**EFFECTS OF ASSET ALLOCATION ON FINANCIAL PERFORMANCE OF UNIT TRUST SCHEMES IN KENYA**

**BY**

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# DECLARATION

I declare that this research project is my original work and has not been submitted for the award of a degree in any other university.

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This research project has been submitted for examination with my approval as

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# ABBREVIATIONS

**ANOVA** Analysis of Variance

**CAPM** Capital Asset Pricing Model

**CBK** Central Bank of Kenya

**CIC** Corporate Insurance Company

**CIS** Collective Investment Schemes

**CMA** Capital Markets Authority

**KNBS** Kenya National Bureau of Statistics

**MPT** Modern Portfolio Theory

**NSE** Nairobi Securities Exchange

**SACCOs** Savings and Credit Co-Operative societies

**SPSS** Statistical Package for the Social Sciences

# ABSTRACT

This study sought to establish the effects which asset allocation has on the financial performance of Unit Trust Schemes in Kenya. Unit Trust Schemes provide diversification, liquidity, professional management among other benefits. In order to diversify the funds raised from various unit holders, fund managers have to adopt a criterion with which funds are allocated optimally; deliver optimal returns to the investor within acceptable volatility levels. A descriptive research design was adopted, and the study period was 5-years. The ratio of the composition of different asset classes to the fund value was used as the independent variables. Fund age was used as the control variable. Sharpe ratio was used to measure investment returns and that represented the dependent variable of the study. Data was collected from secondary sources and a multiple linear regression model was adopted to assess the association of the variables. Collected data showed normality traits, positive autocorrelation when measured using Pearson correlation coefficients between the dependent and independent variables. The data also showed mixed results for multicollinearity tests. The weight of money market instruments, corporate bonds, treasury bonds and equity significantly affected performance of Unit Trust Scheme funds. They all had probability values in the interval of 0 and 0.05. The log of the age of the fund was not significant given that it had a probability of 0.059 which was slightly above 0.05. Immovable property had a probability of 0.473 which was also not significant at the 5% level of significance. This implied that, immovable property had significantly lower influence in the performance of a fund. Further, 47.9% of the fund returns in Kenya can be explained by the independent values of this study. Therefore, the study concluded that asset allocation significantly affects how a fund will perform hence fund managers have to do it right to deliver reasonable returns to the investors. The study further recommends that, the regulation by CMA on the quantities which a certain fund can invest in a particular financial instrument needs to be reviewed. Sometimes, fund managers are boxed into putting investor funds in a certain financial instrument and the fund ends up underperforming. Given that asset allocation alone influences the returns of a fund up to a certain extent, other factors such as timing, manager experience and prevailing economic conditions have to be evaluated well when investment decisions are made.

#  CHAPTER ONE

# INTRODUCTION

## Background of the Study

Deciding on an appropriate mix of financial assets which an investor’s funds will be allocated is a decision fund managers have to make throughout their daily investing operations. Investment is not a matter of picking stocks and other asset classes to put your money in, but it is about choosing the right combination of financial asset classes where one can put their money in (Karimi, 2013). Therefore, asset allocation is an important decision which differentiates between a poorly performing scheme and one which offers attractive returns to the investors. Investment returns point to how a scheme is financially performing. Asset allocation is also regarded as an investment strategy (Dziwok, 2014). An appropriate strategy allows the fund manager to profile investors in terms of the risk levels they can tolerate, their investment preferences and how they rate the fund (Velusamy & Selvaveerakumar, 2014).

Various models have been developed in a bid to explain the inter-relationship which exists between investment returns and the risk involved. Risk underlies asset allocation. Sharpe (1964) and Lintner (1965) developed CAPM to describe expected returns of a security and the risk involved. Markowitz (1952) developed the modern portfolio theory (MPT) to serve as a guide towards building optimal portfolios given the assumption that investors are risk averse. MPT guide ensures delivery of maximum returns on the lowest risk levels. Later, Sharpe (1966) developed a ratio to explain the return of an investment compared to its risk which came to be popularly known as Sharpe’s ratio.

Unit Trust Schemes primarily invest in equity, money market instruments and fixed interest financial instruments. Trends have emerged where Unit Trusts are diversifying their investments by not only investing in local instruments but making investments in foreign financial instruments as well. In Kenya, Unit trust schemes growth has been steady having grown from almost zero schemes in 2001 up to 11 in the year 2008 and 18 in 2018. This is according to a CMA study on the low uptake of capital market products published in June 2018. Assets under management in Kenya has also been growing standing at Ksh. 61.5 Billion in 2019 notes a quarter 1 report by CMA. This is attributed to better asset allocation practices which ultimately lead to better investment returns.

### Asset Allocation

Gibson (2013) defined asset allocation as the distribution of investor funds across different securities and investment classes. Asset allocation is also viewed as the diversification or reinvestment of money among different asset classes which include stocks, fixed income instruments and money market instruments (Bhattacharjee, 2017). Reilly and Brown (2012) affirm the definition for asset allocation above as the process of getting to decide how investor wealth is distributed among different countries and asset classes for the purpose of earning a return within tolerable risk levels. Markowitz (1959) developed the premises of modern portfolio theory based on the optimal allocation of capital to an investment universe exhibiting varying expected return, risk and correlation characteristics.

Two types of asset allocation strategies exist, namely: tactical and strategic asset allocation. Tactical asset allocation refers to how investor funds are divided at any given point in time among different asset classes taking into consideration their short-term forecasts. Horne (1997) observed that the process of asset allocation allows for the construction of an efficient set which allows fund managers to form an efficient portfolio. On the other hand, strategic asset allocation points to how investor wealth will be distributed among investments given the find manager’s long-term forecasts of expected returns and risk (Sharpe, 1996). Asset allocation is critical because an investor can make a gain or a loss on invested funds depending on the performance of a portfolio (Pozen & Crane, 2002).

In order to adequately assess how asset allocation, one needs to assess the performance of the various asset classes. The assessment is to be done depending on the risk which a certain investment class poses versus its return (Reilly & Brown, 2012). Investment time horizons vary depending on the investor’s objective. Investments made over long time horizons will be dominated by equities (Solin & Wollman, 2006). The reverse is also true where investors are keen on their liquidity, they prefer putting their funds in near cash investments. Measures such as the factor model developed by Sharpe (1992) to assess management style and performance measurement are still in use. Further, if a procedure for measuring the exposure to variation in returns which a certain asset class poses, it is possible to measure how fund managers are performing and reward them accordingly.

### Financial Performance

Naz and Ijaz (2016) define financial performance as a reflection of the business sector results and outcomes which shows the financial health of the industry or firm over a period of time. The analysis of financial performance of an organization entails the appraisal of its fertility, sub-businesses, mission, solidarity and its feasibility (Bhunia, Mukhuti & Roy, 2011). An entity that is managing its cashflows prudently is said to be better performing. The assessment of financial performance for a firm is conducted from the perspectives of its solvency, profitability, liquidity and how financially efficient it is. Researchers have carried out studies in a bid to explain financial performance of various entities. A number of those studies have employed financial ratios like sales by Wang (2003), return on the company assets by Naser and Mokhtar (2004), return on company equity by Ponnu and Ramthandin (2008) and the return on capital which the shareholders have invested (Hsu & Liu, 2008).

Measurement of financial performance of an entity informs decision making. And correct decision making is anchored on access to correct information and its analysis (Crane, 2010). Financial performance measurement of a Unit Trusts Scheme is both beneficial to the scheme to measure performance of fund managers and for the Unit holder to appropriately make an informed investment decision.

Financial performance has earlier been measured using financial ratios but the fact that they are backward-looking and do not represent very well the risk on an investment, studies have been conducted into the measurement of fund performance of Unit Trust Schemes and mutual funds; Kuhle and Lin (2018) conducted a research to evaluate risk exposure and return performance measurement options for real estate mutual funds in USA using popular performance ratios which include Sharpe, Treynor and Sortino. The findings of their study indicate that Sharpe index outperforms the other two alternatives. Therefore, Sharpe ratio proofs to be a good measure of risk adjusted returns and is a better indicator when overall performance is assessed based on ex-post data. A similar study by Mamatzakis and Xu (2016) into managerial attributes and equity mutual fund performance in China and while assessing the performance of a fund, used Sharpe ratio amongst other fund performance measurements. Therefore, in this research, Sharpe’s ratio was used to evaluate the performance of the various funds of a Unit Trust Scheme. Data was collected over the 5-year period under study.

### Asset allocation and Financial Performance

Bryant (2011) conducted a study to assess whether there exists a relationship between asset allocation and financial performance of mutual funds in Kenya. The study established existence of a significant difference between the performance of mutual funds and the market. Further, the study notes that mutual funds’ performance outperformed the market. This is attributed to professional management of the funds. Fund managers in actively managed funds, constantly review investments in various asset classes to minimize risk. This leads to better fund performance. Unit Trust Schemes have developed investment policies which guide asset allocation. This is done as per CMA guidelines and regulations.

Investment process is not just confined to picking the right financial instrument. It traverses to selecting the right combination of financial instruments. The strategy of an investment manager is to choose a combination of financial instruments which can deliver optimal returns to the investor at a low risk. A study by Gatua (2012) on investment portfolio choice and profitability of investment companies listed in NSE went further to conclude that there existed a relationship between the return of a portfolio and that of the individual asset.

Other studies by Izundu (2017) on asset allocation as a determinant of banks’ profit in Nigeria found that asset allocation is a critical ingredient in financial management which enhances profitability. Investments in securities is a good avenue for them to increase their profitability just like Unit Trust Funds do. Strategic asset allocation is responsible for a greater portion of variation in portfolio returns whereas market timing and selection of assets appear to have a lesser impact on a portfolio return (Blake, Lehmann & Timmermann, 1998). Therefore, the above empirical reviews pointed to existence of a positive relationship between asset allocation and financial performance.

### Unit Trust Schemes in Kenya

Unit Trust investment is an excellent way of accumulating wealth in which funds are pooled together through investors’ contributions for the purchase of a combination of financial securities which include equities, bonds (both government & corporate), cash and fixed deposits. Johan et al. (2009) notes that Unit Trust Schemes can be recognized as investment vehicles which can aid investors to grow their wealth and diversify their investments. The study notes that Unit Trusts are widely known as Mutual funds in Malaysia and many parts of the world. The pooled funds are administered by a fund manager. The fund issues units to the investors and they become unit holders. Invested funds earn income in the form of dividends for investments in equities, interest income on money market investments and capital gains from investments in the capital markets.

A report by the World Bank, 2015 on Mutual Funds in developing markets notes that approximately 76,200 mutual funds throughout the world had $30 trillion in assets under their management which represents more than 20 percent of assets under management globally. The existence of mutual funds is as a result of the developments which have taken place in financial markets of developed economies rather than the cause of it. Not to the surprise of many, more than 90% of the funds under management by mutual funds are controlled by developed markets. Many of the developing countries are currently looking to enhance development of local mutual fund sector because of their running cost effectiveness through professionally managed investor risks and diversification of assets investments. This ultimately fosters economic growth.

