

**EFFECT OF INVESTMENT STRATEGIES ON INVESTMENT RETURNS:
EVIDENCE FROM KENYAN PENSION FUNDS**

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DECLARATION

I hereby confirm that this project proposal is my original work and the contents therein have not been presented for academic award at any other institution.

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Date

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This project proposal has been submitted for examination with our approval as university supervisors.

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DEDICATION

To

My dear dad

Mr. James Mugo

(I will forever value your sacrifice and guidance)

And

My loving mum

Dr. Jane Mugo

(You always encourage me to be a better version of myself)

ACKNOWLEDGEMENT

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ABSTRACT

This study was aimed at determining the impact of investment strategies on investment returns. The strategies in this case were categorized based on the extent of asset allocation in risky assets; the categories of investment strategies were therefore conservative, moderate and aggressive. The study focused on pension funds in Kenya over the five year period of 2013 to 2017. One of the objectives was to determine which of the three investment strategies result in the highest risk adjusted returns. To determine this, Sharpe ratios of investment returns for each strategy were computed. It was found that a conservative strategy resulted in the highest risk adjusted returns due to the lower volatility of returns compared to both moderate and aggressive returns. We also carried out a regression analysis of investment returns versus various macroeconomic variables (GDP growth, inflation, interest rates and currency movements). The results showed that the regression equation was statistically significant for each of the investment strategies implying that the macroeconomic variables explained a significant portion of the variability of investment returns for all the three strategies. It was also found that investment returns of an aggressive strategy were the most impacted by changes in interest rates and inflation. Key recommendations were to investment managers to conduct thorough due diligence when adopting an aggressive investment strategy by also considering the volatility of returns when pursuing higher returns. We also recommend that the monetary policy committee ensures stability of interest rates and inflation since they have a significant impact on investment returns of pension funds.

TABLE OF CONTENTS

ACCRONYMS AND ABBREVIATIONS viii

CHAPTER ONE 1

INTRODUCTION..... 1

1.1 Background to the Study..... 1

 1.1.1 Investment Strategies 3

 1.1.2 Investment Returns 5

 1.1.3 Effect of Investment Strategies on Returns..... 6

 1.1.4 Pension Funds in Kenya..... 8

1.2 Research Problem 11

1.2 Objectives of the Study 13

 1.3.1 General Objectives of the study 13

1.4 Value of the Study 13

CHAPTER TWO 15

LITERATURE REVIEW 15

2.1 Introduction..... 15

2.2 Theoretical Framework..... 15

 2.2.1 Modern Portfolio Theory 15

 2.2.2 Capital Asset Pricing Model (CAPM) Theory 16

 2.2.3 Arbitrage Pricing Theory 17

2.3 Determinants of Investment Returns 18

2.4 Empirical Literature Review 19

2.5 Conceptual Framework..... 22

CHAPTER THREE..... 23

RESEARCH METHODOLOGY 23

3.1 Introduction..... 23

3.2 Research Design 23

3.3 Target Population 23

3.4 Data Collection process 23

3.5 Data Analysis and Presentation techniques..... 24

 3.5.1 Diagnostic Tests..... 24

 3.5.2 Analytical Framework 26

 3.5.3 Test of Significance 28

CHAPTER FOUR..... 29

DATA ANALYSIS AND FINDINGS	29
4.1 Introduction	29
4.2 Discussion of the findings	29
4.3 Risk adjusted returns	30
4.4 Diagnostic tests	32
4.4.1 Test for Normality.....	32
4.4.2 Test for Multicollinearity	34
4.4.3 Test for Heteroscedasticity.....	35
4.5 Regression Analysis	36
4.6 Analysis of Variance (Anova)	37
CHAPTER FIVE	40
SUMMARY, CONCLUSIONS AND RECCOMENDATIONS	40
5.1 Introduction	40
5.2 Summary of findings	40
5.3 Conclusion	42
5.4 Recommendations for policy	43
5.5 Limitations of the study	43
5.6 Suggestions for further studies	44
REFERENCES	45

ACCRONYMS AND ABBREVIATIONS

APT:	Arbitrage pricing theory
CAPM:	Capital Asset Pricing Model
CMA:	Capital Markets Authority
DB:	Defined Benefits
DC:	Defined Contribution
GDP:	Gross Domestic Product
IPS:	Investment Policy Statement
KES:	Kenyan Shilling
RBA:	Retirement benefits authority
USD:	United States Dollar

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The main purpose of a pension fund is to provide members with a source of income after retirement or in the event of leaving gainful employment. This is achieved through aiming for capital preservation of the funds collected and also investing the funds collected in order to earn a return. An investor chooses those investments that offer the highest rate of return in the long-term if he knew with certainty the rate of return from future investments, this is not the case in reality since returns are unknown (Galbreath & Galvins, 2014). Risk is a key determinant of what asset classes one invests in since most investors are risk averse.

This study is anchored on the theories of Capital Asset Pricing Theory (CAPM), modern portfolio theory and arbitrage pricing theory. CAPM assumes that an investor will earn a higher return for taking up higher systematic risk. The theoretical expectation based on CAPM is therefore that funds pursuing an aggressive investment strategy should have better returns than funds employing a conservative or moderate strategy. Arbitrage pricing theory makes similar assumptions to CAPM but in the case APT there are more risk factors associated with an individual investment asset. APT introduced a framework where one asset can have an unlimited number of risk factors. Modern portfolio theory recommends using indifference curves when constructing the most optimal portfolio. Indifference curves outline the risk return preferences of the investor and based on these an optimal portfolio can be created.

The theories the study is anchored on determine the investment strategy an investor will opt for based on the risk profile since every investor is assumed to be aiming to maximize their risk adjusted return. The investment strategy opted for impacts the returns of a fund and it is this impact that is the basis of this study. Investment returns are of considerable importance to a pension fund since they determine the value of a member's contribution upon retirement. These returns are determined by the investment strategy implemented by a pension fund based on the risk profile.

In the context of investment, strategy is the set of guidelines or procedures. These guidelines are the basis of an investor's selection of specific asset classes. Investment strategy is structured around an investor's risk appetite and the risk-return trade off of the available asset classes. Investors can have a strategy of maximizing returns by taking on more risk (aggressive strategy), or a strategy of minimizing risk and earning a lower return (conservative strategy) or a strategy that is somewhere in between (moderate strategy). (Source; Zamara Quarterly Pensions Survey of Kenyan Pension Funds)

Globally, the main determinant of investment strategy in return. A survey conducted by Price water coopers (PWC) in 2016 of pension funds across the globe determined that returns and diversification were most prominent when deciding on an investment strategy. Historically most pension schemes across the globe invested in fixed income only but with time we've seen more and more funds employing aggressive investment strategies in order to increase returns.

The shift in strategy has been driven by low dollar interest rates over the last decade forcing investors to invest in riskier assets for higher risk adjusted returns. This trend has been observed in Kenya too. In Kenya, the trustees of a pension scheme are bestowed with the responsibility of determining the investment strategy each pension scheme, this is done through drafting an Investment policy statement (IPS) and then appointing a fund manager whose role is implementing investment decisions in line with the IPS.

