteria. His findings have been confirmed by other studies that have also looked at foreign exchange exposure faced by both

international and multinational companies. The studies have explored further the various challenges that face the procedure and methods used for estimation of such exposure which will also be a key consideration in this study. Market model is one of the challenges to look at, which is one of the institutional foreign exchange exposure measurement tools. This paper will not majorly concentrate on the efficiency and/or validity of the various models used in asset pricing, but instead, will be looking at methods and ways in which foreign exchange exposure is measured and estimated, based on studies already done in the past. In early studies, exposure was measured using a monthly time horizons that existed or occurred at similar times. In past studies, focus was more on the extent if any, to which corporations were exposed to foreign exchange exposure. This was first done by Jorion (1990).

Though time variation is a key factor in the determination of the extent to which a firm is influenced or exposed to foreign exchange, it was shown that foreign sales indeed have a major contribution in this determination, Williamson (2001). This was illustrated in his study conducted on the automotive industry in the Japan and United States of America, where a few participating firms were sampled. However, in a study done on industry performance in the US market and other countries open to trade, the effects of exchange rates dynamics did not appear to have major impacts on the performances implying that industry effects had more significant effects of firm's performance than exchange rates did, Griffin and Stulz (2001). Though we find some differences in the findings presented in various empirical conclusions, the general standing is that the competitive design and structure in an industry matters in as far as foreign exchange rate exposure is concerned.

Koutmos and Martin (2003) found out that different business cycles induce variations on the extent to which a firm faces exchange rates exposure. This was in an industry specific study conducted

on sampled portfolios drawn from four countries. They observed that the extent to which a firm in a given selected industry was affected by exchange rates exposure was dependent on whether it was during depreciation or appreciation periods. It was also noted that these variations were more noticeable in the financial sector and with firms that performed just well during the depreciation periods. Generally, it has been established from studies on foreign exchange exposure that, organizations with extensive overseas business as well as multinationals will have more and significant exposure than those without. However, perhaps due to financial and operational hedging, most findings have shown that this estimated exposure fall short of what economic theory purports. We see that domestic firms without foreign activity have been factored in studies on foreign exposure and thereby generally not found to be susceptible to foreign exchange exposure. However, hardly any prior study has well addressed the subject on factors that determine the exposure to foreign exchange by domestic firms. It has become common among industries that firms use combinations in marketing and production strategies as well as operational hedging across different operating units in management of their long term exposures. On the other hand firms use foreign exchange derivatives and financial hedges to manage short term exposure. Because of the cost and difficulty in the reversal of long term operating policy adjustments, firms resolve to having networks of multiple operating units that spread wide and across vast geographical and business areas.

Bodnar and Gentry (1993) however found that the differences existing within industries have a bearing on the extent to which a firm is exposed to foreign exchange risk as well as the level to which they are exposed, which was consistent with economic theory. This was illustrated in their study conducted on industries drawn from Canada, Japan and the US. It is therefore implied that changes in exchange rates are important components of financial performance, profitability as well

as decision making in organizations. Indeed historic economic data and information tells us that among other reasons as to why the euro was introduced, was to take care of the risk posed by exchange rates exposure. The euro's main role was to cushion European firms from uncertainties presented in shifts in prices resulting from shifts in the foreign exchange rates.

While there may be some differences in empirical findings on the study on exchange rates exposure, we see that the extent of exposure is most likely dependent on the competitive structure in an industry Marston (2001). In their study on the causal relationship that exists between the performance of private equity firms and exchange rates, Metrick and Yasuda (2007) established that foreign exchange fluctuations affected the amount of profits received in the home countries of foreign investors.

Evidence shows that it is a general believe that changes in exchange rates will have an implication on a firm's profitability as well as its financial decision making process. We establish that, where there is the creation of currency unions such as that which occurred in the creation of the euro, there is a resultant substantial raise in bilateral trade from a broad point of view (Frankel and Rose, 2002). However, we also need to answer the question as to whether changes in exchange rates have significant measurable effects on the performance of the firm. Empirical evidence as depicted in the two studies, Doidge et al., 2003; Griffin and Stulz, 2001, illustrates that, there lacks strong evidence of the existence of structured exchange rate exposure disruptions on international security prices at the industry level, particularly on shares in the US market.

Closer home, Adongo (2012) demonstrates that various economic events in Kenya have largely contributed to the changes experience in the exchange rates, especially the economy's balance of

payment problems. It is expected that the depreciation of the Kenyan shilling against US Dollar should cause a reduction in the financial performance of private equity firms.

2.3.2 Interest Rate and Financial Performance

In a study by Wensheng et al., (2003), we establish that an increase in the risk premium on the Hong Kong dollar, which is depicted by an increased spread between the Hong Kong dollar and the United States dollar interest rates, would have an impact on the profitability of the banking firm. This is reasonably as a result of the impact the banking firm has on the quality of assets which subsequently affects the charges levied on provisioning as well as the net interest margins offered. Studies show that, within the period 1992 to 2002 the net realized interest margins reduced as a result of increased risk premium. This was due to the fact that interests on deposits were more susceptible to shifts in the risk premium than the lending interest rates were. Little impact was felt as far as trying to correct the situation was concerned, even after changes in the domestic interest rates alongside the United States interest was effected.

Kipng'etich, (2011) did a study on the relationship between interest rates and financial performance of commercial banks in Kenya. To achieve the objective of the study, regression models were developed using interest rates as dependent variables while the financial performance as the independent variable. In the model, return on equity was used to represent the profitability indicator. Secondary data collected from published reports was used for the study. The period of study was five years between the year 2006 and 2010. A regression analysis was conducted on the data to find out the kind of relationship there existed between interest rates and the firm's profitability represented as return on equity. The study finding illustrated that there existed a positive relationship between the financial performance of the firm and interest rates, thereby

recommending that the commercial banks in Kenya should prudently manage the interest rates charged on lending among other factors which would then influence their financial performance.

A study by Fallah (2012) shows that when the profit margin in a business is threatened, the business in this case a bank will sustain a widening yield spread. The accumulation of non-performing loans in the banking sector results from a weak legal system and a poor business environment that reduces the profit margin, and therefore banks respond by increasing the lending rates. Policy actions also have an impact in the determination of the bank's spread. In the case of a foreign exchange rate, an asymmetric response is indicated in the lending rates increase as seen in the example of the foreign exchange rate between the Liberian dollars and US dollars rate, and become sticky downward when the foreign exchange lowers between the two currencies. The Central Bank of Liberia responded to the widening gap in interest rate by publishing the interest rates on both deposits and lending that must be maintained by Commercial banks. However, in the absence of ensuring that factors that lead to the widening gap are addressed, some commercial banks could not adhere to the published interest rates by the Central Bank. The Bank of Liberia also indicated that it was contemplating on adjusting the gap between lending and deposit interest rates and thereby reducing general and substandard provisions by one percent and five percent respectively. The Central Bank of Liberia further indicated that it intended to introduce a stimulus loan package of Five Million United States Dollars to commercial banks at the rate of three percent for lending to Liberian business at the rate of not more than eight percent per annual. This is an example of how policy may affect the resultant spread as the government's indication of the changes in stander and general provisions would obviously influence the kind of interest rates charged by the banks thereafter.

Mwangi (2012) through his study established that the financial performance of microfinance banks has greatly been affected by the high interest rates charged on borrowings. Consequently this has led to the decline in investment activities for these institutions and hence income that would have otherwise been earned from these activities forgone. This has been blamed on the fact that when interest rates charged in the market were too high, potential borrowers preferred relying on soft loans from friends and relatives as well as their savings which in effect reduced the level of investment activities generally in the market. Due to the higher risk tagged on long term loans, it has been established that long loans are much more expensive to the borrower compared to short term loans of the amount

In his study on registered mortgage lending institutions, Ngumo (2012) established the existence of a positive relationship between the financial performance of the firms whereby the higher the mortgage amount lent out the better the financial performance (Earnings Before Interest and Taxes) of the firms would be as it raises the revenue thereof. On the other hand, as interest rates increased, the financial performance of the firms would also increase up to the point where it was too high that it discouraged further borrowings owing to the increased cost of the mortgage. The recommendations of the study were that, for firms to realize good financial performance, interest rates charged on mortgages must be appropriately calculated so as to lower the cost of mortgage borrowing. This is because increased cost of mortgage will in effect leads to lowered demand levels thus negatively affecting their financial performance.

In their study, Garman & Grable (2012) investigated on how the financial performance of agricultural companies in Holland was affected by interest rates. Using secondary data, they focused their study to the five year period between 2008 and 2013. From the regression model fitted to analyze the data, findings of the analysis shows that an inverse relationship exists between

the financial performance of the agricultural firms and interest rates. The inverse correlation was illustrated in the there was more borrowings for funding that went into agricultural activities during periods when interest rates were low and affordable.

Njoroge (2013) assessed the nature of the relationship between the financial performance of companies listed on the NSE and interest rates in Kenya. This study focused on secondary data covering a five year period from 2008 to 2012. Using a regression analysis on the data the study found no significant relationship between the listed companies financial performances and interest rates, a contrary result form that depicted by the study conducted on the relationship between interest rates and firms in the agricultural sector in Amsterdam. When firms were clustered into their respective industries, it was established that using linear regression analysis, one could selectively forecast the financial performance of firms by tracking the behavior of interest rates and using specific interest values only where statistically significant relationship between the two existed. This was however, only applicable to firms whose financial performance was significantly influenced by interest rates otherwise other factors which affect a firm's financial performance would require to be considered and enhanced in order to have any significant improvements on the financial performance of firms that interest rates did not have influence on.

2.3.3 Inflation and Financial Performance

Inflation has been described as the general increase in commodity price levels in an economy over a given extended period or duration. It forms an upward trend in general price levels without a corresponding increase or improvement of the commodities real value. Simply put, it erodes or depletes the purchasing power of an economy's currency. As private equity firms hold investments over a longer investment period, they tend to face more impact from inflation from the time of

acquisition until exit (Nielsen, 2011). Private equity firms or investor provide periodic funding to private companies that seeks to expand by extension of business coverage or new product development or even operational, shareholding or management restructuring. The arrangement is usually for the private equity firm to progressively relinquish its holding in the funded private company by selling off their stake over a period of time, in a bid to either recover the injected capital or to reinvest in another private company that happens either through private placement or initial public offerings.

It has been argued that gradual inflation rate which has no much interference with the value of investments is positive to the success of private equity companies' financial performances. This goes to show that indeed there is good inflation that contributes to the success and development of firms' financial performances in the market. Other factors that affect the performance of private equity firms include legal and regulatory requirements such as fiscal policies that seek to control inflation through currency devaluation. This kind of control would in effect have an impact on investments by private equity firms in assets with low liquidity which are difficult to dispose (Parra-Bernal and Blount, 2011).

When private equity firms seek to divest or relinquish holding from funded companies, a key consideration is the prevailing inflation rate which has adverse impacts on the firms return at exit (Parra-Bernal and Blount, 2011). Private equity firms prefer to exit through initial public offerings driven by a number of reasons including time and costs involved. We learn that the overall amount of private equity investments is correlated to the level of a country's stock market development Gilson and Black (1997)

Microfinance institutions majorly suffer inflationary effects during high inflation levels which ultimately affects their financial performance. Inflation could have negative impacts on the general performance of firms in the financial sector at the first instance of increase in the rates of inflation. This however as shown in the study conducted by Huybens and Smith (1999) on the impact that inflation had on the performance of the financial sector in selected eleven countries, would be through credit market frictions which would later see inflation have a broader impact the general economic growth in a country. Market frictions in this case are described as the minimization of access to credit which results to the reduction in intermediary activity and the effective formation of capital. When capital investments are reduced, the long term economic growth as well as the stock market is negatively affected.