CAP 485 A of the Capital Markets Authority (CMA), 2001 regulations provide the scope and legal framework within which Collective Investment Scheme (CIS) in Kenya operate. CMA May 2019 Report noted that Kenya had 24 licensed Unit Trust Schemes and 75 Funds. Financial performance of the Unit Trust has been a mixed bag of hits and misses; performance for a money market fund is different from a balanced fund. Average return in Kenya for December 2017 on all money market funds was 8.2% and 6.4% on the five largest funds. A quarter 1 2019 report by CMA also revealed that CIC Unit Trust Scheme accounted for 34% of the over Ksh. 61.5 billion value of assets under management. It was followed by Britam Unit Trust Scheme at 14%, ICEA and Old Mutual Trust Schemes with a share of 11% each. The other funds had proportions which were less than 10%. Githuku (2003) investigated Unit Trust Schemes investment by SACCOs and concluded that Unit Trust Schemes would be attractive to SACCOs and they should channel their funds in Unit Trust investment.

## Research Problem

Over the years, fund managers have adopted different strategies to allocate assets in a bid to deliver maximum returns for the Unit holders. On the other hand, investors in different unit trusts have closely monitored the performance of Unit Trust Schemes and the returns from the different funds a scheme deals in. They have then gone ahead to invest in funds which deliver higher returns. In order to resolve the dilemma of fund managers on which asset allocation strategy when adopted delivers value to the investors, studies have been conducted on the returns the available strategies can guarantee and on what features can be incorporated or how the existing asset allocation strategies can be tweaked to enable the fund manager deliver optimally to the investors.

Many scholars have carried out studies on the subject matter of this research, but their findings are limited given the vastness of the study variables and ever-changing circumstances and times. Therefore, they have always made recommendations for further explorations. Asset selection alone do not get to considerably influence performance of a fund. When asset allocation strategies are assessed alongside other determinants of financial performance, financial performance of Unit Trust Schemes is better explained. Besides this research incorporating the various asset classes into its model, a longer time period of 5 years (between 2014-2018) was adopted. Also, the sample size of this study was all licensed Unit Trust Scheme Funds in Kenya.

Olubukola (2017) noted in the study of investment strategies in the Nigerian Pension industry that there are complications in selecting investments. Funds invested on behalf of investors should follow the line of best and most appropriate strategies which foster security and enhanced performance. Louton et al. (2015) conducted a study on Tactical asset allocation for US pension investors and noted that it is pertinent for investors to evaluate the role of asset allocation in their portfolio construction process by assessing the role of risk-return trade-off when the process deviates from the policy. Given the limitations of the above studies and areas recommended for further study, the focus for this study on asset allocation and financial performance becomes a worthy course.

Muindi (2010) carried out a study to assess the factors that affect performance of Unit Trusts in Kenya and concluded that that ability to forecast, appropriate timing of the market as well security selection techniques were critical in determining performance of unit trusts. The study recommended that further studies be conducted on fund management styles which points to investment strategies adopted. A similar study conducted by Karimi (2013) on portfolio choice and profitability of investment companies in Kenya found that investment is not just about picking stocks, but about choosing the right combination of stocks. However, this study was conducted only for the year 2012. Therefore, this research sought to further address the question; how do asset allocation affect financial performance of Unit Trust Schemes in Kenya?

## Research Objective

The general objective of this study was to establish effects of asset allocation on the financial performance of Unit Trust Schemes in Kenya.

## Value of the Study

This study will be very relevant to the Government of Kenya especially the bodies which regulate and advise investors in the country. Capital Markets Authority, which is a government agency established to regulate Unit Trust Schemes will find this research very beneficial as it will shed light on how asset allocation affects performance of a fund. The financial wellbeing of a Unit Trust Scheme eventually contributes to the growth of the economy and the creation of jobs. CMA, by enacting appropriate policies which will ensure preservation of the investor funds and realization of maximum returns will need that the asset allocation strategies available be thoroughly scrutinized to know how best to enact polices. Through this research, it will be able to appropriately advise the government, Unit Trust Schemes and investors.

Unit Trust Schemes and Fund managers will be the greatest beneficiaries of this research. Unit Trust Schemes would like to see the fund performing well by making good returns on the funds at their disposal. They would like to see the fund performing financially well. Fund managers, on the other hand, would like to deliver maximum risk-adjusted returns to the investors and contribute to the profitability of the firm. Therefore, appropriate asset allocation of the investor wealth will make them deliver on their promise to the investors of a higher return and this is a deal breaker to them. By undertaking such a research, the decision-making process for the fund managers will become less painful.

Investors or unit holders both local and foreign need maximum returns on the funds they invest with Unit Trust Schemes. By assessing well and doing their analysis on how asset allocation by fund manager affects their return, they will be better informed on which fund does it better and know where to put their funds. This will deliver maximum returns on their investment.

Other researchers, scholars and students will find the study helpful in several ways: - scholars who would like to conduct a replica research can refer to the contents of this study. The study will also highlight other important relationships that require further research; this may be in establishing a relationship between asset allocation and organizational performance. The study may add value to already similar studies.

# CHAPTER TWO

# LITERATURE REVIEW

1.

## Introduction

This chapter reviewed different models which relate to asset allocation and investment institutions at large. It further explores different determinants of financial performance of Unit Trust Schemes. Empirical reviews of works done by other scholars relating to the research topic was also explored. The chapter is concluded by looking at the conceptual framework of the study.

## Theoretical Framework

This section reviewed theories related to financial performance of Unit Trust Schemes. The theories reviewed include the Capital Asset Pricing Theory (CAPM), Sharpe Theory of Portfolio Management and Modern Portfolio Theory (MPT).

### Capital Asset Pricing Model (CAPM)

Capital asset pricing model (CAPM) was developed by Sharpe (1964) and Lintner (1965) and is premised on portfolio theory and Market Model. The model resulted in a Nobel Prize for Sharpe in the year 1990. CAPM explains the inter-relationship which exists between risk involved and [expected return](https://corporatefinanceinstitute.com/resources/knowledge/trading-investing/expected-return/) when investment is done in a security. The model demonstrates that the return expected on a security is equivalent to the riskless return add a [risk premium](https://corporatefinanceinstitute.com/resources/knowledge/finance/equity-risk-premium/) and this is based on the [beta](https://corporatefinanceinstitute.com/unlevered-beta-asset-beta) of that security.

However, the practicality of CAPM in the real-world studies has been thrown in doubt and studies have been done by several scholars on the assumptions of the model. Nyangara et al. (2016) did an empirical test to validate CAPM on Zimbabwe stock exchange and the study rejected the validity of the model on grounds of skewness and liquidity anomalies. The research goes further to note that investors and analysts have to be careful in the application of CAPM. Leonard et al. (2012) stressed that the two important functions of the model are to provide a yard-stick rate of return which can be used to appraise different investments and one that aids in educational guess as to the expected return generated by assets that that are yet to be traded in the financial markets. Securities which are risk free include government bonds and treasury bills. However, borrowing and lending interest rates vary for the government securities. The assumption of perfect markets with perfect competition is also not practical as investors through their individual actions get to influence prices for the securities therefore creating an imperfect market. The technical assumptions which allude that all assets are marketable and can be divisible in infinite ways also has to be mentioned (Elton & Gruber, 1995).

Four decades after the development of CAPM, its application is still wide like in the estimation of the cost of capital for companies to evaluate their portfolio performance. Amongst the advantages of CAPM is that it offers superior and satisfactory predictions on how to measure risk and its relationship with the expected return of a security. Earlier studies carried out by Fama and MacBeth (1973), Black, Jensen and Scholes (1972), Blume and Friend (1973) tend to support mean-variance efficiency of a market portfolio. CAPM was employed in this study to explain the risk-adjusted portfolio returns for the different funds under consideration. Investment returns indicate how a scheme is performing financially.

### Sharpe Theory of Portfolio Management

Markowitz’s MPT Model as captured in the review above had serious limitations relating to its practicality due to the cumbersome nature of the amount of work which goes into collecting various statistics of the model. The statistics involved include expected returns, standard deviation or variance, covariance of every other security in the portfolio. Sharpe (1966) introduced a measure for performance of mutual funds and proposed the term reward-to-variability ratio. The ratio was aimed at simplifying the process of measuring performance by connecting the return of a security to a single Market index. First, this will theoretically reflect all the securities that are well traded in the market. Secondly, it will bring down and greatly simplify the work required in compiling elaborate metrics of variance and covariance between individual securities.

Modigliani and Modigliani (1997) was concerned that the risk adjusted company performance which was in use did not correctly mirror the managers that were delivering impressive returns and which ones were relying on leverage to outperform set benchmarks. What they primarily noted with Sharpe’s ratio is that it did not give information to managers that could trace back to the returns of the benchmark. Muralidhar (2015) provides a detailed analysis on what Sharpe’s Ratio really communicates to an investor and it has much to do with the amount of time spent to develop a skill and the confidence a fund manager and less to do with risk adjusted performance. Poorly diversified funds have been found to rank highly when Sharpe ratio is used to assess them (Scholz & Wilkens, 2005). Therefore, there is a need of a method which clearly articulates the hazardousness associated with certain investment actions.

On the other hand, Schmid and Schmidt (2009), Lhabitant (2004) and Opdyke (2007) describes Sharpe ratio as a good ratio to measure portfolio compensation taking into consideration the risk an investor takes. Hence, Sharpe ratio was adopted in this study to calculate the risk adjusted investment returns for the schemes.

### Modern Portfolio Theory (MPT)

MPT was developed by Markowitz (1952) as a guide towards portfolio selection. It is premised on the idea that investors are risk averse and goes ahead to give guidelines on how such investors can construct optimal portfolios to ensure that they get maximum returns on the lowest risk levels. The theory lays emphasis on market risk and being an inherent part of getting higher rewards in terms of market returns. This economic theory is highly regarded in the field of Investments and Finance at large.

Despite the theory’s importance, critics have questioned the practicality of MPT as a reliable tool for evaluating investments. The main reason given relates to the assumptions which underlie the model. The critics argue that the assumptions are not reflective of what happens in the real world and have gone a step further to test some of the assumptions. First, they argue that return, risk and their correlation in use by MPT are premised on mathematical expected values which mirror how the future looks like. In the real world of investment, investment analysts like to dig into historical data in measuring returns and the volatility of the returns. According to Montgomery and Runger (2006), the expected return of a portfolio is a random variable which cannot be represented by static values. Another MPT assumption which has faced a lot of criticism is the assumption that investors are rational and risk averse. Critics argue that investors employ emotional biases (Maehl, 2008). This leads investors to making investment decisions which are irrational by basing the investment decisions on rumours and hunches instead of fundamentals as proposed by MPT, (Morien, 2005). Maehl (2008) also criticized the assumption of rationality of the investors in choosing the securities to invest in.

In the middle of all the criticism, many finance and economics models and theories borrow heavily either directly or implied from MPT. Popular examples include but are not limited to: The Capital Asset Pricing Model (CAPM), Value at Risk (VaR), Hedging strategies and Stable value or guaranteed investment contracts (Fabozzio et al., 2002). This study assessed effects of asset allocation and risk profiling alongside other determinants of financial performance for Unit Trust schemes. MPT came in handy to explain why different funds for various schemes are constituted the way they did. Risk profiling of the investors drives the constitution of different funds a scheme deals in. Ultimately, this affects a fund’s performance and the financial performance of the Scheme at large.