1.1.1 Investment Strategies

Investment strategy is the guidelines or procedures based on which an investor selects the assets to invest in. Investment strategy is structured around an investor's risk appetite and the risk-return trade off of the available asset classes. Investors can pursue a strategy of maximizing returns by taking on more risk (aggressive strategy), or a strategy of minimizing risk and earning a lower return (conservative strategy) or a strategy that is somewhere in between (moderate strategy). Strategies are adopted at a market and industry level and serve as a basis for determining the investment portfolio of a fund (Farma & French, 2012).

Based on the risk profile of each strategy, an investment strategy can be classified as conservative, moderate and aggressive. For the purpose of this study, we will focus on conservative, moderate and aggressive strategies which are based on the proportion of investments in risky asset classes invested in by the pension fund.

A conservative investment strategy focuses on capital preservation through minimizing risk. Conservative strategy focuses on investing in risk free securities or high rated corporate securities and large cap stocks with a high dividend yield. This strategy ensures that investment returns are not highly volatile and future income from the investment assets is almost guaranteed, as a result, minimal or no investments are made in risky asset classes.

A moderate strategy focuses on balancing risk and return of the fund. This strategy usually entails allocating 50% to equities and 50% to interest bearing assets (Momba & Nyanumba, 2013). The risk profile of this strategy is higher than that of a conservative strategy and is therefore best suited for investors with a higher risk tolerance than the conservative strategy.

An aggressive strategy is where one allocates a high percentage to risky assets with an aim of getting a higher return. This strategy has a higher risk profile than a moderate strategy and is therefore suitable for investors with a high risk tolerance and long investment horizon. For this strategy, majority of investments will be in assets that are susceptible to market price movements.

Investment strategies can also be classified as passive or active. Passive management (also called passive investing) is a financial strategy which does not entail any forecasting or taking any active risk versus the benchmark. The strategy minimizes transaction and management fees (Jones 2009).

Passive investing also eliminates risks from inaccurate forecasts. Retail investors usually employ passive investing by investing in index funds or risk free assets. Passive investing is based on the assumption that it is impossible to constantly forecast and outperform the market at costs that are low enough to justify the effort. A key advantage of passive investing is lower management costs (Jones, 2009). Active management (also called active investing) is where an investor targets to outperform a pre-determined benchmark by actively rebalancing the portfolio. Active investing entails making forecasts which are used as a basis to buy undervalued securities and sell overvalued securities. Schoenfeld and Steven (2004) found that active investment strategies mainly aim at getting higher returns than the overall market. Active investors use various quantitative measures in portfolio construction. These include intrinsic or relative valuation of securities in order to purchase undervalued securities and short sell overvalued securities. Macroeconomic forecasts are also used to determine which sectors will outperform in the economy and therefore target to invest in those sectors. Active investing is based on the notion that the investor is able to consistently identify high-return investments and achieve better than the average market returns.

1.1.2 Investment Returns

Investment return is described as the percentage change in value of a fund's investment assets. The returns can be in the form of realized returns from dividend, interest income as well as gains or losses from the sale of various securities. Investment returns can also be unrealized returns from the changes in the market prices of the investment assets.

In Kenya, investment returns of pension funds are measured versus the benchmark set out in the investment policy statement. Usually the investment return benchmark is based on various indices for each asset class weighted on the strategic asset allocation targets. The investment manager contracted by the pension fund's trustees therefore aims to exceed the benchmarks set out in the investment policy statement. The percentage investment return is therefore used as a measure of how effective an investment strategy is. In the short term (5 years and below), investment returns can fluctuate significantly therefore long-term investment returns (5 years and above) are used as a basis of evaluating how effective an investment strategy is.

1.1.3 Effect of Investment Strategies on Returns

The impact of investment strategy on investment returns of a pension fund cannot be overemphasized. Brinson et al. (1986) found that asset allocation justifies over 90% of the variability of returns of pension funds. Investment strategy is what determines asset allocation of a fund. For example, an investor pursuing an aggressive investment strategy will allocate a higher proportion to risky assets than one implementing a conservative or aggressive strategy.

The Brinson et al. study found that asset allocation justifies over 90% of the variability of returns among pension funds. The funds in the sample were those that were discretionary and the asset classes in the study were cash bonds and equities. The study also considered security selection and performance of the various investment managers.

Hensel, Ezra, Ilkiw (1991), was a study done using data similar to the Brinson et al. study. The aim of the study was to analyse the long-term investment returns of pension funds. The study found that unlike the Brinson studies, the choice of fund manager was equally as important as the asset allocation decision each accounting for approximately 40% of the variance in returns and market outlook the remaining 20%. This study introduced a new perspective to the Brinson study since it introduced choice of fund manager and market outlook as additional variables that impact investment returns.

Ngotho (2013) concluded that over time, investment policy adopted by trustees explained up to 62.4% of variations in returns of pension funds. This implies that asset allocation and consequently investment strategy is a significant determinant of investment returns for pension schemes in Kenya. Kiplagat (2014) researched on the impact of asset allocation on the financial performance of pension funds in Kenya. He found that 58% of fund returns were explained by asset allocation with the remaining 42% being explained by other factor like manager selection and timing.

The impact of risk on returns can be explained by the theories of CAPM, Modern portfolio theory and Arbitrage Pricing Theory (APT). CAPM assumes that an investor will earn a higher return for taking up higher systematic risk. The theoretical expectation based on CAPM is therefore that funds pursuing an aggressive investment strategy should have better returns than funds employing a conservative or moderate strategy. Arbitrage pricing theory makes similar assumptions to CAPM but in the case APT there are more risk factors associated with an individual investment asset.

APT introduced a framework where one asset can have an unlimited number of risk factors. Modern portfolio theory recommends using indifference curves when constructing the most optimal portfolio. Indifference curves outline the risk return preferences of the investor and based on these an optimal portfolio can be created. The theories the study is anchored on determine the investment strategy an investor will opt for based on the risk profile since every investor is assumed to be aiming to maximize their risk adjusted return.

1.1.4 Pension Funds in Kenya

Pension schemes in Kenya can be classified into two general categories, defined benefits and defined contribution schemes. In a defined contribution (DC) scheme, the employer's and members' contribution are set as a percentage of the pensionable salary or an absolute amount. A member's retirement benefits value is valued as a sum of all the contributions made plus the investment returns earned less expenses incurred in management of the pension scheme including any insurance premiums paid on behalf of the member (Source; Retirement Benefits Authority).

For a DC Scheme, retirement benefits are not known in advance since they are based on the amount of contributions made during the period when the employee was pensionable, the expenses deducted by the pension provider and the investment returns of the pension fund. The retirement income of a member is also based on the annuity rates at the time of retirement (Source; Retirement Benefits Authority).

A defined benefit (DB) Scheme is one where the benefits are pre-determined based on the scheme rules. These rules are set out in advance before an employee joins the DB scheme. Benefits in a DB scheme are based on the number of years an individual has been in employment. The risk with a DB scheme is just the risk that the employer might not meet the solvency requirements of the fund (Source; Retirement Benefits Authority).