According to Makin (2003), in periods when an economy is experiencing inflation, the tax neutralities created result to altered response to inflation by interest rates as generally expected. Decision making therefore becomes affected as far as lending, savings and investments is concerned. Temporary interest income is therefore transferred between the economy's borrowers and lenders during periods when the economy is experiencing deflation shortly after inflation has taken its effect. This is explained by the fact that the distorted interest rates that are too high when the price levels change or rates that are over predicted cause the redistribution of income between borrowers and lenders. Makin also notes that a positive relationship between inflation rates and interest rates does not exactly translate to a rise in the interest rates as a result of high inflation rates or necessarily mean that high interest rates causes greater inflation. Such a correlation would indicate that the economy's central bank would simply respond to greater inflation by increasing interest rates. An increase in inflation rates results to the increased cost of goods and services. The

central bank takes action to increase interest rate in order to reduced demand, and consequently commercial banks also increase their lending rates intendment with central banks rates.

In their study on *The Impact of Inflation on Financial Market Performance*, Boyd, *et al.* (2000) establishes that the ability of financial sector to effectively allocate resources would be affected by increases in the inflation rates even where those were predictable. It's shown that inflation negatively affects both the banking sector development and the equities market activity. The rise in the rate of inflation causes a rapid reduction on banking lending activity as well as a decline in the stock market development. Where inflation rates exceed fifteen percent, there is a distinct decline in the performance of the economy's financial sector. (Boyd et al., 2000) show that nominal stock returns movement is proportional to the small increases in inflation in economies with high inflation though the same may not be said for in low-inflation countries.

2.3.4 Gross Domestic Product and Financial Performance

Economies experience episodes of economic booms and recessions, an experience known as cyclic fluctuations in an economy. During periods when the economy is at peak, the demand for credit increases owing to more robust business and more investment activities taking place, compared to the demand level during periods when the economy is at a recession (Athanosoglou et al, 2005). During periods when economic growth is on the decline, profitability in firms in the financial sector, especially lending firms are negatively affected due the reduced levels of demand for credit in the economy (Ongore and Kusa, 2013). On the other hand improved profitability in the sector would be experienced where growth in the economy is realized with a positive and increasing economic output, due to an increased demand for credit.

A number of studies have been done to prove the significance of growth in GDP towards the performance of investments in an economy. For instance the studies conducted by Bernoth, Colavecchio, & Sass, 2010 as well as Gompers and Lerner(1998) demonstrates that the positive relationship between the financial performance and growth in GDP implies that more investment activities take place in periods of GDP growth supported by the fact that more entrepreneurship opportunities are available and therefore more venture capital injection into the market. Again it is in these periods of high GDP growth that firms experiences improved performance and seek more funding of their increased investment activities as the aggregate demand for their products in the market increases. Consolidated funds such as pension funds therefore have an opportunity to increase their portfolio and diversify more which in turn gives them better chances of good returns. It is generally expected that GDP will have a positive correlation with the financial performance of private equity firms.

Scott and Arias (2011) conducted a study on the performance of five largest banks in the United States. They were able to show that profits in the banking sector in the US were not directly affected by the GDP performance. Hoffmann (2011), using the generalized method of moments estimation principle applied OLS estimation approach to conduct a study on the US banks. His study concluded that there existed no considerable relationship between the GDP and banks. Sufian (2011) analyzed 11-29 Korean commercial banks during year 1992-2003. Using a linear regression model established that indeed there was a negative impact of GDP on return on assets, but a positive impact of inflation. In his study on the profitability determinants of Ethiopian commercial banks using the balance sheet data over 10 years for the 7 leading banks, Damena (2011), confirms a positive relationship between the county's GDP, inflation and interest rate. GDP had a positive effect on both the inflation and interest rates. Similarly, Davydenko (2011)

establishes a positive relationship between both GDP and inflation rates on the return on assets of Ukrainian banks. In this study he applies a fixed effects estimation technique.

Another study on banks was conducted by Saksonova and Solovjova (2011) where they applied a comparative analysis of five largest Latvian commercial banks during a period of economic crises. They established that GDP growth had positive effect to profits, and inflation negatively affected ROA. Several other studies further evidence the existence of variables affecting the banks' income. Kasawneh, Salem and Shaher (2011) conducted a study where they used a sample of 320 respondents among individuals related to the banking industry and the findings proved that there was a significant relationship between GDP and earnings. Khrawish (2011) conducted a study of the macroeconomic factors affecting the listed Jordanian banks. His findings were that there was a negative impact of the inflation rate and GDP to return on asset and return on equity. Another study done looked at the returns of Turkish banks and established that the impact that real interest rates, GDP growth and inflation rates have on the assets and equity returns of bank was minimal (Alper and Anbar 2011).

Sharma and Mani (2012) researched on the impact that inflation rates and GDP had on the return on asset for commercial banks in India for the five year period 2006 to 2011 and found it negligible. Another study done by Zeitun (2012) was on the influence of macroeconomic factors to the banks of Gulf Cooperation Council countries, which involved cross-sectional time series panel data. The study concluded that indeed there exists a positive relationship between GDP and ROA and ROE but a negative one between the two and inflation rates.

2.4 Summary of Literature Review

The reviewed literature highlights the relationship that exists between the macroeconomic variables and firms' financial performance. Griffins and Stulz (2001) found the effect of exchange rate to be minimal in explaining relative US industry performance.

Kipng'etich (2011) in his study found a positive relationship between interest rate and the financial performance of commercial banks in Kenya. On the other hand, Mwangi (2012) found in his study that interest rate had an inverse relationship with organization's financial performance.

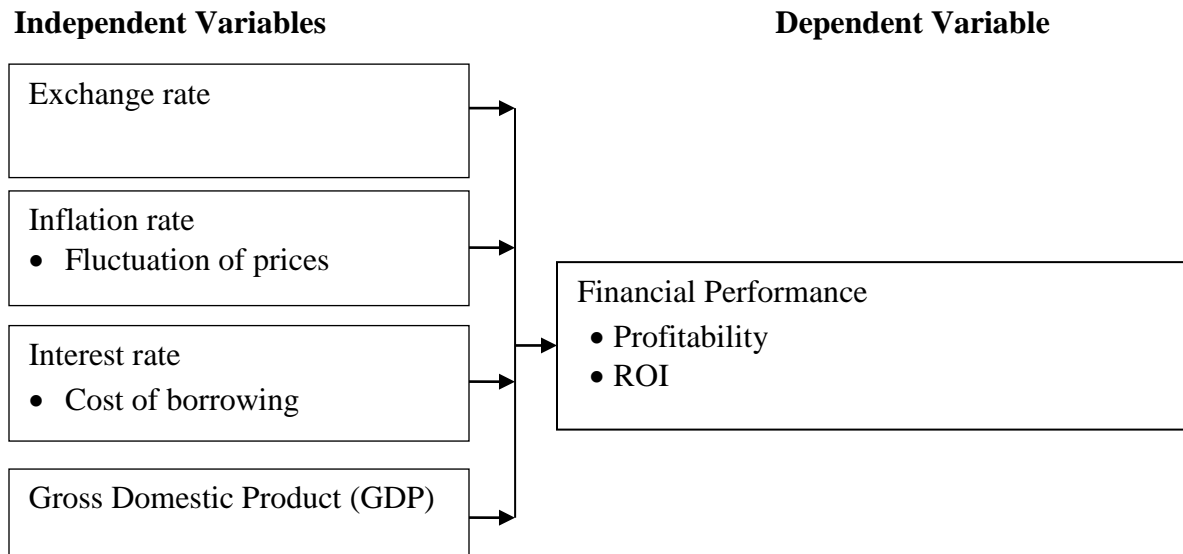
Huybens and Smith (1999) found inflation to impact negatively to both long-term and short-term economic growth and equity market activity. Also, Boyd et al (2000) found that inflation negatively affected the financial performance of firms.

In another study, Scott and Arias (2011) found that GDP did not have direct effect on the profit levels of US banking sector. In a study by Sufian (2011) however, GDP impacted negatively on the firms return on assets. These studies were however, mainly in the banking sub sector, and none focused on the effect of the macro-economic factors on the financial performance of pension funds firms, hence a research gap and motivation for this study.

2.5 Conceptual Framework

The following is the conceptual framework of the study showing the relationship of variables

Figure 2. 1: Conceptual Framework



This study is based on the concept that macroeconomic variables affect the financial performance of firms. The macroeconomic variables include exchange rate, interest rate, inflation rate and GDP while the firm's financial performance is measured in terms of profitability, return on assets and return on investment.

2.6 Operationalization of the Variables

Variable	Description	Measurement
Exchange rate	Is how much it costs to exchange one currency for another.	Rate of exchange of one currency to another
Interest rate	Is the amount of a loan that is charged and repaid as interest to the borrower, which is expressed as an annual percentage of the loan outstanding in any given time	Cost of borrowing
Inflation rate	Refers general increase in the level of prices in an economy that is sustained over a period of time resulting to lost purchasing power of a currency. The retirement benefits funds is invested in other projects like real estate which involves purchase of buying building materials hence affected by inflation	Rate of change of price of goods over a period of time
Gross domestic product (GDP)	Refers to the actual results or production or output of an organization when measured against its intended or expected outputs.	Total value of final goods and services in the country
Financial Performance	Refers to the actual results or production or output of an organization when measured against its intended or expected outputs.	Profits Return on Investment

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology in which the study was conducted on. It specifies the design, process, the target population that was used, mode of data collection as well as the method of analysis.

3.2 Research Design

The study employed descriptive research designs which are used to determine and report how things are (Mugenda & Mugenda, 2003). This study involves gathering facts and looking into the effect of inflation, GDP, foreign exchange rates and interest rates on the performance of NSSF and so this approach became appropriate to apply. This design explored and evaluated the relationship between the selected variables in details. Since descriptive research design can also be used to study a population by analyzing and discovering occurrences from selected samples, this makes it appropriate for this study as the researcher seeks to discover how the macroeconomic factors affect financial performance of NSSF.

3.3 Target Population and Sample

The target population was the financial publications of NSSF and the Kenya Bureau of Statistics library. The study seeks data of the financial performance of the NSSF from financial publications of the NSSF in Kenya while the data on inflation from the Kenya Bureau of Statistics. Data on foreign exchange, interest rate and GDP would be from the CBK libraries.

3.4 Data Collection

This study employed secondary data obtained from NSSF, Kenya Bureau of Statistics and the Central Bank. Other sources of data would include publications, government and private financial reports, newsletters, journals and business magazines. The data regarding the GDP was obtained from the CBK libraries. The data obtained made it possible for the study to have inferences about the relationship that exists between macroeconomic factors and the financial performance of NSSF in Kenya. The data on exchange rates and interest rates was sourced from the Central Bank of Kenya published reports and existing data based on its benchmark lending rate. The study focused on data for a fifty one year period between December 1965 and December 2016.

3.5 Analytical Model Specifications

Econometric models will be used to establish the relationship between the selected variables. This will be done using tests as the Granger causality test, the Johansen cointegration test and Vector Autoregressive model. All these will be conducted using STATA as the statistical software.

3.5.1 Descriptive Analysis

This will be done to test the distribution of the data, whether the data fits normal distribution or not. This was therefore possible by performing the various tests described below:

(i) Correlation Matrix

This is to help identify if there are any two variable with high correlation. The matrix is displayed in a table that depicts how strong a relationship existing between two variables is and also the nature or direction of that relationship. The strength of the relationship between the variables is

shown by the value of the correlation coefficient while the direction of the relationship by the sign of the correlation coefficient.