## Determinants of Financial Performance of Unit Trust Schemes

Several factors affect financial performance of Unit Trust Schemes. This research reviewed asset allocation, risk profiling, liquidity, fund size, fund age and leverage.

### Asset Allocation

Asset allocation refers an investment strategy whose primary goal is to balance risk and expected return by constructing a portfolio in respect to an investor’s objective, risk aversion and length of the investment. Investors keep on adjusting the composition of the portfolio time and again to reflect their objectives. Funds are invested in different classes of assets: namely, stocks, bonds and cash equivalents such as money market funds. From Reilly and Brown (2012) research, asset allocation encompasses how allocation of an investor’s wealth is distributed across the different asset classes. Asset allocations has been established to account for a greater percentage of total portfolio returns in terms of their magnitude and more than 80% of the variance in the aggregate portfolio return (Santacruz, 2012). Hence, proper asset allocation leads to generation of a higher portfolio return.

### Risk Profile

Risk profiling refers to the process of assessing an individual’s risk appetite. Sometime, risk profiling refers to the threats which an organization is faced with. The risks which an organization is exposed to are classified as credit risks, operational or market risks. Resnik (2016) defined risk profiling as the process of finding optimal investment risk levels for clients taking into consideration their capacity, required risk levels and tolerance limits. Required return is linked to the risk exposure to achieve investment objectives of an investor from the available financial resources. Risk capacity when assessed on its own is the degree of financial risk that an investor is willing to shoulder. Finally, risk tolerance refers to the degree of risk which an investor can comfortably accommodate. Therefore, risk profiling gives no assurances with respect to an investor’s capital injection or the extent to which it is likely to happen.

### Liquidity

Liquidity is referred to as how fast debt obligations falling due in the short term can be repaid by available cash or the existing assets can be converted into cash without a considerable change in the asset price. From the financials, it is calculated as a ratio of the current assets over the current liabilities accumulated by a firm. Ibbotson et al. (2013) conducted a research on liquidity as an investment style and notes that Investors vividly would like more liquidity and will be willing to pay for it for all asset classes which include stocks. Limited liquidity comes at a cost in that it will take longer to trade stocks which are deemed as less liquid and transacting costs tend to higher. Increased liquidity would allow a Unit Trust Scheme to deal with emergencies during periods of reduced earnings and take on unexpected investment opportunities with higher expected returns (Liargovas & Skandalis, 2008).

### Fund Age

Pervan et al. (2016) conducted a research on the influence of age on the performance of a firm in Croatian food industry and found out that the age of a firm negatively affects its performance. The older a firm gets, benefits which result from the knowledge accumulated in all its important aspects may it be in technology, management of the supply channels, relationships with the customers, employee relations or finance costs get eroded with their inflexibility, accumulated rules and routines within the organizational structure. Loderer and Waelchli (2010) found that as firms grow older, their profits start to decrease. Other scholars have contrary findings like Kakani, Saha and Reddy (2001) stated that the older a firm gets the more experienced in their operations it becomes. Hence it cannot be hit by surprise with newness and ultimately this translates to better financial performance.

### Leverage

Leverage is expressed a ratio of total debt to equity. It represents the degree to which a firm is financed through borrowing. Unit Trust Schemes borrow funds to engage in investment activities. They pay back interest on borrowed funds with the returns of their investment activities. However, schemes which are highly leveraged risk running into bankruptcy if they are unable to make payments on their debt. Ana and Ghiorghe (2014) conducted a research to analyze financial performance of the Insurance market in Romania in the years 2008 to 2012. The results of their research affirm that leverage, company size among other factors determined financial performance of a company. Burca and Ghiorghe (2014) affirm similar findings in their research.

## Empirical Reviews

Santacruz (2011) conducted a research on strategic asset allocation and portfolio performance in the USA using investment data of four Australian mutual funds. The study found out that asset allocation supersedes other decisions in the investment sphere such the selection of security and timing of the market. The study further notes that strategic asset allocation accounts for approximately 88% of the variability in the aggregate portfolio returns. The study was limited to only four Australian funds. Widening the scope of study to a large number of funds would lead to generation of more conclusive results.

 Louton et al. (2015) studied tactical asset allocation for US Pension investors following the recession period of early 2000s. The study notes that weights of individual financial assets in an investor’s portfolio should be commensurate to their long-term tactical asset allocation goals. The results of the study reveal that when investment managers are limited in their ability to make asset allocation decisions, this allows defined benefit plans to withstand markets in a better way. This study is limited by the virtue that it is focussed on only institutional investors. There was need to conduct a replica study where other types of investors were also considered.

Blake, Lehmann and Timmermann (1998) assessed asset allocation dynamics and pension funds’ performance using a dataset of more than 300 pension funds in the UK. The finding of this study seemed to concur with those of Santacruz (2012) that strategic asset allocation accounts for most of the variation in returns. Market timing and the selection of the assets seem to be of less importance. Given that this study focussed on pension funds, there was need for an assessment of how asset allocation affects financial performance of another set of investment institutions such as the Unit Trust Scheme funds as was the case in this study.

A study by Izundu et al. (2017) on asset allocation as a determinant of bank profitability in Nigeria in the period of 2011 to 2015 reveal that asset allocation is an important financial management tool which can be used to enhance the profitability of a bank. The research goes further to recommend that investment in securities is another channel that banks can explore to increase their profitability. Asset allocation explains up to 54% of the profitability of banks. The focus for this study on banks needed to be expanded to encompass other investment institutions.

Bryant (2012) conducted a research in Kenya to assess the relationship which exists between asset allocation and financial performance of mutual funds. The study period is the year 2011 when the performance of the stock market in the country slumped but mutual funds registered improvement in returns of 18% compared to the year 2010. The study concludes that mutual funds outperformed the market because fund managers can predict performance of stocks and make investments which deliver impressive returns. Further findings point to mutual funds being efficient. The study focussed on funds which invest in shares excluding the ones which undertake their investments in bonds and money market instruments. A study focussing on all the financial asset classes would have given more conclusive findings.

Sang (2017) assessed the effect of asset allocation on financial performance of Unit Trust Schemes in Kenya for the period 2012 to 2016. Descriptive analysis using a multi-factor model was adopted. The study findings reveal that the inclusion of various asset classes in a portfolio will affect its financial performance. The study recommends that a replica be conducted but on a more global scale to enable comfortable generalization of the findings and conclusion. A replica study could also be conducted on a period which was more recent such as up to the year 2018.

Karimi (2013) studied the relationship which exists between the choice of an investment portfolio and the profitability of investment which are listed in NSE for the year 2012. Responses were obtained from 49 senior and middle level managers in charge of different investment lines of their organizations. The study found that investment is not a matter of picking stocks to invest in but picking the right combination of stocks where investor wealth can be invested. This is done by investment managers so as to deliver optimal returns for the investor at minimum risk levels. Given that the study focussed on only listed firms, the discussion needed to be extended to investment funds which were not listed at NSE.

## Summary of Empirical Reviews

The studies reviewed above have numerous gaps which a study can be conducted to address. The researchers have also recommended a number of areas for further studies in their reports. The first gap identified which this study seeks to address is the type of investment organizations focussed on. A number of studies have focussed on pension schemes, Private Equity firms and Insurance companies. It is not may studies which have been conducted on Unit Trust Schemes. Other studies have concentrated on one category of asset allocation; either tactical or strategic. This study assessed asset allocation from both perspectives. The focus period for a number of the above studies was below five years and this begged for a replica study which spans over a longer time period. That way, many of the variables studied were better addressed.

Additionally, the researcher knew no study which concluded the discussion on appropriate asset allocation which yielded maximum risk-adjusted returns for Unit Trust Schemes.

## Conceptual Framework

The research sought to unearth any significant relationship between asset allocation and financial performance of selected Unit Trust Schemes. Empirical studied reviewed pointed to existence of a positive association between and among themselves. Therefore, the researcher also expected independent and control variables to influence the dependent variable.

**Independent Variable Dependent Variables**

**Financial Performance**

Measured using investment returns.

**Asset allocation**

* Treasury bonds
* Corporate bonds
* Equities
* Property
* Money market instruments

**Control Variable**

Fund age

Figure 2.1: Conceptual model

Source: Author, 2019

The null hypothesis to be tested is that the independent and control variables of the above model does not have an effect on financial performance of Unit Trust Schemes in Kenya against an alternative hypothesis that asset allocation influences financial performance of Unit Trust Schemes in Kenya.

# CHAPTER THREE

# RESEARCH METHODOLOGY

1.

## Introduction

Schwardt (2007) connotes a research methodology to be a theory on how an inquiry ought to be conducted. Research methodology involves analysis of the study assumptions, principles and procedures. Therefore, this chapter discussed the type of research design to be adopted in this research, study population, sampling frame, size of the sample, sampling technique employed in the research, instruments used, pilot tests done and analysis of data.

## Research Design

A research design is a strategic framework of action which should perform as a connection between research questions and their successful implementation or execution. A research design clearly outlines what data is required, the methods employed to collect and analyze data and how all these answers the research objectives. This research adopted a descriptive design to study all Unit Trust Schemes licensed in Kenya by CMA.

## Population and Sample

Asika (1991) notes that a population consists of all imaginable components, subjects or elements which possess a particular characteristic that the researcher is investigating or studying. As at May 2019, Kenya had 75 Collective Investment Scheme Funds controlling a portfolio of Kshs. 61.05 Billion according to a report from CMA. The population of this study was all 75 Funds which are listed on appendix I below. Therefore, this was census survey hence there existed no sample nor sampling error.

## Data Collection

Data collection enables the researcher to gather information on research variables in a methodical way so as to answer hypotheses and research questions and to evaluate outcomes of a study or research (Kabir & Muhammad, 2016).

This research collected data from secondary sources only. Data on the value of funds allocated by Unit Trust Schemes to various funds was collected from published unit trust financials. The financials were sourced from fund managers, licensed financial analysts and CMA. The mean and standard deviation of the returns of the various funds Unit Trust Schemes invest in was used to calculate Sharpe ratio.

Data on the yield of a 10-year treasury bond was sourced from the Central Bank of Kenya (CBK) and Kenya National Bureau of Statistics (KNBS).

## Diagnostic Tests

Diagnostic tests are geared towards identifying the presence or absence of statistical bias which in turn affects estimates of the parameters, standard errors, confidence levels, p-vales and test statistics. In many instances, when the assumptions of a statistical test are violated, statistical bias manifests. The statistical assumptions include linearity, homoscedasticity, independence and normality (Field, 2013). Diagnostic tests for normality, multi-collinearity and autocorrelation were carried on the data collected. A plot of the standardized residuals was performed on the data to establish whether it followed a normal curve. Pearson correlation coefficients were calculated to determine the direction and the strength of the relationship which existed between the independent and dependent variables. Variance inflation Factors were run to establish whether in multi-collinearity existed among the independent variables.

## Data Analysis

Simple linear regression was used to analyze data in order to establish the stretch to which asset allocation affects financial performance of a Unit Trust Scheme. Further, descriptive statistics were used to represent the general information of the data collected. SPSS and Excel were used in analysis and presentation of data.