Pension Funds in Kenya are regulated by Retirement Benefits Authority (RBA) through the RBA Act. Through the Retirement Benefits Act (1997) and subsequent regulations of 2000, the investment guidelines of pension funds were implemented. RBA was constituted to tackle the problems that were facing the pension industry such as mismanagement of scheme funds and illiquidity of some of the schemes. All existing and new pension schemes were required to be established under a binding trust with the sponsor having no influence over the pension fund. Pension funds are also required to contract various external service providers among them administrators, fund managers, custodians, auditors, actuary to advice trustees(Source; Retirement Benefits Authority Act)

The fund manager (investment manager) is a firm licensed by the Capital Markets Authority (CMA) and the Retirement Benefits Authority (RBA) and is contracted by the trustees of the scheme. The role of the fund manager is to formulate and implement investment strategy with an aim of outperforming the benchmarks outlined in the investment policy statement (IPS).

Pension funds will therefore employ investment strategies that match the risk profile of the fund i.e. conservative, moderate or aggressive investment strategies. Investment returns will therefore vary across various funds based on the strategy employed (Source; Zamara Quarterly Pensions Survey of Kenyan Pension Schemes). The Retirement Benefits Authority does not stipulate the specific securities in which scheme should invest in but rather provides guidelines on the asset classes. The pension scheme has the option to select the securities that will best maximize returns while still meeting the liquidity needs of the scheme.

Investment strategies will have different determinants depending on whether the fund is DC or DB. DB schemes have to periodically estimate the funding level of the scheme depending on the future liabilities of the fund. These liabilities are determined based on actuarial estimates of life expectancy as well as future expectations of interest rates. The discount rate used to compute the present value of liabilities is also a determinant. The fund also has to consider the contribution levels and projected investment incomes when formulating a strategy. If the fund has a funding deficit, then the sponsor has to pay for the deficit. DC schemes on the other hand do not guarantee the retirees a pre-determined income in retirement and they therefore don't consider funding levels when coming up with an investment strategy (Price Waterhouse Coopers; Best Practices in the pension funds investment process, 2016).

1.2 Research Problem

Investment strategies and consequently investment returns are a key determinant of the long-term sustainability of pension funds. The components of most investment strategies include asset allocation limits and guidelines on buying and selling securities. Asset allocation decisions are based on the risk profile of the investors of a fund (Brinson et al. 1986). For a pension fund this is based on the asset liability profile of the members in a pension scheme. A survey conducted by Price water coopers (PWC) in 2016 of pension funds across the globe determined that historically most pension schemes across the globe invested in fixed income only but with time we've seen more and more funds employing aggressive investment strategies in order to increase returns. The purpose of this study is evaluate whether this trend of investing in riskier assets results in higher risk adjusted returns or whether previous conservative investment strategies resulted in higher risk adjusted returns.

There have been varied arguments on whether riskier assets result in higher returns in the long-term. Booth et al. (2004) was of the opinion that investing in risky asset classes like equities will result in short term volatilities but these are insignificant in the long-term. On the other hand, Ronde (2006) argued that investing purely in fixed income exposes the investor to inflation and interest rate risk which results in similar extents of volatility in returns as equities. Ang, Hodrick, Xing and Zhang (2006), Blitz and van Vliet (2007), Baker, Bradley and Wurgler (2011). They have all come to the conclusion that low risk assets have a high performance relative to their risk, and that they even outperform high-risk assets within several asset classes.

Traditional asset pricing theories predict two scenarios. Either there is no relationship between risk and return under the assumption that markets are complete and frictionless, and all investors are well- diversified. Alternatively, there is a positive relationship under the assumption that markets are incomplete and investors face sizeable frictions and hold poorly- diversified portfolios (Merton, 1987; Hirshleifer, 1988). This implies that the literature contradicts core concepts of finance and challenges the framework of CAPM. Empirical analysis of the relationship between investment strategy and returns has not yet quantified whether a higher allocation to riskier assets results in higher risk adjusted returns for pension funds.

Globally, studies have been done on the impact of strategy and asset allocation on investment returns. Brinson et al. (1986), was a study of returns for 91 pension schemes based in the USA. The Brinson et al. study found that asset allocation explains over 90% of the variability of returns among pension funds. The conclusion was that this was because pension funds tend to maintain a long-term investment horizon. Hensel, Ezra, Ilkiw (1991), was a study done using data similar to the Brinson et al. study. The aim of the study was to analyse the long-term investment returns of pension funds. The study found that unlike the Brinson studies, the choice of fund manager was equally as important as the asset allocation decision each accounting for approximately 40% of the variance in returns and market outlook the remaining 20%. Ibbotson and Kaplan (2010) found that asset allocation justifies only about 40% of the variation of returns among pension funds which is not significant.

Kenyan studies on the impact of asset allocation on investment returns have also been performed. Ngotho (2013) concluded that over time, investment policy adopted by trustees explained up to 62.4% of variations in returns of pension funds. Kiplagat (2014) researched on the impact of asset allocation on the financial performance of pension funds in Kenya. He found that 58% of fund returns were explained by asset allocation with the remaining 42% being explained by other factors like manager selection and timing. This study will seek to answer the question of which investment strategy (based on the risk profile of the strategy) results in the most efficient risk adjusted returns in the long-term.

1.2 Objectives of the Study

1.3.1 General Objectives of the study

To assess the effect of investment strategies on investment returns of pension funds in order to determine which strategy has the most efficient risk adjusted returns. Risk adjusted returns will be computed based on Sharpe ratios. The study will also determine the impact of various macroeconomic variables on investment returns of each strategy.

1.4 Value of the Study

The study will be a guide to pension fund trustees and fund managers on the impact of various investment strategies on investment returns. Based on this study, investment managers can pursue strategies that maximize fund returns which will translate to sustainable incomes for retirees in Kenya.

The findings can also assist the Retirement Benefits Authority (RBA) to put in place appropriate regulations that enhance sustainable investment returns for pension schemes. The study will better guide regulators when coming up with asset allocation limits for various asset classes since the impact on investment returns from various investment strategies will be clear.

The study can be applied by investors when choosing an investment manager or drafting an investment policy statement since the findings will quantify the impact of each of the strategies on returns. An investor can therefore align their pension contributions to a fund that is implementing the investment strategy that has the most efficient risk adjusted returns. The study can also be a basis for further research on variables that impact investment returns and studies on investor behavior with regards to employing investments strategies that result in the highest risk adjusted returns.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter will discuss an overview of theories and empirical literature reviewed providing a basis for the study.

2.2 Theoretical Framework

There are several theories that explain the relationship between investment strategy and investment return. This study will be based on the following theories; Capital Asset Pricing Model: Modern Portfolio Theory, and Arbitrage pricing theory. These theories are discussed below.

2.2.1 Modern Portfolio Theory

The theory was authored by Harry Markowitz in his paper "Portfolio Selection," published in 1952 by the Journal of Finance. The theory states that investors want to take the smallest possible risk in order to obtain the highest possible returns. The theory recommends using indifference curves when constructing the most optimal portfolio. Indifference curves outline the risk return preferences of the investor. The standard deviation of returns is used to quantify risk and return is measured by the expected returns. Based on the theory, an efficient frontier of a portfolio with the maximum return given a particular level of risk can be created. This portfolio is called the efficient portfolio.

O'Neil (2000) found that MPT has important practical applications such as reducing volatility of portfolio returns. Before MPT was invented, investors did not consider the concept of risk when managing investment. This theory relates to our study since the study will seek to determine which strategy has the highest risk adjusted returns which is in line with the theory's assumption of an existence of efficient portfolios have the optimal risk return trade off.