(ii) Ordinary Least Square Test

Regression analysis conducted on the data to examine the effect of the selected macroeconomic factors on the financial performance of NSSF. Specifically a multivariate regression equation was used where the independent variables comprised of inflation rate, interest rate, exchange rate and GDP growth. The financial performance of NSSF being the dependent variable was expressed as the return on investment, ROI. A firm's return on investment compares the initial outlay to the exit investment value. Where limited information is available on cash flows, audited and published earnings of the firm will be used as a proxy for ROI. Thus, the regression equation will appear as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where:

Y = Return on Investment (ROI) of NSSF

β_0 = Constant

X_1 = Inflation Rate (Consumer Price Index used as proxy).

X_2 = GDP Growth Rate

X_3 = Weighted Commercial Bank Lending Interest Rate

X_4 = Exchange Rate of Ksh against US Dollar

$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients of X_1, X_2, X_3 & X_4 and ε = Error term

(iii) Residual Analysis

Durbin-Watson test was used to detect the presence or otherwise of autocorrelation. This occurs when the residuals are not independent from each other. Autocorrelation inflates the t-statistics by underestimating the coefficients' standard errors (Gujarati (2003)). Normality error terms will be tested using histogram and a fitted normal curve. The null hypothesis is that there is normal distribution among the error terms. White test was performed to test for heteroskedasticity which occurs when error variance is not homogeneous. The null hypothesis is that there's no heteroskedasticity and primarily check for independence of residual using residual vs. fitted plots. If the assumption is violated then the study will use time series analysis using the following procedure:

3.5.2 Time Series Analysis

We can describe a time series is a consistent sequence of occurrences or observations that are generally be taken through any dimension, but are usually in terms of equally spaced time intervals. The study used the following analysis to achieve the objective of the study.

i. Diagnostic Tests

The study first performed a unit root test on the data using the Augmented Dickey Fuller abbreviated as ADF approach. Should it be stationary at first level, it is possible that there lacks long-run relationship and therefore the research should proceed to run the Vector Auto regression, VAR model on the data. In this case, the study would proceed to selection of the lag length. This is a process that involves choosing the minimum Schwartz Information Criterion and Akaike Information Criterion values. Upon determination of the lag length, we could then proceed to run

Johansen and Juselius cointegration test on the data. Interpretation of this test requires that, since r equals to the number of corelationship, in the event that it also is equals to the number of variables observed, then this is an indication that there is no long run relationship existing. The possible existence of a long run relationship between the variables will however be evidenced by the r value being larger than zero and smaller than the number of variables. The study could therefore proceed to run the Vector Error Correction Model on the data, to check on the same. The Granger Causality Test could be performed where the researcher intends to test for the short run relationship between the variables.

ii. Unit Root Test

This test is used to test for stationerity in levels and orders of integration, that is, at first or second differences. When the data series has to be differenced once to become stationary, it said to be a series integrated in order 1. The more the differencing times required to convert the series into stationary, the higher the integration order. Unit root test orders of integration are explained as follows;

I (0) series is a stationary series

I (1) series is stationary at first difference

I (2) series is stationary at second difference

The test commonly used for testing for stationary of data is the Augmented Dickey Fuller test

iii. Augmented Dickey-Fuller test

For the ADF test, we estimate the following regression:

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum_{j=1}^k \lambda_j \Delta y_{t-j} + e_t \dots\dots\dots(1)$$

Where;

Δ - is the difference operator

k - is the number of lag differences

y_t - is the series being tested

Δy_t - is the change in series

e_t - is the error term

t – is the time period under consideration

α - is the constant term,

β - is the vector of coefficient on y_{t-1} ,

λ_j - is the lag and Δy_{t-j} are the lagged changes.

The study tested the null hypothesis $H_0 : \beta = 0$ which implies that y_t is non-stationary. The lag length was selected by using one of the information selection criteria which included AIC, FPE, LR, SBIC and the Hannan-Quinn selection criterion while ensuring that the residuals were white noise. Preliminary test included normality test and tests for heteroskedasticity in order to meet the OLS assumptions. Shapiro-Wilk's test would alternatively be used to test normality of the data whereas the Breusch-Pagan or the Cook Weisberg test would otherwise be used to test for heteroskedasticity.

iv. Choosing Lag Length

Vector autoregressive models otherwise known as the VAR models are widely used in forecasting and analysis of the effects of structural shocks. In the model specification, VAR models require proper determination of the lag length as a critical element. Most VAR models are estimated using the same lag length for all variables in all equations of the model, which is usually selected using

an explicit statistical criterion such as the BIC, AIC and SIC (Keating, 1995). The researcher would determine Lag lengths by evaluating Schwarz Information Criterion (SIC) given as:

$$SIC = \ln |\tilde{\Sigma}| + \frac{\ln T}{T}(\text{No. of freely estimated variables})$$

Where

$\tilde{\Sigma}$ = the estimated covariance matrix

T = No. of observations.

v. Cointegration Test

The Johansen's procedure is used to establish the existence a cointegrating vector among the variables of a series that is integrated of the same order, after running the unit root test (Johansen, 1988). The long run relationship between the variables will be tested using the cointegrating test (Hwang, 1998). However, it is not possible to proceed with the test for causality using the cointegration test if the series are not integrated to order one (Aydemir and Demirhan, 2009). In such a scenario, the Toda-Yomamoto (1995) (TY) method is used in establishing the causal relationship between series. The integrating property of the series is not important in the TY method as long as the order of integration is clearly specified. Therefore causal relationship can be established between series which are integrated with different orders. The cointegration test used the Johansen test methodology, and was based on the following equations:

$$Y_t = \beta X_{it} + e_t \dots \dots \dots (2)$$

Where Y_t the financial performance at time period t, β is the vector coefficient of macroeconomic variable at time period t, X_{it} is the macroeconomic variables at time period t and

e_t is the error term. The two variables are cointegrated if the error term (e) is stationary. The ADF test was used to check stationarity of the residual series.

vi. Granger Causality Test

The Granger Causality test was used to determine the causal relationship between the macroeconomic factors and financial performance of NSSF and the standard Granger Causality test would be used in the absence of any cointegrating relationships (Granger, 1988). The granger method seeks to establish how much of a variable’s past values can be used to explain the same variable X, and to what extent that by adding another variable Y would improve the outcome of the explanation of the variable X. The equation below is used in this method:

$$Y_t = \sum_{t-1}^n \alpha_1 X_{it-1} + \sum_{k=0}^n \beta_j y_{it-1} + e_1 \dots \dots \dots (3)$$

$$X_t = \sum_{t-1}^m \lambda_1 X_{it-1} + \sum_{k=0}^m \delta_j Y_{it-1} + e_2 \dots \dots \dots (4)$$

Where based on the Wald statistics the joint hypothesis of F-test for each equation are

$$M_0 = M_1 = M_2 \dots \dots \dots M_i$$

Where;

Y_t - the financial performance at time period t

X_{it} - the macroeconomic factors

e - error terms assumed to be uncorrelated. Equation (3) above implies that current value of Y value is influenced past values of X and Y. Again equation (4) indicates that the current X value is affected by the past values of X and Y.

In equation 3:

$H_0 : \beta_j = 0$, implying no causation from variable Y to X.

Whereas in equation 4:

$H_0 : \delta_j = 0$, implying no causation from variable X to Y.

From these equations, we form the basis of analysis of the presence of unilateral causality from Y to X or from X to Y. The equations will also check for the independence of X and Y from each other as well as the presence of bilateral causality between the two. The Granger causality test is sensitive to the lag length used in the equations. In this study, we employed Akaike's (1970) Final Prediction Error in determining the optimal lag length.

vii. Model Specification

a) Vector Auto Regression Model

If there is no-cointegrating relationship between non-stationary variables, the study would then work with vector autoregressive model (VAR). For applying VAR model the first difference should be taken for making the variables stationary (Toda, and Yamamoto 1995). To estimate this model it is necessary to identify the order, which implies the optimal lag length of variables. The order of VAR for each pair is selected by using the relevant information criterion (AIC or SIC). The estimated VAR model in our analysis is:

$$FP_t = \alpha + \beta_1 MF_{t-1} + \beta_2 MF_{t-2} + \dots + \beta_p MF_{t-p} + \beta_2 FP_{t-1} + \beta_2 FP_{t-2} + \dots + \beta_p FP_{t-p} + e_t \dots \dots \dots \quad (5)$$

$$MF_t = \alpha + \beta_1 MF_{t-1} + \beta_2 MF_{t-2} + \dots + \beta_p MF_{t-p} + \beta_2 FP_{t-1} + \beta_2 FP_{t-2} + \dots + \beta_p FP_{t-p} + e_t \dots \dots \dots \quad (6)$$

Where p is the order of the VAR, α is the constant term, e is an error term, MF denotes proxy of macroeconomic factors and FP denotes financial performance. The model above explains pairwise relationship of financial performance and the four proxies of macroeconomic factors.

b) Vector Error Correction Model (VECM)

The existence of a long run relationship between the series as well as the long term equilibrium will be indicated by the presence of cointegration between them. This would require the evaluation of the short run properties of the series by applying VECM (Engle and Granger, 1987). VECM adopts a regression equation as shown below. $\Delta Y_t = \alpha_1 + p_1 e_1 + \sum_{i=0}^n \beta_i \Delta Y_{t-i} + \sum_{i=0}^n \delta_i \Delta X_{t-i} + \sum_{i=0}^n \gamma_i \Delta Z_{t-i} \dots \dots \dots (7)$

$$\Delta X_t = \alpha_2 + p_2 e_{i-1} + \sum_{i=0}^n \beta_i \Delta Y_{t-i} + \sum_{i=0}^n \delta_i \Delta X_{t-i} + \sum_{i=0}^n \gamma_i \Delta Z_{t-i} \dots \dots \dots (8)$$

The number of vectors cointegrating would be determined by the cointegration rank. The rank would indicate how many linearly independent combinations of non stationary variables would eventually be stationary. For instance a rank of three indicates that three linearly independent combinations of the non-stationary variables will end up being stationary. The significance of the coefficients would then signify whether short term fluctuations between the variables would result to having a long term stable relationship between the independent and dependent variables. If the coefficient is negative and significant then this confirms the projection of a stable long run relationship. The results from VECM model were discussed using impulse response function and variance decomposition.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

In this chapter, the focus is on the presentation of data and interpretation of the findings. The tools adopted for this study included descriptive statistics, the root test for stationarity using Dickey and Fuller, this was then followed by Johansen cointegration test that tests the long run relationships between variables. Post estimation tests of Impulse response were performed to establish the length that effects will last. Granger causality test was carried out to determine whether there exist any causal relationships between the variables under study. Residual autocorrelation test was carried out to find the goodness of the fitted vector error correction model.

4.2 Exploration of the Data

4.2.1 Trend Analysis

The study performed trend analysis to establish the behavior of the variables across the study period. This was done through the line graph plots presented in Figure 1 in Appendix 1. The results show that there was a steady increase in the exchange rate with slight fluctuations over the years. The plots further show that the return on investment showed increase except towards the end of the study period when there was a sharp decline and then a sharp increase. The findings revealed that the GDP, interest rate and inflation recorded fluctuations across the years from 1965 to 2016.