The below research model was adopted: -

*Sfp = α+β1x1 + β2x2+ β3x3+ β4x4+ β5x5+ β6x6+ε*

Whereby *Sfp* refers to fund performance of Unit Trust Schemes measured using Sharpe’s ratio whose formula is shown below;

Sharpe ratio, *Sfp* = $\frac{R\_{p}- R\_{f}}{σ\_{p}}$ , where $R\_{p}$ is the expected portfolio return, $R\_{f}$ is the risk-free rate which was obtained from the yield of a 10-year Treasury bond and $σ\_{p}$ is the standard deviation of the portfolio’s excess return.

*α -* refers to a constantof the model which is the risk-free rate of return obtained from the yield of a 10-year Treasury bond.

*x 1* – the weight of investment in treasury bonds by the scheme. This is calculated as a proportion of the value of investment in treasury bonds by the scheme divided by the total scheme value.

*x 2* –the weight of investment in corporate bonds by the scheme. This is calculated as a proportion of the value of investment in corporate bonds by the scheme divided by the total scheme value.

*x3* – the weight of investment in equities by the scheme. This is calculated as a proportion of the value of investment in equities by the scheme divided by the total scheme value.

*x 4* – the weight of property investment by the scheme. This is calculated as a proportion of the value of investment in properties by the scheme divided by the total scheme value.

*x 5* – the weight investment in money market instruments by the scheme. This is calculated as a proportion of the value investment in money market instruments by the scheme divided by the total scheme value.

*x 6 –* Fund age.

*β1, β2, β3, β4, β5* and *β6* refer to parameters to be estimated for the determinants of financial performance.

*ε* is the error term.

# CHAPTER FOUR

# DATA ANALYSIS, RESULTS AND DISCUSSIONS

1.

## Introduction

Secondary data was collected by the researcher using data collection forms. The data was entered into Excel and coded as appropriate. The Excel file was imported into SPSS where analysis took place. Descriptive and inferential analysis was done. The results are as presented in the subsequent sections.

## Response Rate

The researcher targeted 75 active Unit Trust Schemes in Kenya as at 31st December 2018. Data was collected over a 5-year period, 2014 to 2018. Therefore, N was equivalent to 375, 75\*5. However, the researcher was able to collect data for 50 funds over a 5-year period and one fund over a 2-year period. This gives a response rate of 252. This represents a response rate of 67% and a non-response rate of 33% as represented in the pie chart below.

**Graph 1: Response rate**

Fincham (2008) in his research on response rates and responsiveness for surveys, standards and the journal note that response rates of approximately 60% should be the goal of most researchers and certainly the expectation of most editors of journals. With a response rate of 67%, the researcher was satisfied that it was representative of the population under study.

## Descriptive Statistics

Mean, standard deviation, skewness and kurtosis were used to bring out the descriptive elements of the data under study. The results are as presented in the table below;

|  |
| --- |
| **Table 4.1: Descriptive statistics** |
|   | N | Mean | Std. Deviation | Skewness | Kurtosis |
| Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| Money Market | 252.00 | 0.19 | 0.15 | 0.68 | 0.15 | -0.48 | 0.31 |
| Corporate Bonds | 252.00 | 0.12 | 0.14 | 0.67 | 0.15 | -1.00 | 0.31 |
| Property | 252.00 | 0.00 | 0.03 | 7.86 | 0.15 | 64.52 | 0.31 |
| Treasury Bonds | 252.00 | 0.43 | 0.16 | -0.57 | 0.15 | 1.18 | 0.31 |
| Equity | 252.00 | 0.25 | 0.22 | 0.26 | 0.15 | -1.16 | 0.31 |
| Fund Age | 252.00 | 0.68 | 0.37 | -1.12 | 0.15 | 0.91 | 0.31 |
| Fund Returns | 252.00 | -0.15 | 1.00 | -0.30 | 0.15 | 0.22 | 0.31 |

From the table 4.1 above, the weight of the money market instruments had a mean of 0.19, a standard deviation of 0.15, skewness of 0.68 and a kurtosis of -0.48. The weight of corporate bonds had a mean of 0.12, a standard deviation of 0.14, skewness of 0.67 and a kurtosis of -1.00. The weight of immovable property had a standard deviation of 0.03, skewness of 7.86 and a kurtosis of 64.52. The weight of treasury bonds had a mean of 0.43, a standard deviation of 0.16, skewness of -0.57 and a kurtosis of 1.18. The weight of equity had a mean of 0.25, a standard deviation of 0.22, skewness of 0.26 and a kurtosis of -1.16. The age of the fund expressed as a logarithm of the fund age had a mean of 0.68, a standard deviation of 0.37, skewness of -1.12 and a kurtosis of 0.91. Fund returns which was expressed as a Sharpe ratio had a mean of -0.15, a standard deviation of 1.00, skewness of -0.30 and a kurtosis of 0.22.

The results of the analysis show that the age of the fund had the largest mean and the fund returns had the smallest mean. Fund returns had the largest standard deviation and the weight of property had the least standard deviation. Property had the largest skewness whereas fund age showed the least. Property had the largest kurtosis and the weight of equity had the least.

## Diagnostic Tests

Diagnostic tests for normality, multi-collinearity and autocorrelation were run on the data and the results are as presented below;

### Normality Test

Plotting a normal probability histogram of the standardized regression residuals was run as shown in the diagram below. This showed that the normality assumption is satisfied in the above regression equation.

**Graph 2: Standardized Residuals Histogram**



### Autocorrelation

|  |
| --- |
| **Table 4.2: Autocorrelation Table**  |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .692a | .479 | .466 | .73078 |
| a. Predictors: (Constant), Fund Age, Corporate Bonds, Property, Treasury Bonds, Money Market, Equity |

Table 4.3 showed that the model had a correlation coefficient, R of 0.692. This signifies existence of a strong positive association between the variables of the study. The model also had a coefficient of determination, R Square of 0.479. This was interpreted to imply that 47.9% of the fund returns for Unit Trust Scheme funds in Kenya can be explained by the independent variables of this study.

### Multicollinearity Test

Collinearity diagnostic tests were run on the data to test for multi-collinearity. Tolerance probability was obtained, and the Variance Inflation factors (VIF) were used to evaluate existence and non-existence of multicollinearity among the independent variables.

When VIF ranges from 0 to 2.99, it shows non-existence of multi collinearity among the independent variables. A VIF value of 3 to 4.99 shows that we probably have multi collinearity. A value of 5 to 9.99 shows that we most likely have multi collinearity among the independent variables. A VIF value of 10 or more shows that we definitely do have multi-collinearity among the independent variables.

Iterative diagnostic tests were run on the data and the results are as summarized in the table below;

**Table 4.3: Collinearity Diagnostics**

|  |  |  |
| --- | --- | --- |
| **Coefficientsa** |  | **Coefficientsa** |
| Model | Collinearity Statistics |  | Model | Collinearity Statistics |
| Tolerance | VIF |  | Tolerance | VIF |
| 1 | Corporate Bonds | .512 | 1.952 |  | 1 | Property | .934 | 1.071 |
| Property | .966 | 1.035 |  | Treasury Bonds | .483 | 2.072 |
| Treasury Bonds | .509 | 1.965 |  | Equity | .384 | 2.602 |
| Equity | .392 | 2.551 |  | Fund Age | .930 | 1.075 |
| Fund Age | .927 | 1.078 |  | Money Market | .468 | 2.138 |
| a. Dependent Variable: Money Market |  | a. Dependent Variable: Corporate Bonds |
|  |  |  |  |  |  |  |  |  |
| **Coefficientsa** |  | **Coefficientsa** |
| Model | Collinearity Statistics |  | Model | Collinearity Statistics |
| Tolerance | VIF |  | Tolerance | VIF |
| 1 | Equity | .528 | 1.893 |  | 1 | Fund Age | .931 | 1.074 |
| Fund Age | .929 | 1.077 |  | Money Market | .889 | 1.125 |
| Money Market | .681 | 1.468 |  | Corporate Bonds | .955 | 1.047 |
| Corporate Bonds | .707 | 1.414 |  | Property | .977 | 1.023 |
| Property | .940 | 1.063 |  | Treasury Bonds | .895 | 1.117 |
| a. Dependent Variable: Treasury Bonds |  | a. Dependent Variable: Equity |
| **Coefficientsa** |  | **Coefficientsa** |
| Model | Collinearity Statistics |  | Model | Collinearity Statistics |
| Tolerance | VIF |  | Tolerance | VIF |
| 1 | Treasury Bonds | .063 | 15.949 |  | 1 | Money Market | .037 | 27.126 |
| Equity | .038 | 26.025 |  | Corporate Bonds | .041 | 24.683 |
| Fund Age | .938 | 1.066 |  | Property | .418 | 2.392 |
| Money Market | .086 | 11.599 |  | Treasury Bonds | .028 | 36.240 |
| Corporate Bonds | .091 | 10.960 |  | Equity | .016 | 61.273 |
| a. Dependent Variable: Property |  | a. Dependent Variable: Fund Age |

From the collinearity diagnostic tables above, it was showed that the weight of money market, corporate bonds, treasury bonds and the weight of equity showed no signs of multi-collinearity with the other independent variables since all their VIF values are less than 3.

However, the weight of property showed existence of multi-collinearity with all the independent variables except fund age. Fund age also showed existence of multi-collinearity with all the independent variables except the weight of property.

## Correlation Analysis

Pearson correlations were also run to determine the direction and strength of the relationship between the study variables. The results are presented in the table below;

|  |
| --- |
| **Table 4.4: Correlations** |
|   | Money Market | Corporate Bonds | Property | Treasury Bonds | Equity | Fund Age | Fund Returns |
| Money Market | Pearson Correlation | 1 | .016 | -.120 | -.220 | -.478 | -.213 | .344 |
| Sig. (2-tailed) |   | .802 | .058 | .000 | .000 | .001 | .000 |
| N | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| Corporate Bonds | Pearson Correlation | .016 | 1 | -.025 | -.206 | -.471 | -.006 | .436 |
| Sig. (2-tailed) | .802 |   | .695 | .001 | .000 | .923 | .000 |
| N | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| Property | Pearson Correlation | -.120 | -.025 | 1 | .013 | -.066 | .113 | .045 |
| Sig. (2-tailed) | .058 | .695 |   | .839 | .295 | .073 | .473 |
| N | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| Treasury Bonds | Pearson Correlation | -.220 | -.206 | .013 | 1 | -.488 | -.073 | .215 |
| Sig. (2-tailed) | .000 | .001 | .839 |   | .000 | .250 | .001 |
| N | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| Equity | Pearson Correlation | -.478 | -.471 | -.066 | -.488 | 1 | .190 | -.654 |
| Sig. (2-tailed) | .000 | .000 | .295 | .000 |   | .003 | .000 |
| N | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| Fund Age | Pearson Correlation | -.213 | -.006 | .113 | -.073 | .190 | 1 | -.119 |
| Sig. (2-tailed) | .001 | .923 | .073 | .250 | .003 |   | .059 |
| N | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| Fund Returns | Pearson Correlation | .344 | .436 | .045 | .215 | -.654 | -.119 | 1 |
| Sig. (2-tailed) | .000 | .000 | .473 | .001 | .000 | .059 |   |
| N | 252 | 252 | 252 | 252 | 252 | 252 | 252 |

Pearson correlation range from -1 to +1. A coefficient of 0.1 to 0.29 or -0.1 and -0.29 indicate weak strength of association between the variables. A correlation of 0.3 to 0.49 or -0.3 and -0.49 point to a medium strength of association between the study variables. A coefficient of 0.5 to 1 or -0.5 and -1 indicate a strong or large strength of association.