2.2.2 Capital Asset Pricing Model (CAPM) Theory

The theory was invented by William Sharpe (1964) and John Lintner (1965). The theory states that the expected return of a security or a portfolio is equal to the risk free rate plus a risk premium multiplied by the asset's or portfolio's systematic risk. The standard deviation of returns is used to measure total risk in CAPM. According to CAPM, there are two components of total risk; Systematic risk and Unsystematic risk. Systematic risk is risk that is not associated to a specific asset, also called market risk. It includes inflation risk, interest rate risk, liquidity risk etc. Systematic risk can't be diversified from. Unsystematic risk is associated to a specific asset and can be eliminated by investing in diverse assets with multiple unsystematic risks. CAPM stipulates that the expected return is higher when an investor has a higher systematic risk.

An investment portfolio is always compared to the market, particularly the return. And risk of a portfolio is measured by the ratio between portfolio's variance of return to its market return. Therefore, a diversified portfolio will only bear the market risk, in other words, it has same movement with market (Eiteman, et al. 2010).

CAPM guides our study since based on CAPM, an investor pursuing an aggressive investment strategy is expected to have a higher return in the long-term due to the higher unsystematic risk and vice versa for conservative and moderate strategies.

2.2.3 Arbitrage Pricing Theory

In 1976, Ross (1976) presented the arbitrage pricing theory (APT). APT is an extension of CAPM since the basic concept is similar but in the case APT there are more risk factors associated with an individual investment asset. APT introduced a framework where one can have an unlimited number of risk factors. The return based on this theory is a linear function of various systematic risk factors. The identity of each of the risk factors is not specified and can therefore be tailored towards each investment asset.

The theory makes three assumptions; there exists many assets so investors can invest in diverse assets and eliminate asset-specific risks, a factor model describes asset returns, and that there are no arbitrage opportunities among well diversified portfolios. Black, Jensen and Scholes (1972) challenged the predictions of CAPM, and found that the security market line (SML) is flatter than originally predicted. This was supported by Haugen and Heins (1972) who examined the New York Stock Exchange between 1926 and 1971.

The theory guides our study similarly to CAPM where the expectation is that an investor pursuing an aggressive investment strategy is expected to have a higher return in the long-term due to the higher unsystematic risk and vice versa for conservative strategies. Unlike CAPM, APT also assumes that there are infinite risk factors affecting investment assets.

2.3 Determinants of Investment Returns

There are various determinants of investment returns. One of the key determinants of investment return is asset allocation. Investment strategy and asset allocation is primarily determined by the Investment Policy Statement (IPS) of a fund. The IPS outlines the limits for the various asset classes based on the fund size, risk profile, contribution and liquidity needs of the fund as well as any regulatory requirements on investment. An investment manager also basis their strategy and asset allocation on the future expectations of macroeconomic variables with an aim of aligning the fund's investment to outperform the return benchmarks outlined in the IPS.

Another determinant of investment return is security selection. Security selection can be defined as the process of picking individual investment securities within a specific asset class. The aim of security selection to create a portfolio of securities that outperform the benchmark of an individual asset class (Brinson, Hood and Beebower 1986)

Economic performance is another determinant of investment return. Economic performance also impacts returns since it impacts sectorial performance which ultimately affects the performance of individual asset classes. Factors such as interest rates determine the valuations of bonds which subsequently affects the unrealized gains and losses of a fund.

Choice of investment manager is another determinant of investment returns. An investment manager is the firm designated with the discretion to make investment decisions of the fund. This impacts investment returns since each investment firm has different procedures and guidelines and different investment processes

Another determinant of investment returns is market timing. Market timing is when an investment manager applies technical and economic indicators to determine when to buy and sell securities. The aim to buy undervalued securities and short overvalued securities with a target of outperforming the market (Brinson, Hood and Beebower 1986)

2.4 Empirical Literature Review

Studies have been done both globally and locally on the impact of strategy and asset allocation to investment returns. Brinson et al. (1986), was a study of quarterly returns for 91 large U.S. pension funds. The Brinson et al. study found that asset allocation justifies over 90% of the variability of returns among pension funds. The funds in the sample were those that were discretionary and the asset classes in the study were cash bonds and equities.

The study also considered security selection and performance of the various investment managers. The study did not consider risk policy vs. riskless investing as well as other factors like manager choice and macroeconomic variables. This oversight could imply that the impact on variability of returns found by the studies could have been overstated.

Hensel, Ezra, Ilkiw (1991), was a study done using data similar to the Brinson et al. study. The aim of the study was to analyse the long-term investment returns of pension funds. The study found that unlike the Brinson studies, the choice of fund manager was equally as important as the asset allocation decision each accounting for approximately 40% of the variance in returns and market outlook the remaining 20%. The study however did not account for the impact of macroeconomic variables such as GDP growth, inflation, and currency.

Blake, Lehmann and Timmermann (2014) did a study of 364UK company pension schemes. They found that there was little variation in the various returns of the pension funds. There was also little variation in strategic asset allocation in the long term. They also found that security selection did not cause a significant variation in the returns of the funds. Based on these findings, their conclusion was that the legal and economic environment the various fund managers operated in was the likely cause of the empirical irregularities. The study concludes that passive investment would be better than active funds due to the variability of returns for actively managed funds.

The study however does not quantify which strategy achieved higher risk adjusted returns in the long-term since it mostly focuses on the risks of each of the strategies as opposed to risk adjusted returns.

Omony, (2013) observed that risk and return are the key considerations in investment practices of Pension Fund Managers in Kenya. Current income is not their fund objective; however, the most predominant objective will be capital preservation. Pension schemes also differ from collective investment schemes as they have a minimum funding requirement and they are established to invest funds to meet pension liabilities. That is, they are invested with the expectation that they will be sufficient to pay pension entitlements when these are due. The study concluded that risk is a key consideration but it however did not quantify the relationship if any between risk and return of the pension funds and whether the strategies employed were resulting the highest risk adjusted returns.

Nguthu (2009) found that the variation in returns of pension funds in the long term is explained up to 62.4% by the asset allocation policies adopted by the scheme trustees. Other factors such as securities selection, timing of investments and choice of investment manager explained the balance. The study was conducted on 40 segregated pension schemes in Kenya. Kiplagat (2014) researched on the impact of asset allocation on the financial performance of pension funds in Kenya. He found that 58% of fund returns were explained by asset allocation with the remaining 42% being explained by other factor like manager selection and timing.