4.3 Descriptive Statistics

Table 1 shows that the skewness coefficients for GDP, interest rate, exchange rate, inflation and ROI are (0.7835), (0.0036), (0.319), (0.0017) and (0.0422) respectively showing that the variables interest rate, inflation and ROI have a close to normal distribution as they are symmetrical around the mean. GDP and exchange rate on the other hand may not have a normal distribution as depicted by the coefficients falling far from the mean zero at (0.7835) and (0.319) respectively. We are able to see that the variables are slightly skewed to the right owing to the positive and skewed values of coefficients. GDP, interest rate, exchange rate, inflation and ROI's coefficients of kurtosis are all less than three at (0.7593), (0.1802), (0.000), (0.1048) and (0.766) respectively. This indicates a wider peak and a flatter than normal distribution for the variables and based on the coefficients of Kurtosis, none of the variables is normally distributed.

Table 4. 1: Descriptive Statistics for Study Variable

Variable	Obs	Mean	Std.Dev	Pr(Skewness)	Pr(Kurtosis)	Min	Max
GDP	52	3.995577	2.1322104	0.7835	0.7593	-0.800	8.800
Interest rate	52	15.95788	7.107958	0.0036	0.1802	6.000	36.240
Exchange rate	52	40.84192	33.70939	0.319	0.000	3.000	102.08
Inflation	52	10.18192	6.63038	0.0017	0.1048	1.600	28.800
ROI	52	6.751853	0.3707665	0.0422	0.766	5.824278	7.436526

4.4 Correlation

Correlation is used to measure how strong a relationship existing between two variables is and also indicates the nature or direction of relationship existing. The coefficient values are between +1 and -1, with the direction of the relationship being depicted by the sign of the coefficient. The strength of the relationship between the variables is shown by the value of the correlation coefficient. That

is, a coefficient close to +1 indicates a high positive correlation between the variables and conversely a high negative relationship if the coefficient is close to -1. A coefficient close to 0 indicates a weak correlation on either direction dependent on which side it falls. The correlation matrix in Table 2 shows the relationship between macroeconomic measures among themselves and the financial performance measure.

The results show that the correlation between ROI and GDP and that between GDP and exchange rate was near negligible (0.0491 and 0.0482 respectively). The results however show a strong correlation between ROI and interest rate and exchange rate (0.5971 and 0.7237 respectively) and a weak correlation with inflation (0.2156). Also with weak correlation was interest rate and inflation (0.3336). The results further show negative weak correlation between GDP and interest rate and inflation (-0.3090 and -0.3869 respectively) and between exchange rate and inflation (-0.1174). The results show that there is relatively strong correlation between interest rate and exchange rate (0.5421).

Table 4. 2: Correlation Matrix

```
. pwcorr roi gdp interestrates exchangerate inflation, sig
```

	roi	gdp	interestrates	exchangerate	inflation
roi	1.0000				
gdp	0.0491	1.0000			
interestrates	0.5971	-0.3090	1.0000		
exchangerate	0.7237	0.0482	0.5421	1.0000	
inflation	0.2156	-0.3869	0.3336	-0.1174	1.0000

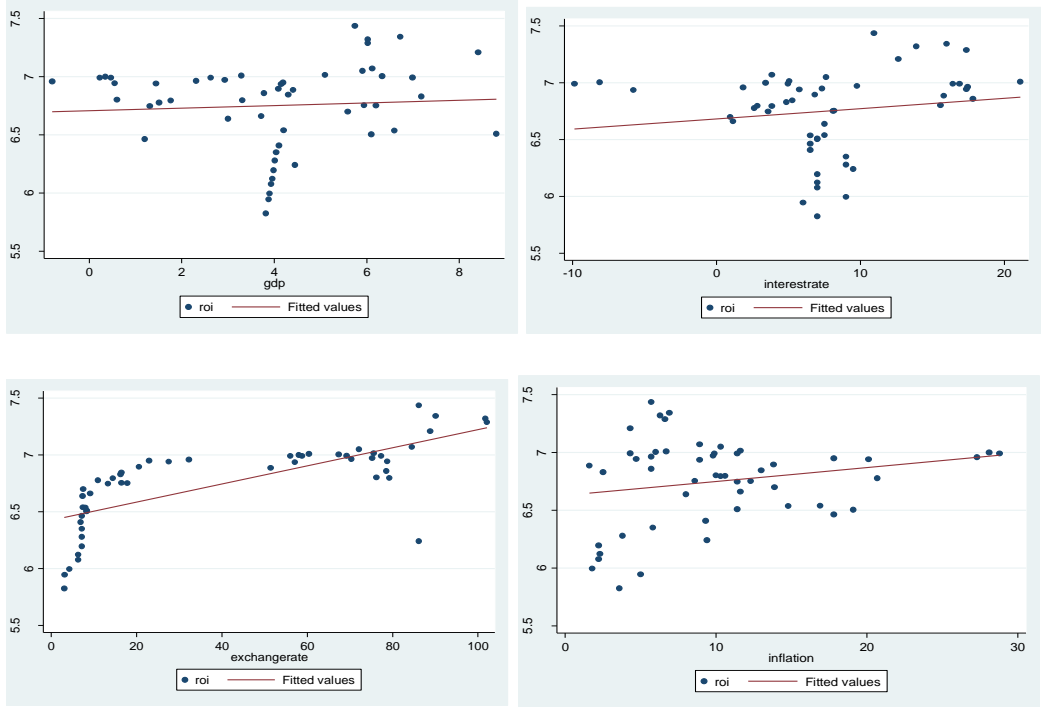
The correlation matrix serves as a diagnostic test which will then inform or have input into more analysis on the data. The results show that the correlation between ROI and GDP and that between GDP and exchange rate was near negligible. This implies that we should expect that ROI will have minimal relationship with the movements of GDP and so is GDP on exchange rates. The results however show a strong correlation between ROI and interest rate and exchange rate, but a weak correlation with inflation. Again this implies that we expect that ROI will have minimal movement in the same direction with inflation, but a higher relationship with that of interest rates and exchange rates. Also the weak correlation between interest rate and inflation implies that we should expect that the movements in interest rates will not be influenced much by the movements in inflation rates. The results further show negative weak correlation between GDP and interest rate, between GDP and inflation and also between exchange rate and inflation. This implies that GDP shouldn't have much relationship with the levels of interest rates as well as inflation rates, albeit it being an inverse relationship. Again the same applies for the relationship between exchange rates and inflation rates. The results show that there is relatively strong correlation between interest rate and exchange rate implying that we expect that the two should move in the same direction with a strong relation.

4.5 Diagnostic tests

The robustness test was conducted using the diagnostic tests, which checks whether the assumptions of OLS estimates have been met through use of residual analysis. That is, that if the residuals are random and that there exists a linear relationship between dependent and independent variables. Also that there is no serial correlation among the residuals as well as testing for their homoscedasticity. The study used scatter plots to check the linearity assumption. The scatter plots

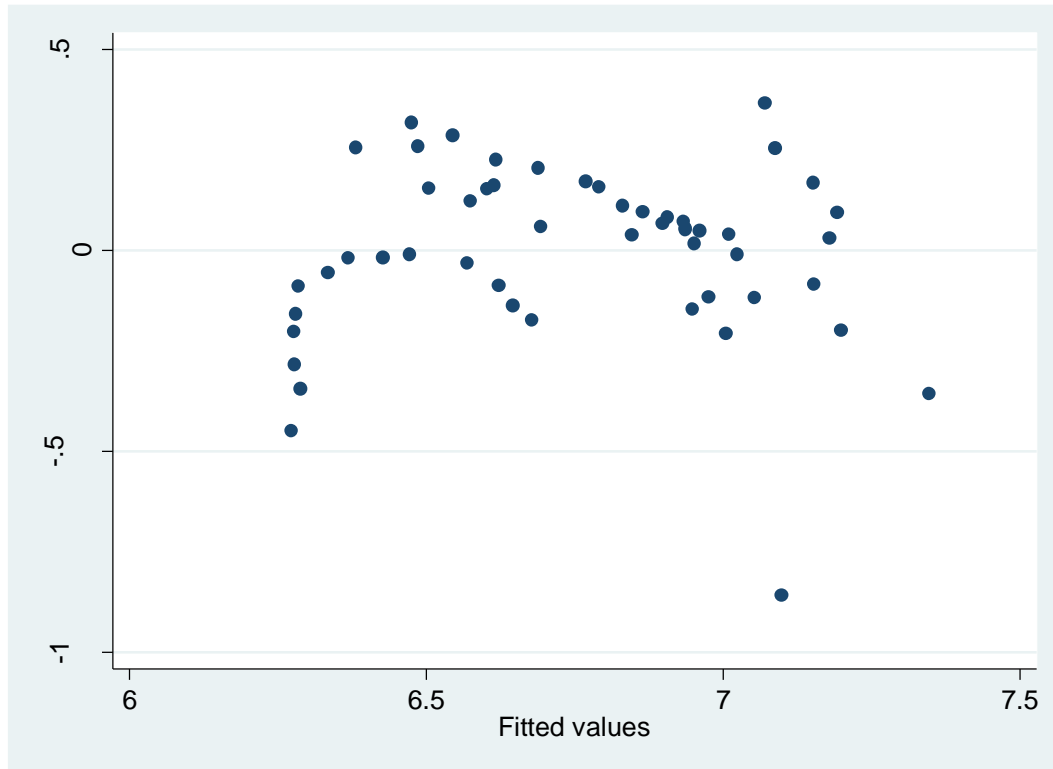
in Figures 1 below indicated that linearity assumption was reasonable as they formed a pattern. The linearity was confirmed by the regression analysis which showed that the correlation of the variables was close to unity which implies linearity. On this account, this implies that the linearity requirement under the assumptions of OLS estimates was met and hence possible to use it.

Figure 1: Linearity Test



Using the residual plot in Figure 2, the fitted values and the residuals to inspect the randomness of the residuals, the results shows that there is a pattern as there is a rise then decline after a short stint of stagnation. This implies lack of fit since the residuals exhibit a pattern and so not random.

Figure 2: Residuals versus Fitted Values



The study then used the Durbin Watson test to check for serial correlation of the residuals. The Durbin Watson statistic of 1.36453 was far from center of distribution and hence we concluded there is a problem of serial correlation. The study then investigated the data for residual variance stability. When variance of residuals is not constant, there is a problem of heteroscedasticity. The study used the Breusch-Pagan test to test the null hypothesis that residuals have constant variance. The results of the homoscedasticity and autocorrelation tests are presented in table 4. From the results, we rejected the null hypothesis since $p < 0.05$ and concluded that the residuals were heteroscedastic. This again is a violation of the assumptions of OLS estimates implying that it was not possible to use the OLS model.

Table 4. 3: Test for Serial Correlation and Heteroscedasticity

Durbin Watson d-Statistic	Breusch-Pagan Test
(5, 51) = 1.36453	Chi2(1) = 5.98 Prob> chi2 = 0.0145
H_0 :No autocorrelation.	H_0 :No Heteroscedasticity.

Test for Multicollinearity

The study also tested for the multicollinearity of independent variables using VIF. The results in Table 5 show that none of the independent variables indicate a VIF>5, an indication of absence of multicollinearity.