Table 4.2 above shows Pearson correlation coefficients and 2-tailed significance probability levels. The Pearson correlation for the weight of money market instruments was 0.344 with a probability value of less than 0.05. This showed existence of moderate positive association between the weight of money market instruments and the fund returns which is significant at 5% level of confidence. The weight of corporate bonds had a Pearson correlation coefficient of 0.436 with a 2-tailed probability of less than 5%. This pointed to the existence of a moderate positive relationship between the weight of corporate bonds in a fund to the fund returns. The probability is also significant at 5% confidence interval.

The weight of property had a Pearson correlation coefficient of 0.045 with a 2-tailed significance probability of 0.473. This showed that there existed weak positive relationship between the weight of property and the performance of a fund which was measured by its investment returns. The probability is not significant at a confidence interval of 5%. The weight of treasury bonds in the fund had a Pearson correlation coefficient of 0.215 with a significance probability of 0.001. This pointed to existence of a weak association between the weight of treasury bonds and the fund returns. The positive association means that increasing the weight of treasury bonds in a fund increases the performance of Unit Trust Scheme fund.

The weight of equity had a Pearson correlation coefficient of -0.654 with a significance probability which was less than 5%. This showed existence of a strong negative relationship between the weight of equity in a fund and the returns of a fund. The negative relationship shows that increasing the weight of equity in a fund decreases its one-year performance. The association is significant at a 5% confidence interval. Fund age had a Pearson correlation coefficient of -0.119 with a significance probability of 0.059. This showed existence of a weak negative relationship between the log of fund age and the returns of a fund. The association is also not significant at 5% confidence interval but if the limit is stretched, it will be significant at an interval of 6%.

## Regression Analysis

Regression analysis was performed on the data collected to determine the effect which asset allocation had on the performance of Unit Trust Scheme funds in Kenya. The results of the regression analysis are as presented below: -

|  |
| --- |
| **Table 4.5: Model Summary** |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .692a | .479 | .466 | .73078 |
| a. Predictors: (Constant), Fund Age, Corporate Bonds, Property, Treasury Bonds, Money Market, Equity |

|  |
| --- |
| **Table 4.6: ANOVAa** |
| Model | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 120.185 | 6 | 20.031 | 37.508 | .000b |
| Residual | 130.841 | 245 | .534 |   |   |
| a. Dependent Variable: Fund Returns |
| b. Predictors: (Constant), Fund Age, Corporate Bonds, Property, Treasury Bonds, Money Market, Equity |

Tabulated F value given the degrees of freedom (6,245) at a 5% level of significance, the value was found to be 2.13. From table 4.4 above, the F distribution value is 37.508 and it is way higher than the tabulated critical value. This showed that the model was a good predictor of the relationship which existed between asset allocation and financial performance of Unit Trust Scheme funds in Kenya.

|  |
| --- |
| **Table 4.7: Regression coefficients** |
| Model | Unstandardized Coefficients | Standardized Coefficients |  t |  Sig. |
|  B |  Std. Error |  Beta |
| 1 | (Constant) | -5.286 | 1.654 |   | -3.196 | .002 |
| Money Market | 5.937 | 1.636 | .872 | 3.629 | .000 |
| Corporate Bonds | 6.698 | 1.651 | .932 | 4.057 | .000 |
| Property | 6.190 | 2.154 | .206 | 2.874 | .004 |
| Treasury Bonds | 5.592 | 1.688 | .921 | 3.313 | .001 |
| Equity | 3.087 | 1.676 | .667 | 1.842 | .067 |
| Fund Age | -.028 | .130 | -.010 | -.212 | .832 |
| a. Dependent Variable: Fund Returns |

When the coefficients are updated into the analytical model, the resultant regression equation is as below;

*Sfp = -*5.286*+*5.592*x1 +*6.698*x2+*3.087*x3+*6.190*x4+*5.937*x5-*0.028*x6*

If all the study variables were to remain constant, performance of Unit Trust Schemes in Kenya will remain at -5.286. Holding all the variables constant, a unit change in the weight of money market instruments will result in an increase in fund performance by 5.937. A unit change in the weight of corporate bonds when all the other factors are held constant results in an increase of the fund performance by 6.698. When all the other variables are held constant, a unit change in the weight of property results in a 6.190 change in the performance of a fund. A unit change in treasury bonds results in a 5.592 change in the performance of a fund when all the other variables are held constant. A unit change in the weight of equity, results in a 3.087 change in the performance of a fund. When all the variables are held constant, a unit change in the log of fund age results in a -0.028 change in the performance of a fund.

Money market financial instruments, corporate bonds, property and treasury bonds all have significance probabilities which are less than 0.05. This showed that they were all significant at the 5% level of significance. Equity was slightly insignificant with a value of 0.067 which was slightly above the 5% confidence level. Fund age was insignificant given that it had a probability value of 0.832 and this was way higher than the 0.05 level of significance.

## Interpretation of Findings and Discussion of the Results

Diagnostic tests conducted on the data show that the assumptions of the model adopted are satisfied. The assumptions of normality, existence of autocorrelation and non-existence of multi-collinearity between the study variables were satisfied.

Results of the correlation and regression analysis of the dataset showed that the weight of money market instruments, corporate bonds, treasury bonds and equity significantly affected performance of Unit Trust Scheme funds. Correlation results for the weight of money market instruments, corporate bonds and treasury bonds showed existence of a positive autocorrelation with the fund returns. This implies that increasing the weight of the financial instruments for the scheme increases financial performance of Unit Trust Schemes. They all had probability values in the interval of 0 and 0.05. This implied that the association between the dependent and independent variable is statistically significant at 95% confidence level.

Correlation results for the weight of equity pointed to existence of a negative association between with one-year fund returns. This implied that when the weight of equity is increased in a fund, it tends to lower the fund returns in the short-term. The probability was significant at 95% level of confidence. The result was also in line with findings by Sutcliffe (2004) that equities tend to have a long-term investment horizon for them to bring in attractive returns.

The log of the age of the fund was not significant given that it had a probability of 0.059 which was slightly above 0.05. Immovable property had a probability of 0.473 which was also not significant at the 5% level of significance. This implied that, immovable property had significantly lower influence in the performance of a fund. This is consistent with a study conducted by Sang (2017) to assess the effect that asset allocation has on the financial performance of Unit Trust Schemes in Kenya.

The findings of this study that are in line with what Santacruz (2011) found that asset allocation accounts for a huge percentage in the variability of the aggregate portfolio returns. The research also concurs with the findings of a study conducted by Blake, Lehmann and Timmermann (1998) in the UK that asset allocation is an integral element in the determination of the financial performance of an investment institution. However, correlation and regression results differ on the significance levels of property in influencing performance of a fund. Equity had a negative association with one-year fund performance.

# CHAPER FIVE

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

1.
2.

## Introduction

This chapter reflects the entire study by providing a summary of the findings. Conclusions have also been drawn from the findings of the research. This has been related to the study objectives. Recommendations to theory, policy and practise have also been given. The chapter is wrapped up by giving suggestions where further research can be done.

##  Summary of the Findings

The objective of this research was to determine the effect that asset allocation has on financial performance of Unit Trust Scheme funds in Kenya. The weight of money market instruments, corporate bonds, treasury bonds, equity, property and the log of fund returns were collected over a five-year period. A multivariate linear regression model was fitted to the data. Results from the description of the data, correlation and regression analysis discussed in Chapter 4 are as summarized in the subsequent paragraphs.

The weight of money market financial instruments in the fund value was found to have an average of 0.19, a standard deviation of 0.15, skewness of 0.68 and a kurtosis of -0.48. It had a correlation of 0.344 and a statistically significant probability at 0.05 confidence interval. This pointed to existence of a moderate positive association between the weight of money market instruments in the fund and the investment returns of a fund. Increasing the weight of money market instruments in a fund increases the returns of a fund. The regression coefficient of money market instruments had a significant effect in the determination of the fund returns given that the level of significance is less than the 0.05 confidence interval.

The weight of corporate bonds in the value of the fund had a mean of 0.12, a standard deviation of 0.14, skewness of 0.67 and a kurtosis of -1.00. It had a correlation coefficient of 0.436 with a statistically significant 2-tailed probability at 95% confidence level. This showed existence of a moderate positive association between the weight of corporate bonds and fund returns. Therefore, increasing the weight of corporate bonds will increase the returns of a fund. The regression coefficient of the weight of corporate bonds in a fund was statistically significant at 95% level of confidence.

The weight of property in the fund value had a mean close to 0, a standard deviation of 0.03, skewness of 7.86 and a kurtosis of 64.52. This shows that it was skewed to the right and its frequency distribution had a sharp spike. It also showed existence of the least absolute correlation with the fund returns of 0.045 and 2-tailed probability of 0.473 which was not statistically significant at 95% confidence level. Therefore, this weak positive association of the weight of property to fund returns was insignificant. Correlation differed with regression coefficients given that the significance of the regression coefficient was 0.004 and it fell within the acceptable confidence level of 95%.

The weight of treasury bonds had a mean of 0.43, a standard deviation of 0.16, skewness of -0.57 and a kurtosis of 1.18. It had a correlation coefficient of 0.215 and a 2-tailed probability of 0.001. This pointed to existence of a weak positive association of the weight of treasury bonds to the fund returns which was statistically significant at a confidence level of 95%. The significance of the regression coefficient was also significant given that it was within the 0.05 confidence interval. Increasing the weight of treasury bonds in a fund performance of a fund.

The weight of equity had a mean of 0.25, a standard deviation of 0.22, skewness of 0.26 and a kurtosis of -1.16. It had a correlation coefficient of -0.654 and a 2-tailed significance probability which between 0 and 0.05. This showed a negative strong relationship between the weight of equity and annualized fund returns which is statistically significant. Significance of the regression coefficient was 0.067 hence insignificant at the 95% confidence level.

The log of fund age had a mean of 0.68, a standard deviation of 0.37, skewness of -1.12 and a kurtosis of 0.91. It had a correlation coefficient of -0.119 and a 2-tailed significance probability of 0.059 which was slightly above 0.05. This demonstrated existence of a weak negative association between the age of the fund and its return which were statistically insignificant at 95% confidence level. Significance of the correlation coefficient was 0.832 which was way too high than 0.05 hence insignificant at 95% confidence interval.

## Conclusion and Recommendations

The study sought to determine what effect asset allocation had on the financial performance of Unit Trust Schemes in Kenya. The study established significant correlations between fund returns and money market instruments, corporate bonds, treasury bonds and equity. Property and fund age had insignificant effects according to the level of confidence adopted. Investment in property had insignificant effects in the short-term on the financial performance of investment organizations. Its assessment over a longer period of time may yield different observations.

On the other hand, equity was found to negatively correlate with one year returns of a fund. Investment in equity requires assessment over medium to long time periods for a proper verdict on its effects to be authoritatively stated. Expanding the confidence interval will see fund age have a correlation with the returns of a fund but its effects were not as significant as the financial instruments do. Immovable property due to its illiquid nature, its effect on the one year returns of a fund was insignificant.