2.5 Conceptual Framework

The focus of the study is to evaluate which of the investment strategies has the best risk-return trade off. This will be established by computing the Sharpe ratios of funds in each strategy category. The impact of macroeconomic variables of the returns of each strategy will be established using multiple regression with the macroeconomic variables as the independent variables and the investment returns of each strategy as the dependent variables as illustrated in figure 2.1

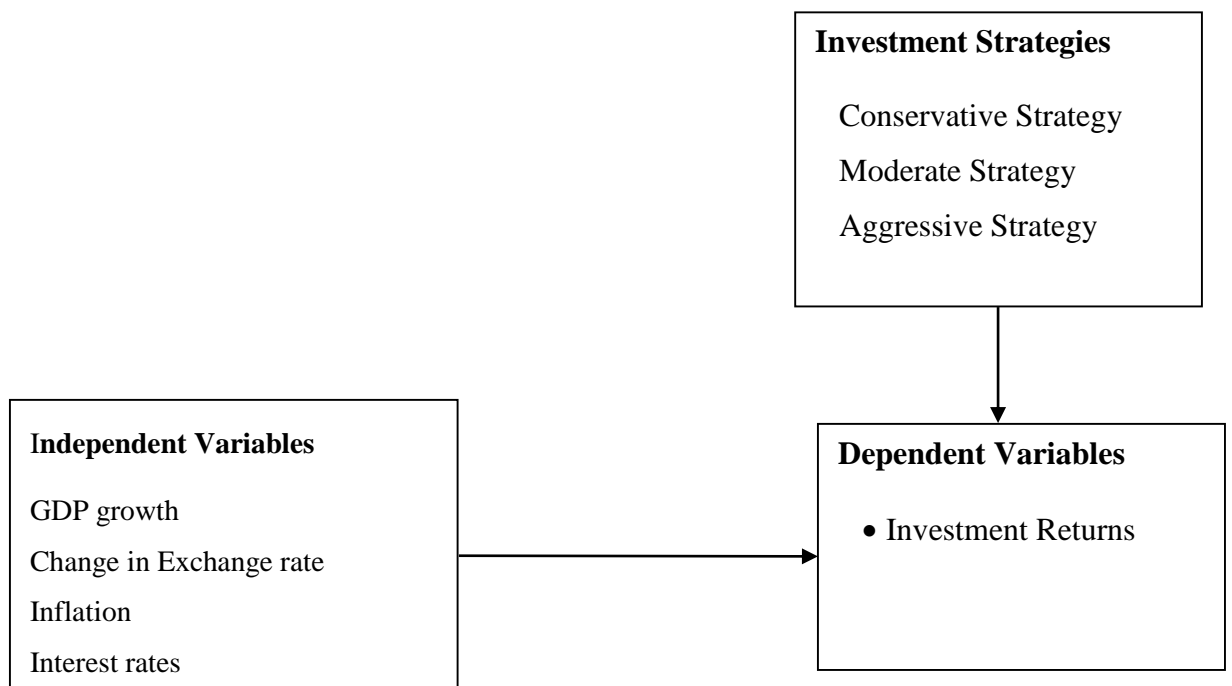


Figure 2.1 Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology which will guide the study. The research methodology outlines the procedures used in conducting the study which is basically the research design, population, data collection and methods of analysis which are described.

3.2 Research Design

The research design selected will be a descriptive survey. Travers (1969) states that descriptive surveys are conducted to establish the nature of the existing situation or condition. This research design will be effective in gathering, evaluating and deriving results on the effect of investment strategies on pension fund returns.

3.3 Target Population

The study's population is all registered pension schemes in Kenya. These were 1,474 pension schemes as at December 2017 based on RBA. These are both defined contribution and defined benefits schemes.

3.4 Data Collection process

Secondary data will be gathered for the study. This data will be obtained from both Zamara Investment Consulting Actuaries and the RBA database. The Zamara survey is published on a quarterly basis and it outlines pension schemes' returns reported by funds employing various investment strategies.

3.5 Data Analysis and Presentation techniques

Quantitative data in the form of the annual return of pension schemes will be collected. To determine the risk return trade off of conservative, moderate and aggressive funds, Sharpe ratios will be used as a measure of determining the strategy with the optimal risk-return trade off. Sharpe ratio is a measure of the returns above the risk free return per unit of total risk taken. The ratio will be used to determine whether the returns attained by portfolios implementing an aggressive investment strategy are due to effective investment decisions or due to underwriting excess risk. To determine the extent to which macroeconomic variables impact the return of each of the variables, multiple regression models will be used.

3.5.1 Diagnostic Tests

Diagnostic testing will be carried out in order to test for any forms of biases that may occur while carrying out the statistical analysis. Diagnostic testing will be aimed at testing the validity of the regression equations used to ensure that they meet the various assumptions of multiple regression. In the present study, the diagnostic tests will include tests of normality, Multicollinearity and Heteroscedasticity.

3.5.1.1 Tests for Normality

Statistical procedures require that the assumption of normality is test. The test for normality ascertains whether the data follows a normal or asymmetrical distribution by checking for kurtosis coefficients and skewness.

If the data is not normally distributed, the true relationship of the variables may not be depicted. We will test for normality using a Quartile on Quartile (Q-Q) normality plot.

3.5.1.2 Test for Multicollinearity

Multicollinearity is assumed to be present when the various independent variables have a high correlation. Multicollinearity leads to unreliable results and estimates that are unstable. This implies that results of the extent to which the independent variables determine variations in the dependent variable are not reliable when multicollinearity is present. We will test for multicollinearity by computing the correlations of each of the variables to determine if any of the variables is highly correlated to other variables.

3.5.1.3 Test of Heteroscedasticity

One of the assumptions of multiple regression is homoscedasticity which is defined as the assumption that the error terms have a constant variance. When the variance of the error term is not constant, then heteroscedasticity is present. This implies that standard errors are biased and therefore t statistics and F statistics cannot be used accurately to draw inferences. Heteroscedasticity results in confidence interval that are too wide or too narrow. A plot of residuals versus predicted values will be used to check for the convergence.

3.5.2 Analytical Framework

The study will classify pension funds in the sample into three categories based on the allocation to fixed income securities. Sharpe ratios will be computed for each of the funds in the various categories based on the formula below:

$$= \frac{\bar{r}_p - r_f}{\sigma_p} \dots\dots\dots \text{equation (i)}$$

Where:

\bar{r}_p = Expected portfolio return

r_f = Risk free rate

σ_p = Portfolio standard deviation

The following linear multiple regression models will be applied for to evaluate the effect of macroeconomic variables on the pension funds in each category (Moderate, conservative and aggressive):

$$Y_c = \alpha_c + \beta_1 cX_1 + \beta_2 cX_2 + \beta_3 cX_3 + \beta_4 cX_4 + \epsilon_c \dots\dots\dots \text{equation (ii)}$$

$$Y_m = \alpha_m + \beta_1 mX_1 + \beta_2 mX_2 + \beta_3 mX_3 + \beta_4 mX_4 + \epsilon_m \dots\dots\dots \text{equation (iii)}$$

$$Y_a = \alpha_a + \beta_1 aX_1 + \beta_2 aX_2 + \beta_3 aX_3 + \beta_4 aX_4 + \epsilon_a \dots\dots\dots \text{equation (iv)}$$

Where:

Y_c = Annualized Investment return of conservative pension funds measured by the weighted average annualized return of conservative pension funds as defined in equation

(ii) Conservative funds will be funds with greater than 80% allocation to fixed income.

Y_m = Annualized Investment return of moderate pension funds measured by the weighted average annualized return of moderate pension funds as defined in equation (iii). Moderate funds will be funds with a fixed income allocation of 65% to 80%.