Table 4. 4: Multicollinearity

. estat vif

Variable	VIF	1/VIF
interestrates	1.97	0.507260
exchangerate	1.70	0.588140
inflation	1.39	0.718440
gdp	1.27	0.789868
Mean VIF	1.58	

4.6 Regression Analysis

The variables were regressed to determine the causal relationship between the financial performance (return on investment) and the macroeconomic indicators (GDP, interest rate, exchange rate and inflation). The regression model was given as:

$$ROI = \beta_0 + \beta_1(GDP) + \beta_2(Int\ rt) + \beta_3(Ex\ rt) + \beta_4(IfI) + e$$

Table 4. 5: Regression Analysis

```
. regress roi gdp interestrate exchangerate inflation
```

Source	SS	df	MS			
Model	4.62579269	4	1.15644817	Number of obs =	52	
Residual	2.38506567	47	.050746078	F(4, 47) =	22.79	
Total	7.01085835	51	.137467811	Prob > F =	0.0000	
				R-squared =	0.6598	
				Adj R-squared =	0.6309	
				Root MSE =	.22527	

roi	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
gdp	.0348183	.0166468	2.09	0.042	.0013293	.0683073
interestrate	.0114667	.006231	1.84	0.072	-.0010684	.0240018
exchangerate	.0069218	.0012202	5.67	0.000	.0044671	.0093765
inflation	.0164163	.0056128	2.92	0.005	.0051248	.0277079
_cons	5.9799	.1282302	46.63	0.000	5.721935	6.237866

The results of the study show that all the model coefficients are positive. The results imply that a unit increase in GDP will result into a 0.0348183 change in the ROI. The findings further show that a unit changes in interest rate will result into a 0.0114667 change in ROI though in the same direction. A unit change in exchange rate will result into a 0.0069218 in the ROI. Finally, the findings show that a unit of change in inflation will result into a 0.0164163 change in the ROI. The findings mean that the all the macroeconomic indicators have a positive influence on the ROI.

We therefore see that a number of the assumptions of the OLS estimates have been violated from the diagnostic tests performed implying the ineffectiveness of using the OLS in analyzing the data. Due to this fact coupled with the fact that the data is a time series, the study proceeded to conduct time series analysis on the data.

4.7 Test for Stationarity

The time series analysis began with the investigation of the time series properties of each variable employed in the study by using the Augmented Dickey Fuller (ADF) test for stationarity. This is

because when non-stationary time series data are used for analysis, the study may end up with spurious results because estimates obtained from such data possess non-constant mean and variance (Dimitrova, 2005). Stationarity of a time series is when the mean, variance and covariances are time invariant. The study tested stationarity by use of time series graphs presented in Figure 2 in Appendix 1. The plot shows a possible non stationarity as their movement exhibits a trend. The correlograms further show possible non stationarity as they die away slowly. The researcher then performed an Augmented Dickey Fuller (ADF) unit root tests to confirm the stationarity of the time series. The study findings in Table 6 show that variables were not stationary in their original form since the ADF statistic was less than the entire critical statistic except for GDP. The researcher therefore differenced the data to achieve stationarity. The results in Table 6 show the results of the ADF test after the data is differenced once. After differencing once the results show that all the variables were stationary. The data is stationary if the absolute value of ADF test statistic is greater than the critical values. In summary, all the variables in levels GDP, interest rate, exchange rate, inflation and ROI are found to have a single unit root or are integrated of degree one, I(1) and they are stationary at their first differences at 5% levels of significance. Presentation of the time series plots and correlogram plots (see figure 3 in Appendix 1) show stationarity after difference as they do not depict any trend and all the correlograms do not die away. The researcher then went ahead to fit multivariate time series models to the data.

Table 4. 6: ADF Unit Root Test Results at Levels and First Difference

		Level 1	Level 2		First Diff	First Diff
Variables	ADF Test stat	1%	5%	ADF Test stat	1%	5%
GDP	-4.177	-3.580	-2.930	-7.462	-3.587	-2.933
Interest rate	-1.717	-3.580	-2.930	-3.951	-3.587	-2.933
Exchange rate	0.372	-3.580	-2.930	-4.849	-3.587	-2.933
Inflation	-2.879	-3.580	-2.930	-6.593	-3.587	-2.933
ROI	-2.193	-3.580	-2.930	-10.076	-3.587	2.933

4.8 Choosing Lag Length

The error term should not be misspecified. To ensure this, the researcher performed the test to select an appropriate lag length. The selection criteria included Akaike Information Criterion, Sequential Modified Likelihood Ratio Criterion, the Schwarz Bayesian Information Criterion, the Final Prediction Error criterion and the Hannan-Quinn Information Criterion. We chose the model that has the lowest value of information criteria. Table 7 below shows the lag selection information criteria:

Table 4. 7: Results of VAR Lag Selection

```
. varsoc Droi Dgdp Dinterestrates Dexchangerate
```

Selection-order criteria
Sample: 1970 - 2016

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-352.834				46.199	15.1844	15.2437	15.3419*
1	-343.145	19.38	16	0.249	60.6235	15.453	15.7492	16.2403
2	-299.753	86.783	16	0.000	19.2018*	14.2874*	14.8206*	15.7045
3	-289.828	19.85	16	0.227	25.8818	14.5459	15.3162	16.5928
4	-273.122	33.412*	16	0.007	27.1521	14.5158	15.5231	17.1926

Number of obs = 47

Endogenous: Droi Dgdp Dinterestrates Dexchangerate
Exogenous: _cons

The results of the study FPE, AIC and HQIC criterion prefer two lag while LR criterion prefer four lags and SBIC criterion prefer zero lag. According to Brooks (2008), average variation in lag lengths from different samples within a given population will be greater in the BIC than in the AIC. This implies that AIC is more efficient than BIC. Therefore based on the efficiency property, the study chose two lag lengths to be used in this model as the optimal lag length.

4.9 Cointegration Test

The study sought to determine the long run relationship between the macroeconomic factors and financial performance. A test for series for cointegration was therefore performed. According to the Granger representation theorem, if the series are cointegrated, then there is a corresponding error correction term which then requires an error correction model. The first step is to examine the order of integration of each variable such that if the series are integrated of order one then, the Johansen procedure is used to test existence of any cointegrating vector among variables. The series are I(1), therefore proceed to test for cointegration using the Johansen cointegration test. The researcher tested the null hypothesis that there are $r=0$ cointegrating vectors against the alternate that there is at least one cointegrating vectors. Having established earlier the appropriate lag length to be two, we proceed to determine the number of cointegrating equations. When the trace statistics is less than the critical value, we accept the null hypothesis of no cointegration.

Table 4. 8: Johansen Cointegration Test

```
. vecrank
```

Johansen tests for cointegration						
Trend: constant			Number of obs =		49	
Sample: 1968 - 2016			Lags =		2	
maximum				trace	5%	
rank	parms	LL	eigenvalue	statistic	critical	value
0	30	-539.1968	.	200.4216	68.52	
1	39	-501.52598	0.78510	125.0799	47.21	
2	46	-474.31339	0.67068	70.6547	29.68	
3	51	-450.24333	0.62561	22.5146	15.41	
4	54	-442.14445	0.28148	6.3169	3.76	
5	55	-438.98602	0.12095			

From the table above, we establish that there is cointegration of order four since it's the last order where trace statistics at $r=0$ exceed critical value. We reject the null hypothesis of no cointegrating equation implying that the variables moved together in the long run. The existence of cointegration

then probes the need to also investigate the behavior among the variables in the long run. This is a requirement of fitting a VECM in modeling the relationship which exist between macroeconomic factors and financial performance.

5.0 Granger Causality Test

The researcher performed a Granger causality test to investigate the direction of influence between two variables. The findings are presented in Table 9.

Table 4. 9: Granger causality Wald tests

. vargranger

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
Droi	Dgdp	11.071	2	0.004
Droi	Dinterestrates	.24986	2	0.883
Droi	Dexchangerate	9.0814	2	0.011
Droi	Dinflation	1.1115	2	0.574
Droi	ALL	28.019	8	0.000
Dgdp	Droi	.94731	2	0.623
Dgdp	Dinterestrates	1.0528	2	0.591
Dgdp	Dexchangerate	5.3212	2	0.070
Dgdp	Dinflation	1.4656	2	0.481
Dgdp	ALL	8.6432	8	0.373
Dinterestrates	Droi	.95868	2	0.619
Dinterestrates	Dgdp	2.838	2	0.242
Dinterestrates	Dexchangerate	22.91	2	0.000
Dinterestrates	Dinflation	1.7176	2	0.424
Dinterestrates	ALL	28.78	8	0.000
Dexchangerate	Droi	5.4156	2	0.067
Dexchangerate	Dgdp	14.045	2	0.001
Dexchangerate	Dinterestrates	1.6459	2	0.439
Dexchangerate	Dinflation	2.2599	2	0.323
Dexchangerate	ALL	18.251	8	0.019
Dinflation	Droi	2.6265	2	0.269
Dinflation	Dgdp	9.8895	2	0.007
Dinflation	Dinterestrates	.68985	2	0.708
Dinflation	Dexchangerate	26.985	2	0.000
Dinflation	ALL	49.105	8	0.000

The results of the study show that there unidirectional causality running between firm's performance (ROI) to GDP. The study found that ROI granger cause economic growth (GDP) at 5% level of significance. This implies that any change in ROI will cause a change in GDP. Further, the study established that there was unidirectional causality between ROI to exchange rate. That

is, ROI granger cause exchange rate, thus implying that any change in the ROI will cause a similar change in exchange rate. Also evident from the results was the unidirectional causality between the interest rate and exchange rate. In other words, interest rate granger cause exchange rate which implies that a change in interest rate will cause a change in exchange rate. The findings show unidirectional causality between exchange rate and GDP. That is, exchange rate granger cause GDP which implies that a change in exchange rate will cause a change in GDP. Results show unidirectional causality running between inflation to GDP. That is inflation granger cause GDP which implies that a change in inflation will cause a change in GDP. And lastly, the findings show that there is unidirectional causality between inflation and exchange rate, where the study found that inflation granger cause exchange rate at 5% level of significance. This implies that a change in inflation will cause a change in exchange rate.

Overall, the results show that there is no causation between ROI and macro-economic factors.

5.1 Vector Error Correction Model

The presence of cointegrating relationship between the variables implies that there exists a long term equilibrium relationship between the variables. However in the short run, there may be deviation from the equilibrium. This deviation needs correction to fix the errors using the error correction model. The study findings in Table 10 below show the VEC model. The coefficients; $ce1$ represent the speeds adjustment of the model towards the long term equilibrium. The study findings could be interpreted to mean that the long run relationship is established as a coefficient $ce1$ is negative and significant. This implies that the VECM model is below equilibrium and will adjust upwards at a speed of 170% towards the long term equilibrium. In the long run the economic growth is positive and significant to financial performance same as exchange rate. However,

although interest rate is positive, it is negative and insignificant to firm's performance in the long run. The study further show that in the long run, inflation is negative and also insignificant to the financial performance.

Table 4. 10: Cointegrating equations

Cointegrating equations

Equation	Parms	chi2	P>chi2
_cel	4	35.68313	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta		Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_cel	Droi	1	.	.	.	.	.
	Dgdp	.0428735	.0096294	4.45	0.000	.0240002	.0617468
	Dinterestraterate	.000182	.0076122	0.02	0.981	-.0147376	.0151016
	Dexchangerate	.0127323	.0040682	3.13	0.002	.0047588	.0207059
	Dinflation	.0006094	.0040681	0.15	0.881	-.0073639	.0085826
	_cons	-.0609178	.	.	.	.	.

The findings in table 10 above show that economic growth and exchange rate are significant as the P-values < 0.05. However, interest rate and inflation are statistically insignificant as the P-values > 0.05. The table represents the speed of adjustment speed back to long run equilibriums of each individual variable.

$$Droi = -0.061 + 0.0429Dgdp + 0.0002Dinterestraterate + 0.0127exchangerate + 0.0006Dinflation$$

5.2 Post Estimation Analysis

The researcher performed a post estimation analysis of the model to check for robustness of the model in modeling the relationship between the macroeconomic indicators and financial performance measured by the ROI.