The study further established existence of a significant linear relationship between the investment returns of a fund and money market instruments, corporate bonds, property and treasury bonds. The linearity of the association between the age of a fund and equity was statistically insignificant. Equity is significantly correlated with fund returns but the association is not linear. The correlation between the age of a fund and the returns of a fund was insignificant and their association was not linear.

Fund managers in their quest to comply with CMA regulations on the quantities of funds which a certain fund can invest in a particular financial instrument proof to be restrictive. Fund managers end up investing in financial assets which they could otherwise not have invested in. This decreases the investment returns which a fund generates. Relaxing such restrictive regulation while still maintaining a balance between risk and return of the investors will enhance innovative investment by fund managers. Asset allocation decision should be left to fund managers to make based on their return-risk assessment of a certain financial instrument but under strict guidelines from CMA. Investment returns largely depend on a fund manager’s assessment, selection and timing of an investment and that is not fully put into practice with a quantitative regulation in a certain investment.

Findings of the research point to positive correlations between the returns of a fund and money market instrument, corporate bonds and treasury bonds. Therefore, this study recommends that for funds where investors expect returns in short term such as money market funds, they should have more of money market instruments such as treasury bills, commercial paper and investment in Fixed deposits and less of equity. Greater investment in equity should be considered when investing in funds where investors expect to make reasonable returns in the medium to long term.

Listed firms should be encouraged to issue corporate bonds and commercial paper. This can be achieved through proper guidelines and appropriate promotions by CMA. They are high yielding financial instruments which fund managers should give specific attention to.

Asset allocation has to be assessed alongside other investment aspects such as timing, manager experience and the prevailing economic conditions of operation when making an investment decision.

## Limitations of the study

Collecting the secondary data from Unit Trusts Schemes in Kenya was herculean. The researcher had to approach the schemes individually to get the data where the financial statements were not available on their website. The organizations needed a lot of convincing that it was to be used exclusively for academic purposes to fill in the data collection form. The researcher ended up in the University of Nairobi Archives to get financial statements of the Unit Trust Schemes which were not willing to give the information. Therefore, the data collection process took longer than expected. Afterwards, data analysis and presentation of the results has been handled with a lot of confidentiality.

The study focussed only on Unit Trust Schemes which represents part of the investment institutions we have in Kenya. Asset allocation is a critical investment decision which all investment institutions have to do it right for them to make reasonable returns and attract clients. The study was also limited to only Unit Trust Schemes in Kenya. A comparison of the findings between the local Unit Trust Schemes and the rest of the world would have given more insights and probably yield a more efficient way to tackle some of the common asset allocation mistakes committed.

The research was carried out for a period of over five-month period. Due to previously unforeseen circumstances, this proved to be a challenge to the researcher. Despite the time constraint, the researcher worked out an aggressive plan that saw it that all the challenges are addressed, and the quality of the research is held to very high standards.

The study measured financial performance of the dependent variable using investment returns. Sharpe ratio was adopted to measure the returns. The measurement was adopted after careful assessment of on how Unit Trust Schemes work in Kenya and on which method is commonly adopted to measure fund returns. However, the researcher understands too well that other methods which are equally as good exist.

The researcher adopted a linear regression model to assess the association which existed between the independent and dependent variables. The model was later tested and found to adequately represent the relationship well. However, some of variables might not exhibit a linear relationship with the dependent variable.

## Suggestions for Further Studies

This research was limited to the assessment of the effect of asset allocation in the financial performance of Unit Trust Schemes in Kenya. The discussion can be expanded to other investment organizations whereby asset allocation is a significant decision that its leadership grapple with on a day to day basis. Comparison of the local funds’ performance with global leaders in the industry will also be beneficial to theory, practice and policy.

One of the assumptions which this research adopted and some variables like equity and fund age violated is existence of a linear relationship between the independent and dependent variables. Adoption of a better model fit for the variables will give further insights into the nature of association which exists between the variables.

Annualized returns were collected over a 5-year period for all the Unit Trust Scheme funds in Kenya. The researcher feels that a replica study can be conducted over a longer time period for more conclusive findings.

Adequate timelines to conduct out such a study is also required. Much time was taken up during the data collection process, analysis and presentation. Without sufficient time, the researcher will find himself/herself in an awkward position which might compromise the quality of the research.

Practitioners, scholars and regulators will greatly benefit from a replica study which adopts a different approach of getting to measure investment returns. Some of the shortcomings of the Shape ratio are mitigated by Sortino and Treynor’s ratios. However, their selection and adoption should follow after good assessment and convincing logic – they should not be used for the sake of it.

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# APPENDICES

## APPENDIX I: List of Licensed Collective Investment Funds in Kenya

|  |  |
| --- | --- |
| **S/N** | **Fund Name** |
| 1 | African Alliance Kenya Shilling Fund |
| 2 | African Alliance Kenya Fixed Income Fund |
| 3 | African Alliance Kenya Managed Fund |
| 4 | African Alliance Kenya Equity Fund |
| 5 | British-American Money Market Fund |
| 6 | British-American Bond-Plus Fund |
| 7 | British-American Balanced Fund |
| 8 | British-American Equity Fund |
| 9 | Commercial Bank of Africa Money Market Fund |
| 10 | Commercial Bank of Africa Equity Fund |
| 11 | Zimele Balanced Fund |
| 12 | Zimele Money Market Fund |
| 13 | ICEA Money Market Fund |
| 14 | ICEA Equity Fund |
| 15 | ICEA Growth Fund |
| 16 | ICEA Bond Fund |
| 17 | Standard Investment Equity Growth Fund |
| 18 | Standard Investment Fixed Income Fund |
| 19 | Standard Investment Balanced Fund |
| 20 | CIC Money Market Fund |
| 21 | CIC Balanced Fund |
| 22 | CIC Fixed Income Fund |
| 23 | CIC Equity Fund |
| 24 | Madison Asset Equity Fund |
| 25 | Madison Asset Balanced Fund |
| 26 | Madison Asset Money Market Fund |
| 27 | Amana Shilling Market Fund |
| 28 | Amana Balanced Fund |
| 29 | Amana Growth Fund |
| 30 | Diaspora Money Market Fund |
| 31 | Diaspora Bond Fund |
| 32 | Diaspora Equity Fund |
| 33 | First Ethical Opportunities Fund |
| 34 | GenCap Hazina Fund (Bond Fund) |
| 35 | GenCap Eneza Fund (Diversified Fund) |
| 36 | GenCap Hela Fund (Money Market Fund) |
| 37 | GenCap Iman Fund (Shariah Compliant Fund) |
| 38 | GenCap Hisa Fund (Equity Fund) |
| 39 | GenCap Hela Imara Fund (Money Market Fund) |
| 40 | Sanlam Money Market Fund (Sanlam Pesa Plus Fund) |
| 41 | Sanlam Dividend Plus Fund (Sanlam Faida Plus Fund) |
| 42 | Sanlam Balanced Fund (Sanlam Chama Plus Fund) |
| 43 | Nabo Africa Money Market Fund (USD) |
| 44 | Nabo Africa Balanced Fund (USD) |
| 45 | Nabo Africa Fixed Income Fund (USD) |
| 46 | Nabo Africa Equity fund (USD) |
| 47 | Nabo Capital Money Market Fund (KES) |
| 48 | Nabo KES Fixed Income Fund (KES) |
| 49 | Old Mutual Equity Fund |
| 50 | Old Mutual Money Market Fund |
| 51 | Old Mutual Balanced Fund |
| 52 | Old Mutual East Africa Fund |
| 53 | Old Mutual Bond Fund |
| 54 | Equity Investment Bank Money Market Fund |
| 55 | Equity Investment Bank Balanced Fund |
| 56 | Dry Associates Money Market Fund (Kenya Shillings) |
| 57 | Dry Associates Money Market Fund (US Dollars) |
| 58 | Dry Associates Balanced Fund (Kenya Shillings) |
| 59 | Co-op Balanced Fund |
| 60 | Co-op Equity Fund |
| 61 | Co-op Bond Fund |
| 62 | Co-op Money Market Fund |
| 63 | Apollo Money Market Fund |
| 64 | Apollo Balanced Fund |
| 65 | Apollo Equity Fund |
| 66 | Watu Money Market Fund |
| 67 | Seriani Money Market Fund |
| 68 | Seriani Balanced Fund |
| 69 | Seriani Equity Fund |
| 70 | Alphafrica Hifadhi Fixed Income Fund |
| 71 | Alphafrica Kasha Money Market Fund |
| 72 | Stanlib Kenya Money Market Fund  |
| 73 | Stanlib Kenya Equity Fund  |
| 74 | Stanlib Kenya Balanced Fund  |
| 75 | Stanlib Kenya Fixed Income Fund  |