Y_a = Annualized Investment return of aggressive pension funds measured by the weighted average annualized return of aggressive pension funds as defined in equation (iv). Aggressive funds will be funds with an allocation of less than 65% to fixed income and;

α = constant

β = regression coefficient

x_1 = Kenya's GDP growth measured by the percentage growth of Kenya's GDP

x_2 = the annual inflation rate measured by the average headline inflation rate in Kenya per year

x_3 = Change in exchange rate measured by measured by the annual percentage change of the Kenya Shilling versus the US dollar

x_4 = interest rates measured by the average 364-day treasury bill rate in Kenya per year

ϵ_c = error term for conservative schemes

ϵ_m = error term for conservative schemes

ϵ_a = error term for conservative schemes

3.5.3 Test of Significance

Tests of significance will be used in the study which includes Bivariate Correlation between the macroeconomic variables and portfolio returns, R- square and ANOVA. R-Square (Co-efficient of Determination) will be used to establish the extent of the variability of fund returns explained by the independent variable over time. Analysis of Variance (ANOVA) will be used to determine the linear relationship among the variables in the multiple regression models. The purpose of the tests on the regression equation will estimate the impact of movements in macroeconomic variables to each of the strategies which will indicate which returns based on the various strategies is most susceptible to economic performance. The tests will also quantify the extent to which macroeconomic variables contribute to the investment returns of each of the investment strategies.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents the findings of the data analysis. Sample schemes were selected and analyzed based on the objective of the study which is to evaluate the impact of investment strategies on investment returns. The data collected was subsequently analyzed and comparison done to similar studies done on the subject matter. The sample of schemes used was based on the Zamara pensions survey which incorporated 374 schemes as at December 2017, the schemes were then classified into the various investment strategies (conservative, moderate and aggressive) based on the asset allocation of the schemes. The findings post analysis give a summary of the strategy with the highest risk adjusted returns as well as the impact of various macroeconomic variables on the investments returns of each of the three strategies.

4.2 Discussion of the findings

Data on the performance of the pension schemes was sourced both from RBA and the Zamara pensions' survey. The annual performance of pension schemes employing each of the three investment strategies (conservative, moderate and aggressive) was then computed. This was based on weighted average return of pension schemes in each category. Sharpe ratios were then computed over a five-year period and these were used to determine the strategy with the highest risk adjusted returns.

Diagnostic tests were then performed on the regression variables and subsequently Analysis of Variation (ANOVA) in order to determine the impact of various macroeconomic variables on the investment returns of each strategy.

4.3 Risk adjusted returns

Sharpe ratios were computed for the years based on the weighted average annualized return of schemes in each category. The Risk free return was based on the average return of the 364 day T-bill for each year. The expected portfolio return was based on the annualized weighted average return of portfolios in each category of investment strategy over the period of 2013-2017.

The formula for computing Sharpe ratios is:

$$= \frac{\bar{r}_p - r_f}{\sigma_p}$$

Where:

\bar{r}_p = Expected portfolio return

r_f = Risk free rate

σ_p = Portfolio standard deviation

Table 4.1 gives the annual returns for each category from 2013-2017 as well as the 5 year annualized returns and standard deviation of returns.

Year	Overall	Conservative	Moderate	Aggressive
2013	21.4%	19.2%	25.4%	19.7%
2014	15.5%	15.4%	15.4%	17.5%
2015	0.5%	4.0%	0.2%	-0.6%
2016	6.3%	9.4%	6.2%	5.2%
2017	18.5%	15.7%	18.5%	18.8%
Standard Deviation	8.8%	6.0%	10.0%	9.2%
5 year annualized return	12.2%	12.6%	12.8%	11.8%

Table 4.1

Based on the annualized 5 year returns, moderate schemes have the highest return of 12.8% compared to 12.6% and 11.8% for conservative and aggressive schemes respectively. In terms of volatility, conservative schemes have the least volatility of returns at 6% compared to 10% and 9.2% for moderate and aggressive schemes respectively.

Table 4.2 has the computed Sharpe ratios for each category,

	5 year Annualized return	Risk Free Return	Standard deviation of returns	Sharpe Ratio
Conservative	12.60%	11.30%	6.00%	21.30%
Moderate	12.80%	11.30%	8.40%	17.50%
Aggressive	11.80%	11.30%	9.20%	5.20%

Table 4.2

Based purely on Sharpe ratios, conservative schemes have the highest risk adjusted returns with a sharp ratio of 21.3% compared to 17.5% and 5.2% for moderate schemes

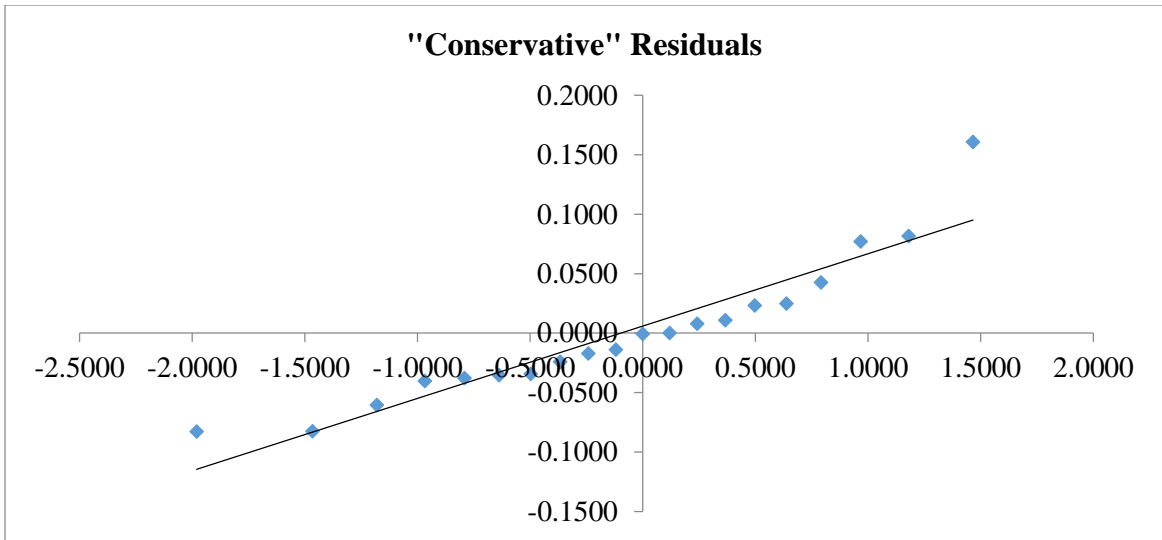
and aggressive schemes respectively. This is because conservative schemes have a significantly lower volatility of return compared to other schemes while still having a higher return than aggressive schemes over a 5 year period.

4.4 Diagnostic tests

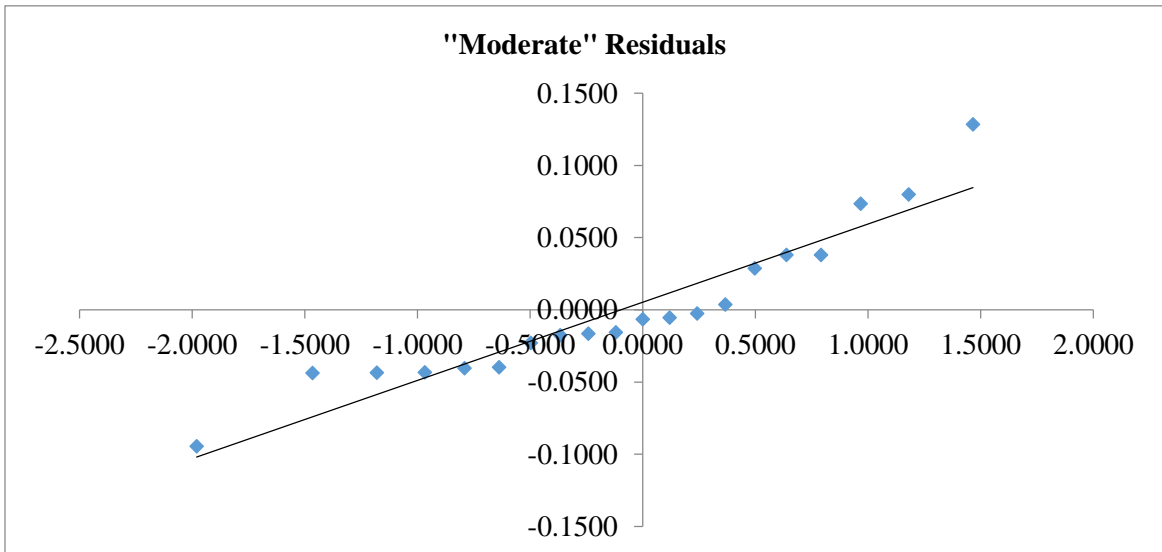
Diagnostic tests were carried out to test the validity of the regression equations used to ensure that they meet the various assumptions of multiple regression. In the present study, the diagnostic tests were tests of normality, Multicollinearity and Heteroscedasticity.