To check for autocorrelation in residuals of VEC model the study used the Lagrange multiplier test. The result from table 11 indicates no serial correlation in the residuals. The p-value > 0.05 at all lags. We therefore accept the null hypothesis of no autocorrelation.

Table 4. 11: Lagrange-multiplier test

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	17.8107	25	0.85032
2	23.7890	25	0.53159

H0: no autocorrelation at lag order

Next the researcher checked for the stability condition of VEC estimates. After fitting a VEC model, it is required that variables be covariance stationary. The study findings in Table 12 show that all the modulus of each eigenvalues is less than one. Thus, since the modulus of each eigenvalue is strictly less than one, the estimated VEC is stable in accordance with Gonzalo's (1994) proposal. The study plotted the eigenvalues of the companion matrix as shown in Figure 3. The graph of the eigenvalues shows that none of the remaining eigenvalues appears close to the unit circle. The stability check does not indicate that our model is misspecified.

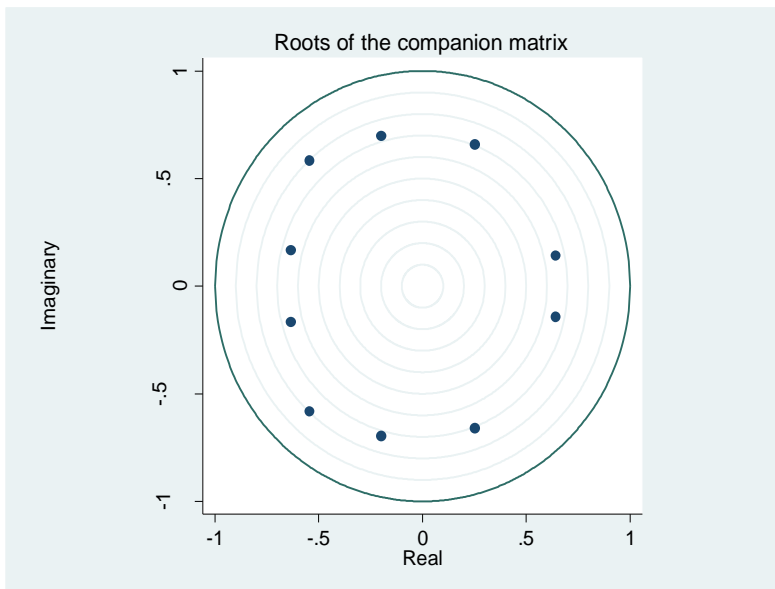
Table 4. 12: Eigenvalue Stability Condition

Eigenvalue stability condition

Eigenvalue	Modulus
-.5448131 + .5831081 <i>i</i>	.79802
-.5448131 - .5831081 <i>i</i>	.79802
-.1981661 + .6966419 <i>i</i>	.724279
-.1981661 - .6966419 <i>i</i>	.724279
.2527628 + .6592323 <i>i</i>	.706029
.2527628 - .6592323 <i>i</i>	.706029
.643057 + .1420648 <i>i</i>	.658563
.643057 - .1420648 <i>i</i>	.658563
-.6337223 + .166488 <i>i</i>	.655227
-.6337223 - .166488 <i>i</i>	.655227

All the eigenvalues lie inside the unit circle.
 VAR satisfies stability condition.

Figure 3: Stability of Variance



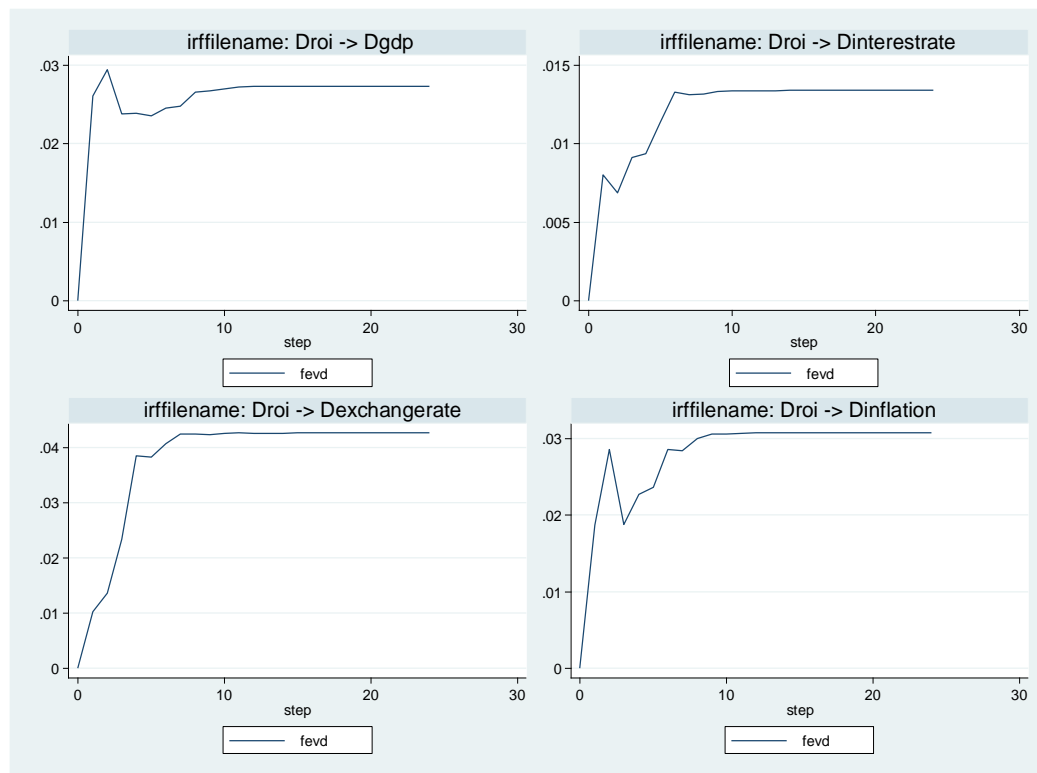
5.3 Impulse Response Functions

The study sought to determine the responsiveness of the dependent variable in the system to shocks applied to each of the independent variables. If the model is stable, the shock should die gradually

and if not, there should be persistence. The results in Figure 4 show that the effect of a shock to any of the cointegrating variables will not die out over time.

The results show a one standard deviation shock on the gross domestic product results into an immediate increase in the financial performance for the first period but later followed by a decrease on financial performance from second year after which it fluctuates until 13th period then forms a constant trend from the 14th period onwards which remains persistent. Persistence means the shock is permanent. The results further show that a one standard deviation shock in the interest rate will result into an immediate increase in the financial performance followed by a slight decline in the 2nd year and thereafter an increase and fluctuations until the 13th period when it stabilizes to remain persistent implying permanent shock. The results also show that a one standard deviation shock in the exchange rate will result into an immediate increase in the financial performance in the first to about 5th period before stagnating and then increasing to the seventh period then forms a constant trend from the 8th period which remains persistent, hence a permanent shock. Finally, the study findings revealed that one standard deviation shock in the inflation will result into an immediate increase in the financial performance in the first two periods then a decrease in the 3rd period the slight fluctuation up to the 8th period before being constant. This remained persistent which means permanent shock. The establishment of steady and constant positions after initial shock effects on the regressors indicated that the fitted model was stable.

Figure 4: Impact of GDP, interest rate, exchange rate and inflation on ROI



The study findings in Table 13 show that in the 4th quarter, changes in financial performance were largely due to own variations which stood at 70.6%, economic growth (GDP) 2.4%, interest rates 0.9%, exchange rates 3.8% and inflations 2.3% changes in financial performance. During the 10th quarter, the changes in financial performance were as attributed to own variation of 56.5%, while economic growth explained 2.7%, interest rate 1.3%, exchange rate 4.25% and inflation explained 3.1% of the change in financial performance.

On the 15th quarter, financial performance were explained by 56.1% own variation, GDP 2.7%, interest rate 1.3%, exchange rate 4.2% and inflation explained 3.1% change in financial performance. The results above show that the effect of a shock to GDP on itself and on other independent variables indicates a long run relationship and a stable fitted model.

Table 4. 13: Results from VEC IRF

step	(1) fevd	(2) fevd	(3) fevd	(4) fevd	(5) fevd
0	0	0	0	0	0
1	1	.026074	.008029	.010181	.018683
2	.99495	.029474	.006849	.013581	.02855
3	.814981	.023819	.009127	.023296	.018721
4	.705738	.023901	.009355	.03844	.022716
5	.659221	.023524	.011373	.038197	.023597
6	.611054	.02456	.013299	.040635	.028539
7	.591168	.0248	.013129	.042366	.028416
8	.572825	.026575	.013154	.042326	.030022
9	.569073	.026704	.013321	.042304	.030585
10	.564792	.026958	.013382	.0425	.030539
11	.562468	.027257	.013376	.042565	.03064
12	.561783	.027289	.013381	.042545	.030711
13	.561861	.027292	.013385	.042521	.030707
14	.561589	.027322	.013393	.042532	.030707
15	.561283	.027328	.013395	.042562	.030703
16	.561246	.027327	.013396	.042569	.030703
17	.561185	.027325	.013401	.042567	.030706
18	.561101	.027325	.013403	.042575	.030707
19	.561037	.027327	.013403	.04258	.030707

- (1) irfname = irffilename, impulse = Droi, and response = Droi
- (2) irfname = irffilename, impulse = Droi, and response = Dgdp
- (3) irfname = irffilename, impulse = Droi, and response = Dinterestrates
- (4) irfname = irffilename, impulse = Droi, and response = Dexchangerate
- (5) irfname = irffilename, impulse = Droi, and response = Dinflation

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter is a composite of the entire study, and contains a summary and exposition of the research findings, commensurate with the objectives, conclusions and recommendations proposed thereon.

5.2 Summary of Findings

From the analysis of findings, the trend analysis show that the exchange rate increased steadily with slight fluctuations over the years while the return on investment continued to increase except towards the end of the study period when there was a sharp decline and then a sharp increase again. GDP, interest rate and inflation recorded fluctuations across the years from 1965 to 2017.

None of the variables showed evidence of normal distribution from the descriptive analysis. The results depicts that all variables had positive skewness coefficients indicating that their distribution is right skewed.

The correlation matrix generally depicts that a strong relationship exists between ROI and interest rate and exchange rate with the coefficients 0.5971 and 0.7237 respectively, and a weak one with inflation (0.2156). There is weak correlation between interest rate and inflation (0.3336) and that existing between ROI and GDP and between GDP and exchange rate near negligible (0.0491 and 0.0482 respectively). The results further show a negative weak relationship between GDP and interest rate and inflation (-0.3090 and -0.3869 respectively) and between exchange rate and

inflation (-0.1174) but relatively strong correlation between interest rate and exchange rate (0.5421).

The regression analysis shows that all the model coefficients are positive, implying that all the macroeconomic indicators have a positive influence on the ROI. A unit increase in GDP, interest rates, exchange rates and inflation will result into a 0.0348183, 0.0114667, 0.0069218 and 0.0164163 change in the financial performance (ROI) in the same direct respectively.

The granger causality test overall results depicts that there is no causation between return on investment and macro-economic factors.

Johansen cointegration test results indicated the existence of cointegrating relationships between the variables implying that there exists a long term equilibrium relationship between the variables. This was in consonance with the VECM model study result that show that in long run the economic growth is positive and significant to financial performance same as exchange rate. However, although interest rate is positive, it is insignificant to firm's performance in the long run. The study further show that in the long run, inflation is negative and also insignificant to the financial performance.