**Source: CMA, 9th May 2019**

## APPENDIX II: Data Collected

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Money Market**  | **Corporate Bonds**  | **Property**  | **Treasury Bonds**  | **Equity**  | **Fund Age**  | **Fund Returns**  |
| 0.49 | 0.4 | 0 | 0.11 | 0 | -0.38 | 2.15 |
| 0.5 | 0.4 | 0 | 0.11 | 0 | 1.02 | 2.03 |
| 0.43 | 0.39 | 0 | 0.12 | 0.06 | 0.92 | 1.91 |
| 0.43 | 0 | 0 | 0.16 | 0.41 | 0.92 | 1.9 |
| 0.42 | 0.37 | 0 | 0.14 | 0.07 | 0.99 | 1.88 |
| 0.42 | 0.36 | 0 | 0.16 | 0.06 | 0.98 | 1.8 |
| 0.2 | 0.35 | 0 | 0.17 | 0.28 | 0.98 | 1.68 |
| 0.2 | 0 | 0 | 0.47 | 0.33 | 0.97 | 1.68 |
| 0.3 | 0.25 | 0 | 0.27 | 0.18 | 0.48 | 1.56 |
| 0.47 | 0.23 | 0 | 0 | 0.3 | 0.48 | 1.55 |
| 0.47 | 0.23 | 0 | 0 | 0.3 | 0.93 | 1.54 |
| 0.46 | 0 | 0 | 0 | 0.54 | 0.93 | 1.48 |
| 0.45 | 0.21 | 0 | 0 | 0.34 | 0.64 | 1.44 |
| 0.43 | 0.21 | 0 | 0.36 | 0 | 0.64 | 1.44 |
| 0.43 | 0.31 | 0 | 0.26 | 0 | 0.64 | 1.44 |
| 0.42 | 0.3 | 0 | 0.28 | 0 | 0.64 | 1.36 |
| 0.42 | 0 | 0 | 0.28 | 0.3 | 0.7 | 1.31 |
| 0.41 | 0.28 | 0 | 0.31 | 0 | 0.7 | 1.24 |
| 0.4 | 0.28 | 0 | 0.32 | 0 | 0.7 | 1.24 |
| 0.4 | 0.27 | 0 | 0.33 | 0.1 | 0.45 | 1.23 |
| 0.39 | 0.23 | 0 | 0.38 | 0.1 | 0.45 | 1.23 |
| 0.11 | 0.2 | 0 | 0.42 | 0.27 | 0.45 | 1.23 |
| 0.04 | 0.2 | 0 | 0.48 | 0.28 | 0.45 | 1.12 |
| 0.3 | 0 | 0 | 0.54 | 0.16 | 0.45 | 1.09 |
| 0.3 | 0 | 0 | 0.55 | 0.15 | 0.02 | 1.04 |
| 0.3 | 0 | 0 | 0.57 | 0.13 | 0.02 | 1.03 |
| 0.29 | 0 | 0 | 0.58 | 0.13 | 0.02 | 1 |
| 0.29 | 0 | 0 | 0.58 | 0.13 | 0.06 | 1 |
| 0.29 | 0 | 0 | 0.6 | 0.11 | 0.06 | 1 |
| 0.28 | 0 | 0 | 0.51 | 0.21 | 0.06 | 1 |
| 0.28 | 0.2 | 0 | 0.52 | 0 | 0.9 | 1 |
| 0.04 | 0.2 | 0 | 0.53 | 0.23 | 0.7 | 0.99 |
| 0.05 | 0.2 | 0 | 0.53 | 0.22 | 0.9 | 0.98 |
| 0.05 | 0.18 | 0 | 0.55 | 0.23 | 0.9 | 0.98 |
| 0.26 | 0.17 | 0 | 0.57 | 0 | 0.9 | 0.93 |
| 0.24 | 0.14 | 0 | 0.62 | 0 | 0.9 | 0.92 |
| 0.21 | 0.14 | 0 | 0.65 | 0 | 0.9 | 0.92 |
| 0.21 | 0 | 0 | 0.66 | 0.13 | -0.63 | 0.88 |
| 0.2 | 0.22 | 0 | 0.58 | 0 | -0.63 | 0.83 |
| 0.2 | 0.2 | 0 | 0.6 | 0 | -0.63 | 0.83 |
| 0.2 | 0.2 | 0 | 0.6 | 0 | -0.14 | 0.82 |
| 0.2 | 0.19 | 0 | 0.61 | 0 | 0.15 | 0.8 |
| 0.2 | 0.18 | 0 | 0.62 | 0 | 1.06 | 0.79 |
| 0.19 | 0.17 | 0 | 0.64 | 0 | 0.97 | 0.79 |
| 0.19 | 0.16 | 0 | 0.65 | 0 | 0.97 | 0.78 |
| 0.18 | 0.15 | 0 | 0.67 | 0 | 1.03 | 0.75 |
| 0.3 | 0.14 | 0 | 0.56 | 0 | 1.02 | 0.72 |
| 0.3 | 0 | 0 | 0.57 | 0.13 | 1.02 | 0.72 |
| 0.3 | 0 | 0 | 0.57 | 0.13 | 1.02 | 0.69 |
| 0.3 | 0 | 0 | 0.56 | 0.12 | 0.6 | 0.68 |
| 0.17 | 0 | 0 | 0.71 | 0.12 | 0.6 | 0.68 |
| 0.16 | 0.4 | 0 | 0.44 | 0 | 0.98 | 0.68 |
| 0.26 | 0.4 | 0 | 0.34 | 0 | 0.98 | 0.68 |
| 0 | 0.39 | 0 | 0.35 | 0.26 | 0.95 | 0.68 |
| 0 | 0.39 | 0 | 0.35 | 0.26 | 0.95 | 0.68 |
| 0 | 0.38 | 0 | 0.37 | 0.25 | 0.95 | 0.68 |
| 0 | 0.38 | 0 | 0.37 | 0.25 | 0.78 | 0.67 |
| 0 | 0.37 | 0 | 0.38 | 0.25 | 0.73 | 0.67 |
| 0 | 0.37 | 0 | 0.38 | 0.25 | 0.73 | 0.64 |
| 0.23 | 0.37 | 0 | 0.4 | 0 | 0.73 | 0.63 |
| 0.23 | 0.37 | 0 | 0.4 | 0 | 0.73 | 0.6 |
| 0.23 | 0.35 | 0 | 0.42 | 0 | 0.76 | 0.58 |
| 0.23 | 0.35 | 0 | 0.42 | 0 | 0.76 | 0.58 |
| 0.22 | 0.35 | 0 | 0.43 | 0 | 0.76 | 0.56 |
| 0 | 0.34 | 0 | 0.45 | 0.21 | 0.78 | 0.56 |
| 0 | 0.34 | 0 | 0.45 | 0.21 | 0.78 | 0.55 |
| 0 | 0.34 | 0 | 0.45 | 0.21 | 0.78 | 0.55 |
| 0 | 0.34 | 0 | 0.45 | 0.21 | 0.58 | 0.55 |
| 0.2 | 0.33 | 0 | 0.47 | 0 | 0.58 | 0.55 |
| 0.2 | 0.33 | 0 | 0.47 | 0 | 0.58 | 0.54 |
| 0.2 | 0.33 | 0 | 0.47 | 0 | 0.58 | 0.51 |
| 0.2 | 0.33 | 0 | 0.47 | 0 | 0.58 | 0.49 |
| 0.18 | 0.32 | 0 | 0.5 | 0 | 0.31 | 0.49 |
| 0.17 | 0.32 | 0 | 0.51 | 0 | 0.31 | 0.49 |
| 0.16 | 0.32 | 0 | 0.52 | 0 | 0.31 | 0.49 |
| 0.16 | 0.32 | 0 | 0.52 | 0 | 0.33 | 0.48 |
| 0.16 | 0.31 | 0 | 0.53 | 0 | 0.33 | 0.48 |
| 0.16 | 0.3 | 0 | 0.54 | 0 | 0 | 0.47 |
| 0.15 | 0.3 | 0 | 0.55 | 0 | 0 | 0.47 |
| 0.15 | 0.3 | 0 | 0.55 | 0 | 0.95 | 0.45 |
| 0.14 | 0.29 | 0 | 0.57 | 0 | 0.95 | 0.44 |
| 0.14 | 0.29 | 0 | 0.57 | 0 | 0.95 | 0.44 |
| 0.14 | 0.28 | 0 | 0.58 | 0 | 0.95 | 0.44 |
| 0.13 | 0.28 | 0 | 0.59 | 0 | 0.95 | 0.43 |
| 0.12 | 0.28 | 0 | 0.6 | 0 | 0.2 | 0.42 |
| 0.12 | 0.28 | 0 | 0.6 | 0 | 0 | 0.39 |
| 0.11 | 0 | 0 | 0.62 | 0.27 | 0 | 0.36 |
| 0.11 | 0 | 0 | 0.62 | 0.27 | 0 | 0.35 |
| 0.11 | 0.34 | 0 | 0.35 | 0.2 | 0 | 0.33 |
| 0.1 | 0.27 | 0 | 0.63 | 0 | 0.38 | 0.33 |
| 0.08 | 0 | 0.25 | 0.67 | 0 | 1.09 | 0.31 |
| 0.08 | 0 | 0.24 | 0.68 | 0 | 1.01 | 0.3 |
| 0.08 | 0 | 0 | 0.69 | 0.23 | 1.01 | 0.29 |
| 0.06 | 0.23 | 0 | 0.71 | 0 | 1.07 | 0.29 |
| 0.06 | 0.23 | 0 | 0.71 | 0 | 1.06 | 0.25 |
| 0.06 | 0.22 | 0.16 | 0.56 | 0 | 1.06 | 0.25 |
| 0.05 | 0.22 | 0.15 | 0.58 | 0 | 1.06 | 0.24 |
| 0.05 | 0.21 | 0 | 0.74 | 0 | 0.7 | 0.24 |
| 0.24 | 0.2 | 0 | 0.56 | 0 | 0.7 | 0.21 |
| 0.23 | 0.2 | 0 | 0.57 | 0 | 1.02 | 0.2 |
| 0.23 | 0.19 | 0 | 0.58 | 0 | 1.02 | 0.18 |
| 0.21 | 0.19 | 0 | 0.6 | 0 | 1 | 0.17 |
| 0.01 | 0.19 | 0 | 0.6 | 0.21 | 0.99 | 0.17 |
| 0.01 | 0.17 | 0 | 0.62 | 0.2 | 1 | 0.17 |
| 0.1 | 0.16 | 0 | 0.54 | 0.2 | 0.84 | 0.14 |
| 0.08 | 0.16 | 0 | 0.56 | 0.2 | 0.8 | 0.11 |
| 0.28 | 0.16 | 0 | 0.56 | 0 | 0.8 | 0.08 |
| 0.27 | 0.16 | 0 | 0.56 | 0 | 0.8 | 0.05 |
| 0.26 | 0.16 | 0 | 0.58 | 0 | 0.8 | 0.04 |
| 0.26 | 0.15 | 0 | 0.59 | 0 | 0.83 | 0.01 |
| 0.06 | 0.15 | 0 | 0.59 | 0.2 | 0.83 | 0 |
| 0.05 | 0 | 0 | 0.61 | 0.34 | 0.83 | 0 |
| 0.05 | 0 | 0 | 0.61 | 0.34 | 0.84 | -0.01 |
| 0.24 | 0 | 0 | 0.63 | 0.13 | 0.84 | -0.01 |
| 0.03 | 0.13 | 0.34 | 0 | 0.5 | 0.84 | -0.05 |
| 0.03 | 0.13 | 0 | 0.84 | 0 | 0.68 | -0.06 |
| 0.01 | 0 | 0 | 0.87 | 0.12 | 0.68 | -0.08 |
| 0.01 | 0.12 | 0 | 0.87 | 0 | 0.68 | -0.08 |
| 0.01 | 0.11 | 0 | 0.88 | 0 | 0.68 | -0.12 |
| 0.34 | 0.11 | 0 | 0.55 | 0 | 0.68 | -0.12 |
| 0.34 | 0.1 | 0 | 0.56 | 0 | 0.48 | -0.14 |
| 0.53 | 0.1 | 0 | 0.37 | 0 | 0.48 | -0.17 |
| 0.5 | 0.1 | 0 | 0.4 | 0 | 0.48 | -0.18 |
| 0.5 | 0.1 | 0 | 0.4 | 0 | 0.5 | -0.18 |
| 0.5 | 0.09 | 0 | 0.41 | 0 | 0.5 | -0.2 |