4.4.1 Test for Normality

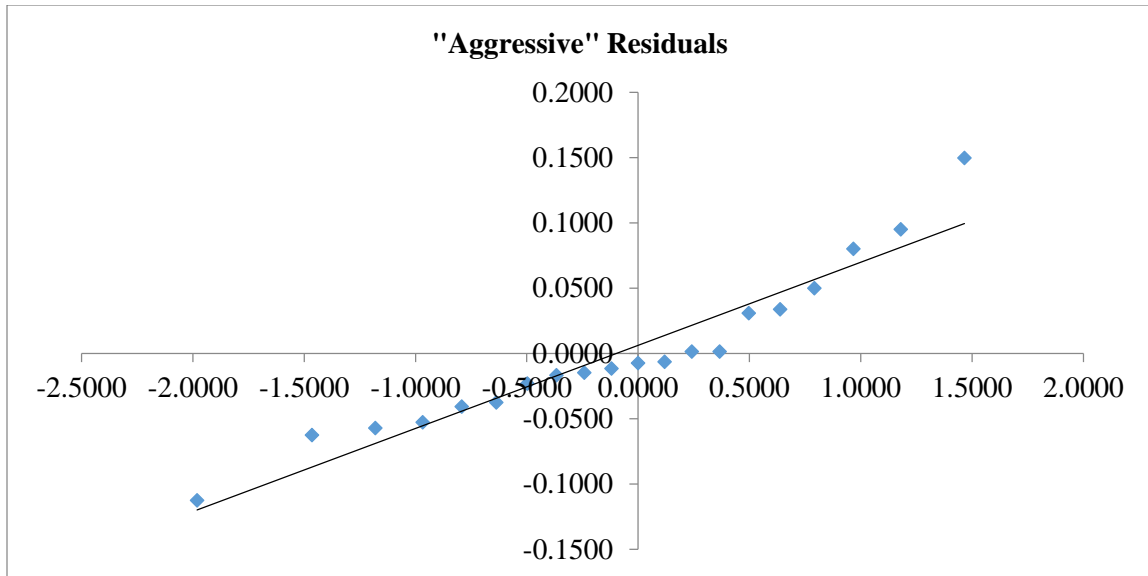
Statistical procedures require that the assumption of normality is tested. The test for normality ascertains whether the data follows a normal or asymmetrical distribution by checking for kurtosis coefficients and skewness. If the data is not normally distributed, the true relationship of the variables may not be depicted. We tested for normality using a quantile-quantile (Q-Q) plot. For normally distributed data, observations should lie approximately on a straight line. If the data is non-normal, the points form a curve that deviates markedly from a straight line.



Observations for conservative schemes residuals lie on a straight line on the Q-Q plot implying that the data is normally distributed.



Observations for moderate schemes residuals lie on a straight line on the Q-Q plot implying that the data is normally distributed.



Observations for aggressive scheme residuals lie on a straight line on the Q-Q plot implying that the data is normally distributed.

4.4.2 Test for Multicollinearity

Multicollinearity is assumed to be present when the various independent variables have a high correlation. Multicollinearity leads to unreliable results and estimates that are unstable. We computed the correlations among each of the variables to determine if any of the variables is highly correlated to other variables. This is outlined in table 4.3.

	GDP Growth	T Bill Rate	Inflation	Exchange Rate
GDP Growth	1.00			
T Bill Rate	0.08	1.00		
Inflation	-0.09	-0.21	1.00	
Exchange Rate	-0.11	-0.07	0.00	1.00

Table 4.3

The correlation coefficients are significantly different from -1 and +1 implying a low correlation among the variables and therefore no multicollinearity in our regression model.

4.4.3 Test for Heteroscedasticity

One of the assumptions of multiple regression is homoscedasticity which is defined as the assumption that the error terms have a constant variance. When the variance of the error term is not constant, then heteroscedasticity is present. This was tested by plotting the squared residuals versus the predicted variables and the ANOVA (Analysis of Variance) results are summarized below in table 4.4:

ANOVA-Conservative					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	0.000266339	6.65848E-05	2.594787843	0.078777956
Residual	15	0.000384915	2.5661E-05		
Total	19	0.000651254			

The significance of F was 7.8% which was significantly above our significance level of 5% implying that the equations are not significant. Heteroscedasticity is therefore not present.

ANOVA-Moderate					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	8.62161E-05	2.1554E-05	1.429612753	0.272365011
Residual	15	0.000226152	1.50768E-05		
Total	19	0.000312368			

The significance of F was 27.2% which was significantly above our significance level of 5% implying that the equations are not significant. Heteroscedasticity is therefore not present.

ANOVA-Aggressive					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	0.00017	4.2E-05	1.493578029	0.253771911
Residual	15	0.00042	2.8E-05		
Total	19	0.00059			

Table 4.4

The significance of F was 25.4% which was significantly above our significance level of 5% implying that the equations are not significant. Heteroscedasticity is therefore not present.

4.5 Regression Analysis

The regression analysis results are summarized below

	Conservative	Moderate	Aggressive
R squared	0.5706	0.6058	0.5701
Adjusted R Squared	0.5561	0.6007	0.5555

The table above shows that the coefficient of determination (R-squared) was significant (>50%) for all investment strategy categories. This implies that the independent variables (GDP growth, T Bill rate, Inflation and Exchange rate) explain 57%, 61% and 57% of the variations in conservative, moderate and aggressive investment returns respectively.

The significance of F (0.9%, 0.5% and 0.9% for conservative, moderate and aggressive schemes respectively) is less than our significance level of 5% or all categories implying that R-squared is significantly different from zero for each of the categories.

4.6 Analysis of Variance (Anova)

The study applied Analysis of Variance (ANOVA) to test for the existence of a correlation between the predictor variables (GDP growth, T Bill rate, Inflation and exchange rate) at a significance level of 5%. The results are summarized below in table 4.5.