5.3 Conclusion

This study looked at the effects of macroeconomic factors on the financial performance of NSSF in Kenya. Four factors were considered, that is, foreign exchange rates, inflation rates, interest rates and GDP. From the findings, we see that the variables substantially explain 63.09% of the financial performance of NSSF in Kenya. We further draw conclusions from the findings that, GDP positively and significantly influences the financial performance of NSSF in Kenya. This is

contrary to a number of studies conducted on the bank sub sectors but in concurrence with the study done by Bernoth, Colavecchio, & Sass (2010) in their study on Drivers of Private Equity Investment in CEE and Western European Countries which confirmed the positive relationship between financial performance and GDP growth.

The study further concludes that exchange rates positively and significantly influences the financial performance of NSSF in Kenya. Though contrary to some studies done which have shown that the influence on firm's financial performance is dependent on the extent to which the firm is exposed to foreign activity, it is also in agreement with other studies done. For instance this agrees with the study done by Bodnar and Gentry (1993) which they conducted on industries drawn from Canada, Japan and the US. They found that that the differences existing within industries have a bearing on the extent to which a firm is exposed to foreign exchange risk as well as the level to which they are exposed.

The study also concludes that inflation rates positively and significantly influences the financial performance of NSSF in Kenya. This contrasts the finding of the study done by Boyd, *et al.* (2000) on the Impact of Inflation on Financial Market Performance, which showed that both the banking sector development and equity market activity are negatively affected by inflation.

Finally the study however concludes that interest rates positively but insignificantly influences the financial performance of NSSF in Kenya. This contradicts studies done on the banking sector and subsector but is in concurrence with the study done by Njoroge (2013) which assessed the nature of the relationship between interest rates and financial performance of firms listed at the Nairobi Securities Exchange and found that there was no significant positive relationship between interest rates and financial performance of the firms.

5.3 Limitations of the Study

The study was limited to the NSSF in Kenya. Though the data was verifiable as it was secondary data collected from the Central Bank and the Kenya Bureau of Statistics resources, it could however still be prone to some shortcomings. Secondary data was also collected from the NSSF published financial reports and so subject to the same limitations.

The study looked at how the macroeconomic factors affect financial performance of NSSF. Only specific factors were considered and for the time period between December 1965 and December 2016 which is a 51 year period. Perhaps a longer period would have given a broader perspective of the problem by factoring and considering various economic patterns and cycles.

5.4 Recommendations

The study findings show that the selected macroeconomic variables have a significant impact on the financial performance of NSSF. All selected variables showed a positive correlation with the financial performance of NSSF in Kenya, with exchange rates having the strongest correlation and GDP the weakest. More focus should however be on GDP for future forecasts, being that it has the greatest influence on the financial performance of NSSF in Kenya. Interest rates, exchange rates and GDP in that order were found to have the greatest influence on the financial performance of NSSF in Kenya and so should be factored in stakeholders' considerations in the policy formulation and investment strategy setting for the NSSF in Kenya.

More study should be done on the effects of legislation on the financial performance of NSSF in Kenya. It would be interesting to learn how legislation would affect the performance of NSSF beyond the macroeconomic environment.

It would also be of interest to understand how the general insurability of the population in Kenya and the insurance penetration would affect the performance of the NSSF in terms of savings levels, especially with the advent of the NSSF Act 2013.

Further research should also be done on the effects of other macroeconomic factors not featured in this study, to the NSSF in Kenya.

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APPENDICES

Appendix I: Figures and Tables

Figure 1.

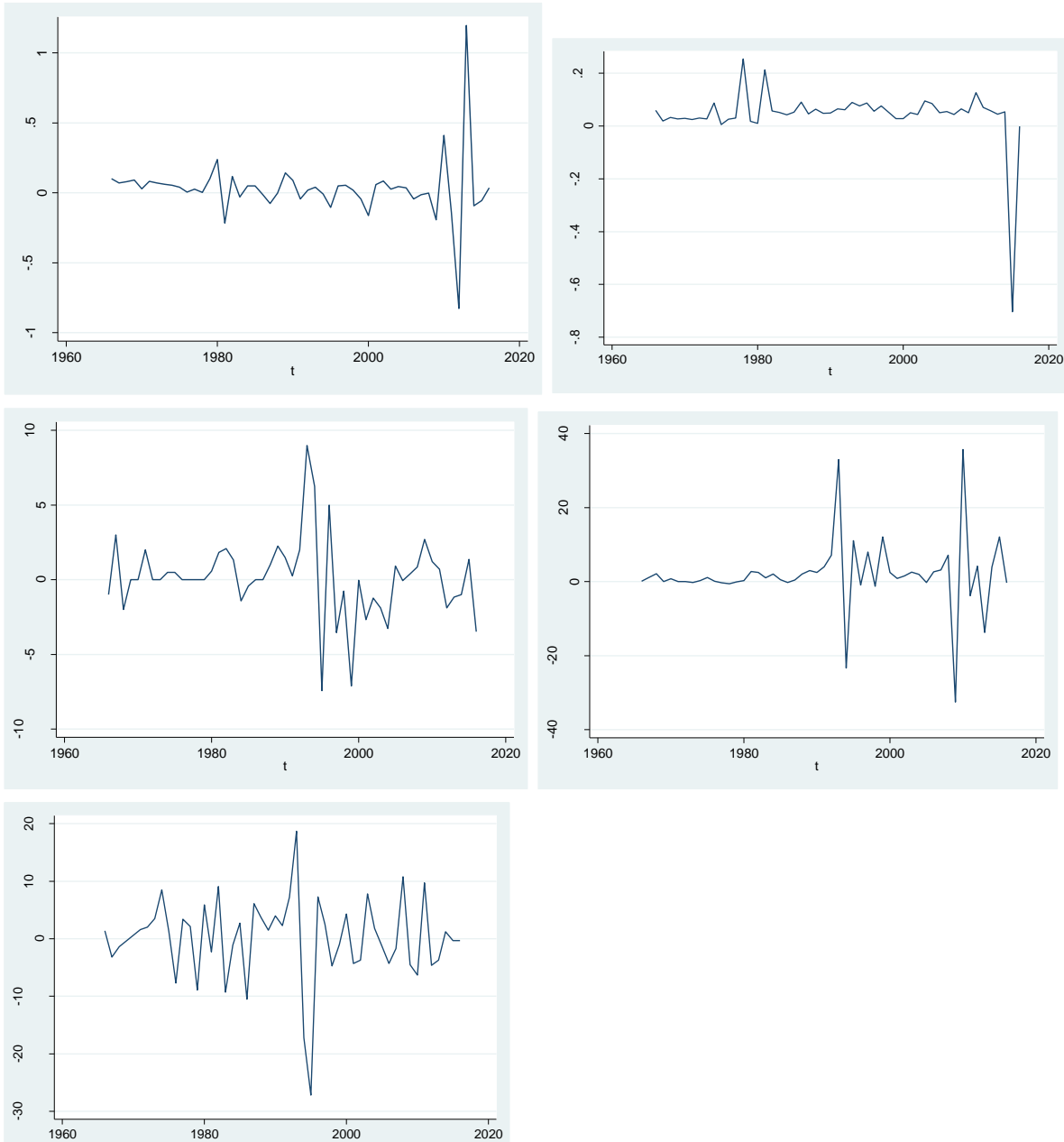


Figure 2:

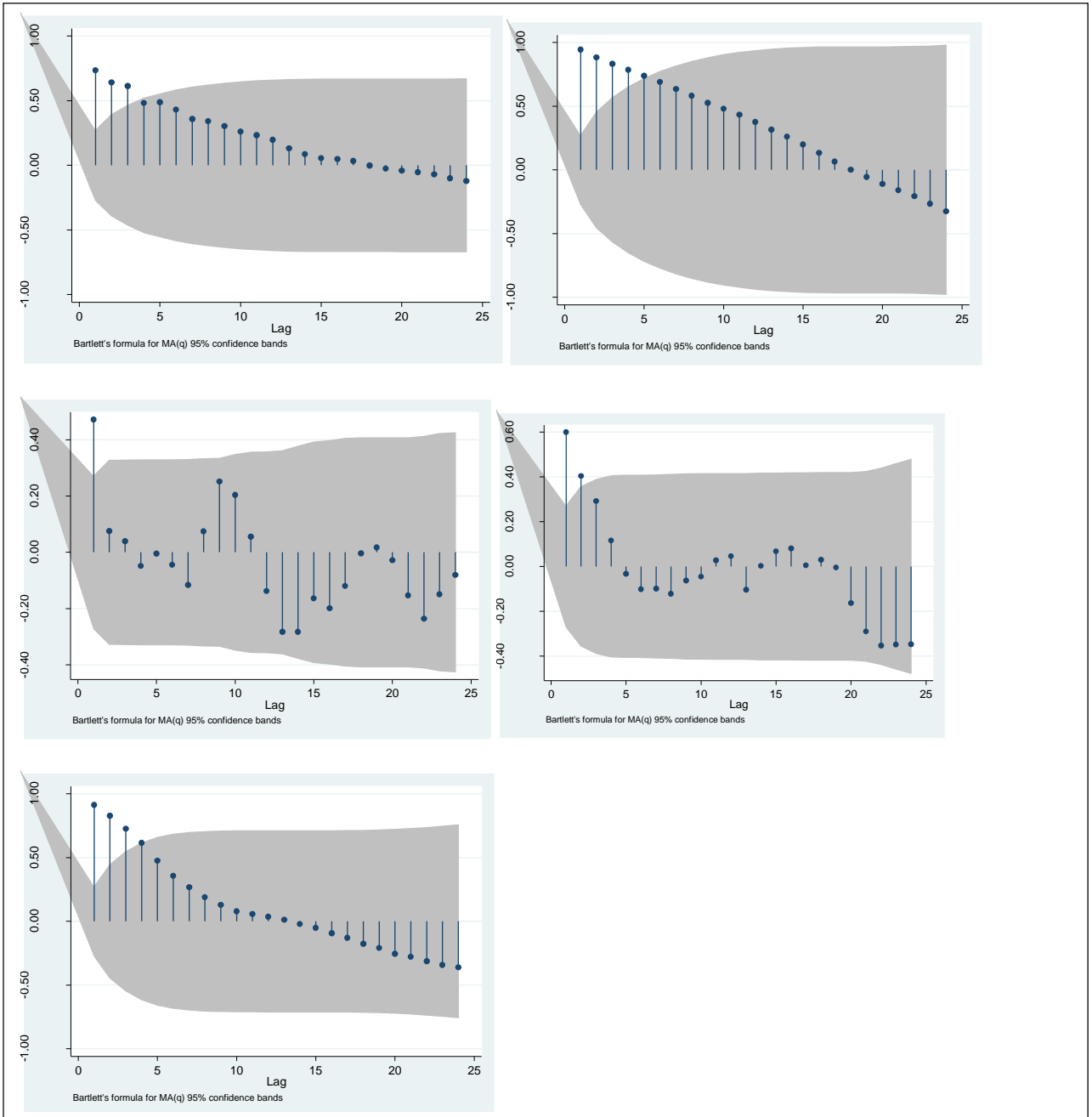


Figure 3:

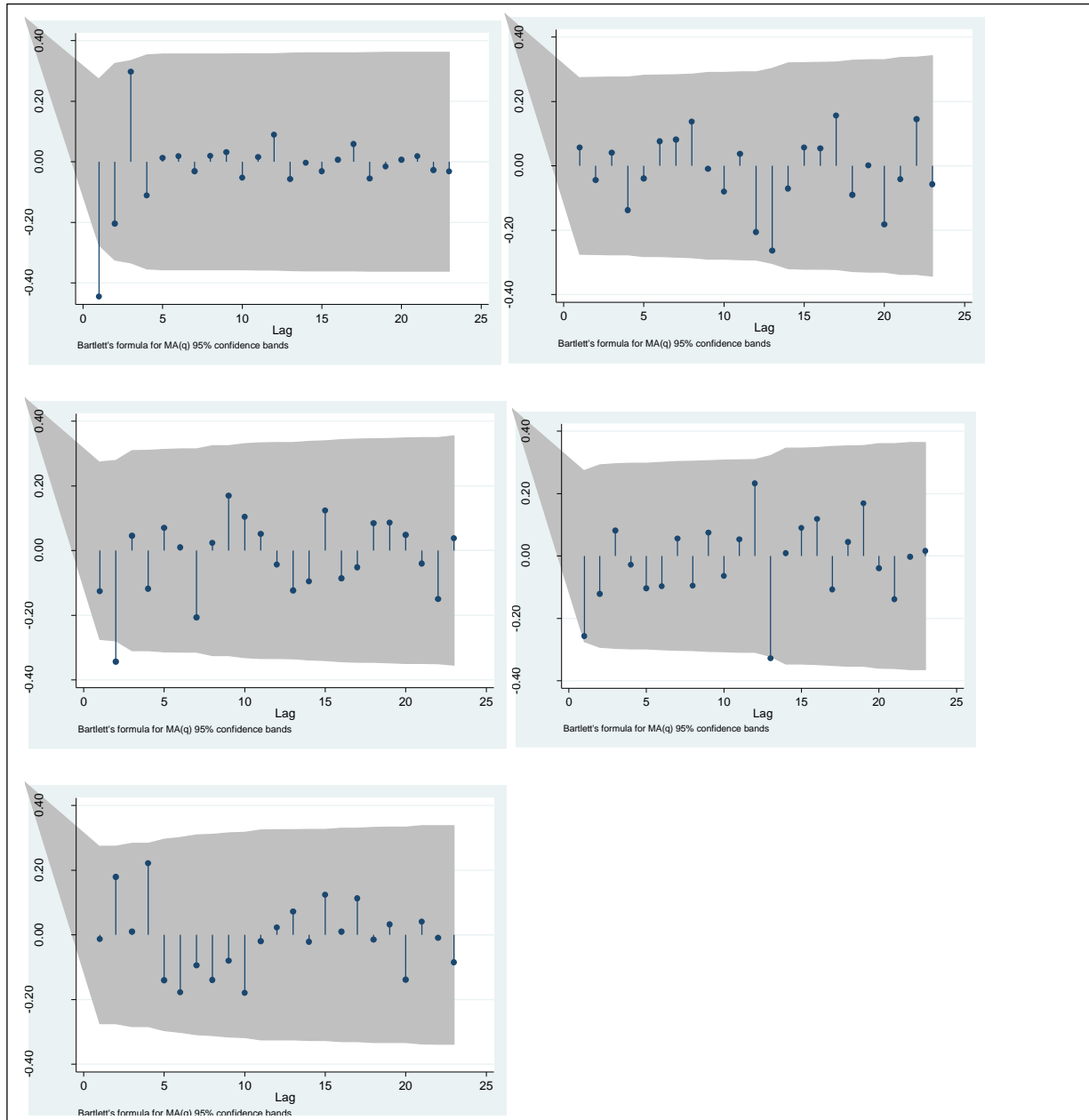


Table 1:

Vector error-correction model

Sample: 1968 - 2016	No. of obs	=	49
	AIC	=	22.06235
Log likelihood = -501.5277	HQIC	=	22.63363
Det(Sigma_ml) = 534.3931	SBIC	=	23.56809

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_Droi	7	.162016	0.8466	231.8061	0.0000
D_Dgdp	7	3.00285	0.3025	18.2109	0.0111
D_Dinterestrates	7	2.66321	0.5731	56.37758	0.0000
D_Dexchangerates	7	6.13809	0.2698	15.51535	0.0299
D_Dinflation	7	7.01073	0.5243	46.28396	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
D_Droi						
_cel						
L1.	-1.706001	.1573051	-10.85	0.000	-2.014313	-1.397688
Droi						
LD.	.2421512	.1020399	2.37	0.018	.0421567	.4421458
Dgdp						
LD.	.0553754	.0082805	6.69	0.000	.039146	.0716048
Dinterestrates						
LD.	.002249	.0074382	0.30	0.762	-.0123295	.0168276
Dexchangerates						
LD.	.0160645	.0038114	4.21	0.000	.0085944	.0235347
Dinflation						
LD.	-.0031265	.002995	-1.04	0.297	-.0089967	.0027436
_cons	-.0143126	.0231804	-0.62	0.537	-.0597453	.0311201

D_Dgdp							
_cel							
L1.	-7.611829	2.915532	-2.61	0.009	-13.32617	-1.897491	
Droi							
LD.	2.806185	1.891234	1.48	0.138	-.9005652	6.512934	
Dgdp							
LD.	-.2382405	.1534723	-1.55	0.121	-.5390406	.0625597	
Dintererate							
LD.	.1064849	.1378611	0.77	0.440	-.1637179	.3766876	
Dexchangerate							
LD.	-.0196076	.0706409	-0.28	0.781	-.1580612	.118846	
Dinflation							
LD.	-.0097933	.0555107	-0.18	0.860	-.1185923	.0990058	
_cons	-.0324619	.4296308	-0.08	0.940	-.8745229	.8095991	
<hr/>							
D_Dintererate							
_cel							
L1.	-1.382718	2.585774	-0.53	0.593	-6.450742	3.685305	
Droi							
LD.	.9143511	1.677327	0.55	0.586	-2.37315	4.201853	
Dgdp							
LD.	-.1465499	.136114	-1.08	0.282	-.4133283	.1202286	
Dintererate							
LD.	-.6975796	.1222684	-5.71	0.000	-.9372213	-.4579379	
Dexchangerate							
LD.	.2789466	.0626511	4.45	0.000	.1561527	.4017406	
Dinflation							
LD.	-.010476	.0492322	-0.21	0.831	-.1069694	.0860174	
_cons	-.1711461	.3810379	-0.45	0.653	-.9179666	.5756744	

D_Dexchangerate							
_cel							
L1.	-6.986409	5.959616	-1.17	0.241	-18.66704	4.694224	
Droi							
LD.	1.48519	3.865856	0.38	0.701	-6.091748	9.062127	
Dgdp							
LD.	.3003466	.3137115	0.96	0.338	-.3145166	.9152098	
Dinterestrates							
LD.	-.3198972	.2818007	-1.14	0.256	-.8722164	.232422	
Dexchangerate							
LD.	-.3938932	.1443965	-2.73	0.006	-.6769051	-.1108813	
Dinflation							
LD.	.0931605	.113469	0.82	0.412	-.1292347	.3155557	
_cons	.0456892	.878205	0.05	0.959	-1.675561	1.766939	
<hr/>							
D_Dinflation							
_cel							
L1.	5.46887	6.806886	0.80	0.422	-7.87238	18.81012	
Droi							
LD.	.3280762	4.415458	0.07	0.941	-8.326063	8.982215	
Dgdp							
LD.	-.9598023	.3583114	-2.68	0.007	-1.66208	-.257525	
Dinterestrates							
LD.	-.303518	.3218639	-0.94	0.346	-.9343596	.3273236	
Dexchangerate							
LD.	.5200459	.1649251	3.15	0.002	.1967986	.8432932	
Dinflation							
LD.	-.6123414	.1296008	-4.72	0.000	-.8663542	-.3583285	
_cons	-.0345511	1.003058	-0.03	0.973	-2.000509	1.931406	

Cointegrating equations

Equation	Parms	chi2	P>chi2
_cel	4	35.68313	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
_cel					
Droi	1	.	.	.	.
Dgdp	.0428735	.0096294	4.45	0.000	.0240002 .0617468
Dinterestrates	.000182	.0076122	0.02	0.981	-.0147376 .0151016
Dexchangerate	.0127323	.0040682	3.13	0.002	.0047588 .0207059
Dinflation	.0006094	.0040681	0.15	0.881	-.0073639 .0085826
_cons	-.0609178	.	.	.	.

Appendix II: Data

Time	GDP	Interest Rate	Exchange rate	Inflation	ROI
1965	3.82	7	3	3.6	5.824278168
1966	3.88	6	3.12	5	5.943610246
1967	3.90	9	4.23	1.8	5.994420104
1968	3.93	7	6.34	2.2	6.075080666
1969	3.96	7	6.34	2.3	6.122000152
1970	3.99	7	7.14	2.2	6.195441327
1971	4.01	9	7.14	3.8	6.278578476
1972	4.04	9	7.14	5.8	6.349400706
1973	4.10	9	6.9	9.3	6.409483726
1974	1.2	9.5	7.14	17.8	6.463645475
1975	6.1	10	8.25	19.1	6.503754468
1976	8.8	10	8.31	11.4	6.509398247
1977	6.6	10	7.95	14.8	6.534740707
1978	4.2	10	7.4	16.9	6.538113938
1979	3	10	7.33	8	6.637724325
1980	5.59	10.58	7.42	13.86	6.697860442
1981	3.72	12.42	9.05	11.6	6.660508223
1982	1.51	14.5	10.92	20.7	6.776580756
1983	1.31	15.83	13.31	11.4	6.745639398
1984	1.76	14.42	14.41	10.3	6.794588766
1985	4.3	14	16.43	13	6.84375225
1986	7.18	14	16.23	2.5	6.831448836
1987	5.94	14	16.45	8.6	6.754946913
1988	6.2	15	17.75	12.3	6.752311481
1989	4.09	17.25	20.57	13.8	6.895611638
1990	4.19	18.75	22.91	17.8	6.949260284
1991	1.44	19	27.51	20.1	6.94122532
1992	-0.8	21	32.22	27.3	6.960148719
1993	0.35	29.99	58	28.1	6.999299048
1994	2.63	36.24	56.05	28.8	6.990664764
1995	4.41	28.8	51.43	1.6	6.885261174
1996	4.15	33.79	57.11	8.9	6.935583991
1997	0.47	30.25	58.73	11.4	6.990490787
1998	3.29	29.49	60.37	6.7	7.010055215
1999	2.31	22.38	70.33	5.7	6.96540271
2000	0.6	22.34	76.18	10	6.801733731
2001	3.8	19.67	78.56	5.7	6.859404619
2002	0.5	18.45	78.75	4.7	6.943664243

2003	2.9	16.57	75.17	9.8	6.970454878
2004	5.1	13.31	75.55	11.6	7.014635355
2005	5.7	14.23	72.1	10.3	7.050566235
2006	6.5	14.18	67.32	6	7.005791399
2007	6.9	14.57	69.18	4.3	6.993314258
2008	1.5	15.43	77.35	9.9	6.990417935
2009	2.7	18.13	79.23	10.6	6.797983986
2010	8.4	19.34	88.81	4.3	7.209574391
2011	6.1	20.04	84.53	8.9	7.068780697
2012	4.6	18.15	86.12	9.4	6.240668788
2013	5.9	16.99	86.15	5.7	7.436525696
2014	5.4	15.99	90.04	6.9	7.343419289
2015	5.7	17.35	102.08	6.6	7.287156839
2016	5.9	13.88	101.73	6.3	7.321957274