| 0.5 | 0.09 | 0 | 0.4 | 0.01 | 0.5 | -0.2 |
| 0.5 | 0.09 | 0 | 0.4 | 0.01 | 0.5 | -0.2 |
| 0.5 | 0.09 | 0 | 0.4 | 0.01 | 1.01 | -0.24 |
| 0.49 | 0.08 | 0 | 0.41 | 0.02 | 1.01 | -0.29 |
| 0.49 | 0.08 | 0 | 0.39 | 0.04 | 1.01 | -0.32 |
| 0.49 | 0.08 | 0 | 0.38 | 0.05 | 1.01 | -0.32 |
| 0.48 | 0.07 | 0 | 0.39 | 0.06 | 1.01 | -0.36 |
| 0.47 | 0.07 | 0 | 0.37 | 0.09 | 0.41 | -0.39 |
| 0.47 | 0.07 | 0 | 0.36 | 0.1 | 0.3 | -0.41 |
| 0.46 | 0.06 | 0 | 0.37 | 0.11 | 0.09 | -0.44 |
| 0.46 | 0.06 | 0 | 0.36 | 0.12 | 0.09 | -0.47 |
| 0.45 | 0.05 | 0 | 0.38 | 0.12 | 0.09 | -0.47 |
| 0.44 | 0.05 | 0 | 0.37 | 0.14 | 0.24 | -0.47 |
| 0.43 | 0.04 | 0 | 0.35 | 0.18 | 0.24 | -0.49 |
| 0.43 | 0.03 | 0 | 0.34 | 0.2 | 0.24 | -0.49 |
| 0.43 | 0.02 | 0 | 0.35 | 0.2 | 0 | -0.49 |
| 0.42 | 0.02 | 0 | 0.36 | 0.2 | 0 | -0.49 |
| 0.42 | 0.02 | 0 | 0.35 | 0.21 | 0 | -0.49 |
| 0.42 | 0.01 | 0 | 0.35 | 0.22 | 0 | -0.49 |
| 0.42 | 0.01 | 0 | 0.32 | 0.25 | 0.53 | -0.49 |
| 0.21 | 0.01 | 0 | 0.52 | 0.26 | 1.13 | -0.49 |
| 0.2 | 0.01 | 0 | 0.53 | 0.26 | 1.05 | -0.49 |
| 0.2 | 0.01 | 0 | 0.53 | 0.26 | 1.05 | -0.49 |
| 0.2 | 0.01 | 0 | 0.49 | 0.3 | 1.11 | -0.49 |
| 0.2 | 0.01 | 0 | 0.49 | 0.3 | 1.1 | -0.49 |
| 0.2 | 0.01 | 0 | 0.49 | 0.3 | 1.1 | -0.49 |
| 0.2 | 0 | 0 | 0.49 | 0.31 | 1.09 | -0.49 |
| 0.19 | 0 | 0 | 0.5 | 0.31 | 0.78 | -0.49 |
| 0.19 | 0 | 0 | 0.5 | 0.31 | 0.78 | -0.49 |
| 0.19 | 0 | 0 | 0.48 | 0.33 | 1.06 | -0.5 |
| 0.18 | 0 | 0 | 0.49 | 0.33 | 1.06 | -0.51 |
| 0.18 | 0 | 0 | 0.49 | 0.33 | 1.04 | -0.51 |
| 0.18 | 0 | 0 | 0.49 | 0.33 | 1.03 | -0.51 |
| 0.18 | 0 | 0 | 0.49 | 0.33 | 1.04 | -0.51 |
| 0.18 | 0 | 0 | 0.48 | 0.34 | 0.9 | -0.54 |
| 0.17 | 0 | 0 | 0.49 | 0.34 | 0.87 | -0.54 |
| 0.17 | 0 | 0 | 0.47 | 0.36 | 0.87 | -0.55 |
| 0.17 | 0 | 0 | 0.46 | 0.37 | 0.87 | -0.55 |
| 0.17 | 0 | 0 | 0.46 | 0.37 | 0.87 | -0.56 |
| 0.16 | 0 | 0 | 0.47 | 0.37 | 0.89 | -0.56 |
| 0.16 | 0 | 0 | 0.47 | 0.37 | 0.89 | -0.56 |
| 0.16 | 0 | 0 | 0.47 | 0.37 | 0.89 | -0.57 |
| 0.16 | 0 | 0 | 0.45 | 0.39 | 0.9 | -0.58 |
| 0.16 | 0 | 0 | 0.45 | 0.39 | 0.9 | -0.58 |
| 0.15 | 0 | 0 | 0.46 | 0.39 | 0.9 | -0.58 |
| 0.15 | 0 | 0 | 0.45 | 0.4 | 0.77 | -0.58 |
| 0.15 | 0 | 0 | 0.45 | 0.4 | 0.77 | -0.58 |
| 0.15 | 0 | 0 | 0.45 | 0.4 | 0.77 | -0.58 |
| 0.15 | 0 | 0 | 0.45 | 0.4 | 0.77 | -0.58 |
| 0.14 | 0 | 0 | 0.43 | 0.43 | 0.77 | -0.6 |
| 0.14 | 0 | 0 | 0.43 | 0.43 | 0.15 | -0.6 |
| 0.13 | 0 | 0 | 0.43 | 0.44 | 0.61 | -0.6 |
| 0.13 | 0 | 0 | 0.42 | 0.45 | 0.61 | -0.61 |
| 0.13 | 0 | 0 | 0.41 | 0.46 | 0.61 | -0.61 |
| 0.13 | 0 | 0 | 0.41 | 0.46 | 0.62 | -0.61 |
| 0.13 | 0 | 0 | 0.41 | 0.46 | 0.62 | -0.61 |
| 0.13 | 0 | 0 | 0.41 | 0.46 | 0.62 | -0.63 |
| 0.12 | 0 | 0 | 0.42 | 0.46 | 0.62 | -0.68 |
| 0.12 | 0 | 0 | 0.41 | 0.47 | -0.05 | -0.68 |
| 0.12 | 0 | 0 | 0.41 | 0.47 | 0 | -0.68 |
| 0.12 | 0 | 0 | 0.4 | 0.48 | 1.04 | -0.69 |
| 0.11 | 0 | 0 | 0.41 | 0.48 | 1.04 | -0.7 |
| 0.1 | 0 | 0 | 0.42 | 0.48 | 1.04 | -0.7 |
| 0.09 | 0 | 0 | 0.42 | 0.49 | 1.04 | -0.7 |
| 0.09 | 0 | 0 | 0.42 | 0.49 | 1.04 | -0.7 |
| 0.08 | 0 | 0 | 0.42 | 0.5 | 0.55 | -0.7 |
| 0.08 | 0 | 0 | 0.42 | 0.5 | 0.48 | -0.7 |
| 0.08 | 0 | 0 | 0.42 | 0.5 | 0.35 | -0.7 |
| 0.08 | 0 | 0 | 0.42 | 0.5 | 0.35 | -0.7 |
| 0.08 | 0 | 0 | 0.42 | 0.5 | 0.35 | -0.7 |
| 0.08 | 0 | 0 | 0.41 | 0.51 | 0.44 | -0.73 |
| 0.07 | 0 | 0 | 0.41 | 0.52 | 0.44 | -0.73 |
| 0.07 | 0 | 0 | 0.41 | 0.52 | 0.44 | -0.83 |
| 0.07 | 0 | 0 | 0.41 | 0.52 | 0 | -0.85 |
| 0.07 | 0 | 0 | 0.41 | 0.52 | 0 | -0.85 |
| 0.07 | 0 | 0 | 0.39 | 0.54 | 0 | -0.86 |
| 0.06 | 0 | 0 | 0.4 | 0.54 | 0 | -0.87 |
| 0.06 | 0 | 0 | 0.4 | 0.54 | 0.65 | -0.92 |
| 0.06 | 0 | 0 | 0.37 | 0.57 | 1.16 | -0.92 |
| 0 | 0.05 | 0 | 0.38 | 0.57 | 1.09 | -0.94 |
| 0 | 0.05 | 0 | 0.37 | 0.58 | 1.09 | -0.94 |
| 0 | 0.05 | 0 | 0.36 | 0.59 | 1.14 | -0.94 |
| 0 | 0.36 | 0 | 0.05 | 0.59 | 1.13 | -0.94 |
| 0 | 0.34 | 0 | 0.07 | 0.59 | 1.13 | -0.94 |
| 0.05 | 0.34 | 0 | 0.01 | 0.6 | 1.13 | -0.94 |
| 0.04 | 0.34 | 0 | 0 | 0.62 | 1.1 | -0.94 |
| 0.04 | 0.33 | 0 | 0 | 0.63 | 1.1 | -0.95 |
| 0.03 | 0 | 0 | 0.34 | 0.63 | 1.08 | -0.95 |
| 0.03 | 0 | 0 | 0.33 | 0.64 | 1.07 | -0.99 |
| 0.03 | 0 | 0 | 0.3 | 0.67 | 1.08 | -1.05 |
| 0.03 | 0 | 0 | 0.3 | 0.67 | 0.95 | -1.06 |
| 0.03 | 0 | 0 | 0.29 | 0.68 | 0.92 | -1.11 |
| 0.03 | 0 | 0 | 0.29 | 0.68 | 0.92 | -1.11 |
| 0.03 | 0 | 0 | 0.27 | 0.7 | 0.92 | -1.12 |
| 0.02 | 0 | 0 | 0.27 | 0.71 | 0.92 | -1.12 |
| 0.02 | 0 | 0 | 0.26 | 0.72 | 0.94 | -1.18 |
| 0.01 | 0 | 0 | 0.26 | 0.73 | 0.94 | -1.18 |
| 0.01 | 0 | 0 | 0.45 | 0.54 | 0.94 | -1.19 |
| 0.01 | 0 | 0 | 0.43 | 0.56 | 0.95 | -1.25 |
| 0.01 | 0 | 0 | 0.42 | 0.57 | 0.95 | -1.26 |
| 0.21 | 0 | 0 | 0.42 | 0.37 | 0.95 | -1.28 |
| 0.21 | 0 | 0 | 0.41 | 0.38 | 0.83 | -1.35 |
| 0.21 | 0 | 0 | 0.4 | 0.39 | 0.83 | -1.35 |
| 0.21 | 0 | 0 | 0.4 | 0.39 | 0.83 | -1.42 |
| 0.01 | 0.2 | 0 | 0.39 | 0.4 | 0.83 | -1.42 |
| 0.01 | 0.2 | 0 | 0.39 | 0.4 | 0.83 | -1.55 |
| 0.01 | 0.2 | 0 | 0.39 | 0.4 | 0.38 | -1.55 |
| 0.01 | 0.2 | 0 | 0.39 | 0.4 | 0.7 | -1.55 |
| 0.03 | 0.17 | 0 | 0.39 | 0.41 | 0.7 | -1.6 |
| 0.03 | 0.17 | 0 | 0.39 | 0.41 | 0.7 | -1.67 |
| 0.03 | 0.17 | 0 | 0.38 | 0.42 | 0.71 | -1.69 |
| 0.2 | 0 | 0 | 0.38 | 0.42 | 0.71 | -1.71 |
| 0.2 | 0 | 0 | 0.38 | 0.42 | 0.71 | -1.74 |
| 0.2 | 0.37 | 0 | 0 | 0.43 | 0.71 | -1.74 |
| 0.2 | 0.34 | 0 | 0 | 0.46 | 0.28 | -1.8 |
| 0.25 | 0.5 | 0 | 0.05 | 0.3 | -0.09 | -1.88 |
| 0.25 | 0.4 | 0 | 0 | 0.4 | 1.08 | -1.9 |
| 0.25 | 0 | 0 | 0.33 | 0.42 | 1.08 | -1.98 |
| 0.23 | 0 | 0 | 0.29 | 0.51 | 1.08 | -1.98 |
| 0.24 | 0 | 0 | 0.2 | 0.6 | 1.08 | -2.54 |
| 0.27 | 0 | 0 | 0.2 | 0.6 | 1.08 | -2.64 |
| 0.27 | 0.2 | 0 | 0 | 0.6 | 0.51 | -2.76 |
| 0.21 | 0 | 0 | 0.48 | 0.32 | 0.51 | -2.76 |
| 0 | 0 | 0 | 0.33 | 0.47 | 0.51 | -2.77 |
| 0 | 0 | 0 | 0.33 | 0.47 | 0.57 | -2.99 |
| 0 | 0 | 0 | 0.3 | 0.5 | 0.57 | -2.99 |
| 0 | 0 | 0 | 0.31 | 0.49 | 0.57 | -3.01 |