	Conservative		Moderate		Aggressive	
	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value
Intercept	0.7104	0.0054	0.7443	0.0016	0.8251	0.0023
GDP Growth	0.0683	0.9723	-0.6029	0.7302	-0.3887	0.8481
T Bill Rate	-3.2990	0.0374	-3.3871	0.0183	-3.9014	0.0192
Inflation	-2.3833	0.0382	-2.4585	0.0183	-2.8615	0.0182
Exchange Rate	0.9083	0.0062	0.7885	0.0070	0.7829	0.0177
Significance of F	0.0093		0.0051		0.0094	

Table 4.5

The significance of F (0.9%, 0.5% and 0.9% for conservative, moderate and aggressive schemes respectively) is less than our significance level of 5% or all categories implying that R-squared is significantly different from zero for each of the categories. The model is therefore significant.

The P-values of each of the independent variables (with the exception of GDP) are below our significance level of 5% implying that the coefficients are significantly different from zero.

The following regression equations were therefore obtained:

$$Y_c = 0.7104 + 0.0683X_1 - 3.2990X_2 - 2.3833X_3 + 0.9083X_4$$

$$Y_m = 0.7443 - 0.6029X_1 - 3.3871X_2 - 2.4585X_3 + 0.7885X_4$$

$$Y_a = 0.8251 - 0.3887X_1 - 3.9014X_2 - 2.8615X_3 + 0.7829X_4$$

Where:

Y_c = Annualized Investment return of conservative pension funds measured by the weighted average annualized return of conservative pension funds. Conservative funds were funds with greater than 80% allocation to fixed income.

Y_m = Annualized Investment return of moderate pension funds measured by the weighted average annualized return of moderate pension funds. Moderate funds were funds with a fixed income allocation of 65% to 80%.

Y_a = Annualized Investment return of aggressive pension funds measured by the weighted average annualized return of aggressive pension funds. Aggressive funds were funds with an allocation of less than 65% to fixed income and;

X1= Kenya's GDP growth measured by the percentage growth of Kenya's GDP

X2= the annual inflation rate measured by the average headline inflation rate in Kenya per year

X3 = Change in exchange rate measured by measured by the annual percentage change of the Kenya Shilling versus the US dollar

X4 = interest rates measured by the average 364-day treasury bill rate in Kenya per year

From the results, GDP growth rate does not have a significant impact on investment returns for all the three categories as indicated by P-values (97.2%, 73.02% and 84.8% for conservative, moderate and aggressive respectively) that are above the significance level of 5%.

Aggressive schemes are the most impacted by changes in T bill rates and inflation rates. Holding all other factors constant, a unit increase in T bill and inflation would result in a 3.9% decrease and 2.9% decrease in investment return for aggressive schemes as compared to 3.3% and 2.4% decrease for conservative and 3.4% and 2.5% decrease for moderate schemes.

Conservative schemes are the most impacted by changes in exchange rate. Holding all other factors constant, a unit increase in the exchange rate would result in a 0.9% in returns for conservative schemes, 0.8% for moderate schemes and 0.8% for aggressive schemes

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECCOMENDATIONS

5.1 Introduction

This chapter is a summary of the entire study and is constituted by the summary of findings in line with the objectives of the study and the recommendation subsequently derived.

5.2 Summary of findings

The objective of the study was to determine the impact of investment strategies on investment returns with the strategies being classified as conservative, moderate and aggressive. The study first sort to determine which strategy resulted in the highest risk adjusted returns based on Sharpe ratios. It was determined that conservative schemes have the highest risk adjusted returns with a sharp ratio of 21.3% compared to 17.5% and 5.2% for moderate schemes and aggressive schemes respectively. This is because conservative schemes have a significantly lower volatility of return compared to other schemes while still having a higher return than aggressive schemes over a 5 year period. This implies that pension schemes that have been adopting an aggressive investment strategy have not been compensated with higher risk adjusted return for taking on additional risk.

Further analysis was carried out to determine the impact of various macroeconomic variables on the investment returns of each of the strategies. The variables were GDP growth, T-Bill rates, inflation and changes in exchange rate.

From the findings of the analysis, there is a linear relationship between the investment returns of each of the strategies and the macroeconomic variables. This was demonstrated by the regression models passing various diagnostic tests (Normality, multicollinearity and heteroscedasticity) as well as significantly high R-squared values for each of the investment strategies (57%, 60% and 57% for conservative, moderate and aggressive schemes). This implies that variation in investment returns for each of the strategies can be explained by changes in the macroeconomic variables considered.

The study also sort to determine the impact of each of the macroeconomic variables to the investment returns of each of the strategies. From the results, GDP growth rate does not have a significant impact on investment returns for all the three categories as indicated by P-values (97.2%, 73.02% and 84.8% for conservative, moderate and aggressive respectively) that are above the significance level of 5%. Aggressive schemes are the most impacted by changes in T bill rates and inflation rates. Holding all other factors constant, a unit increase in T bill and inflation would result in a 3.9% decrease and 2.9% decrease in investment return for aggressive schemes as compared to 3.3% and 2.4% decrease for conservative and 3.4% and 2.5% decrease for moderate schemes. Conservative schemes are the most impacted by changes in exchange rate. Holding all other factors constant, a unit increase in the exchange rate would result in a 0.9% in returns for conservative schemes, 0.8% for moderate schemes and 0.8% for aggressive schemes

5.3 Conclusion

The objective of the study was to determine the impact of various investment strategies on investment returns of pension funds. From the study, it was found that a conservative investment strategy resulted in the highest risk adjusted returns based on Sharpe ratios due to lower volatility of returns compared to moderate and aggressive returns. It also found that an aggressive investment strategy is the most impacted by changed in interest rates and inflation both of which have a significant impact on the returns of all the strategies.

From the findings, a pension fund in Kenya should adopt a conservative investment strategy which has the highest risk adjusted risk adjusted returns due to the lower volatility of returns compared to moderate and aggressive schemes. Alternatively, an investment manager should only increase the risk profile of the pension fund if after thorough due diligence, they can determine that the higher returns from the riskier asset classes will result in higher risk adjusted returns after factoring in the expected volatility of returns. In addition, during periods when the expectation is that interest rates and inflation will rise, investors should adopt a conservative investment strategy since it is the least impacted by changes in inflation and interest rates.

5.4 Recommendations for policy

There is need for RBA and CMA to monitor the trend to increasingly invest in riskier assets as this may not necessarily result in higher risk adjusted returns for pension funds. Investment manager should ensure through due diligence before investing in riskier asset classes in order to determine whether the higher expected returns also compensate the investors for implied volatility of investment returns of riskier asset classes.

The Central Bank of Kenya (CBK) as well as the Monetary Planning Committee (MPC) should aim to maintain some level of stability and interest rates and inflation as these have a significant impact on the returns of pension funds and subsequently the income of retirees post retirement. Erratic changes in inflation and interest rates will result in volatility of pension fund returns.

5.5 Limitations of the study

The study sought to determine the impact of investment strategies on investment returns using Kenyan pension funds; it was however subject to some limitations. The key limitation was that information on asset allocation and investment returns of pension funds is still considered confidential in Kenya. The researcher therefore had to take time to demonstrate that confidentiality of the information will be maintained and that the information is only for the purpose of the study. Pension fund asset allocation and returns are also not available in a central database and the researcher had to manually compile data from various sources.

5.6 Suggestions for further studies

The study focused on the impact of investment strategies on Kenyan pension funds, further studies can be carried out to determine whether these investment strategies have similar results when applied to other types of investment funds e.g. Mutual funds, Hedge funds etc. or other geographies outside Kenya.

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