AN INVESTIGATION INTO THE IMPORTANCE OF ASSET ALLOCATION DECISION ON PORTFOLIO PERFORMANCE IN ZIMBABWE

BY

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GRADUATE SCHOOL OF MANAGEMENT UNIVERSITY OF ZIMBABWE

SUPERVISOR: MR R. MUDALA
DECLARATION

I........................................................................do hereby declare that this dissertation is the result of my own investigation and research, except to the extent indicated in the: Acknowledgements, References and comments included in the body of the report, and that it has not been submitted in part or full for any degree to any other University.

.................................................  .................................................
Student Signature                      Date

Approved for submission

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Supervisor’s Signature                 Date
ACKNOWLEDGEMENTS

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To my immediate family:

My wife Phillistas, our daughter Sharon, sons Shaun and Sheldon

And

The extended family:

Thanks for the support, patience and encouragement.

Special mention to, my group members:

Fungai, Kulupi, Magure, Tendai, Chidhakwa, Deshe and Mupedzisi.

MAY OUR SOON COMING LORD BLESS YOU ALL!!!!!!
ABSTRACT

This study investigated the impact on performance of asset allocation policy relative to active management and market movement. In aggregate, 100 percent of return levels come from asset allocation, for aggregate return levels, asset allocation has the highest explanatory power. Most of the portfolio variation using both time-series and cross-sectional regressions (around 80 percent) comes from general market movement. After the removal of market movements, asset allocation and active management play an almost equal important role in determining portfolio return differences within a peer group. The findings of this study suggest that establishing an asset allocation policy consistent with an investor’s goals, investment horizon, and risk tolerance must be the first priority for fund managers and sponsors.
TABLE OF CONTENTS

PAGE

Title page.................................................................0

Declaration.........................................................i

Dedication..........................................................ii

Acknowledgements...........................................iii

Abstract..........................................................iv

Table of contents........................................v

List of tables....................................................viii

List of figures....................................................ix

Abbreviations......................................................x

CHAPTER 1: INTRODUCTION

1.0 Introduction......................................................1

1.1 Background to the study...................................2

1.2 Research problem..........................................5

1.3 Research objectives......................................5

1.4 Research questions......................................6

1.5 Research proposition......................................6

1.6 Justification of the study............................7

1.7 Scope of the study.........................................8

1.8 Dissertation outline......................................9
Chapter 2: Literature Review

2.0 Introduction ............................................... 12

2.1 Empirical literature ........................................ 13

2.1.2 Criticism of BHB ....................................... 13

2.1.3 Return levels and variations ........................... 15

2.1.4 Asset allocation and return levels .................... 17

2.1.5 Equal importance on variation ....................... 20

2.1.6 Why results may vary .................................. 21

2.1.7 Effect of Market Movement ......................... 22

2.2 Time series and cross sectional .......................... 25

2.3 Active and passive strategies ............................. 28

2.4 Performance measurement ............................... 34

2.5 Coefficient of determination ............................. 37

2.6 Conceptual framework ................................. 39

2.7 Chapter summary ........................................ 40

CHAPTER 3: Methodology

3.0 Introduction ............................................. 41

3.1 Research design ........................................ 41

3.2 Research philosophy ................................... 43

3.3 Research Strategy ....................................... 45

3.4 Population and sampling ............................... 46
Chapter 4: Findings and Discussion

4.0 Introduction...............................................55
4.1 Data Analysis...............................................55
4.2 Study results...............................................58
4.3 Asset allocation on return levels..............69
4.4 Chapter summary...........................................75

Chapter 5: Conclusion and Recommendations

5.0 Introduction................................................76
5.1 Conclusions from the study..................... ..76
5.2 Recommendations.........................................78
5.3 Recommendations for future studies.........81
5.4 Chapter summary...........................................82
**LIST OF TABLES**

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Research Strategies</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>Distributions of respondents</td>
<td>62</td>
</tr>
<tr>
<td>3</td>
<td>Unit Trust Funds Allocation</td>
<td>63</td>
</tr>
<tr>
<td>4</td>
<td>Pension Funds Allocations</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>Individual investors Allocations</td>
<td>64</td>
</tr>
<tr>
<td>6</td>
<td>Return variation and correlations</td>
<td>65</td>
</tr>
<tr>
<td>7</td>
<td>Time Series total return variations</td>
<td>67</td>
</tr>
<tr>
<td>8</td>
<td>Time Series excess return variations</td>
<td>68</td>
</tr>
<tr>
<td>9</td>
<td>Total return explained by policy</td>
<td>78</td>
</tr>
<tr>
<td>10</td>
<td>Time Series regressions for pension funds</td>
<td>81</td>
</tr>
<tr>
<td>11</td>
<td>Asset allocation in different environments</td>
<td>83</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Efficient frontier</td>
<td>14</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Investor utility curves</td>
<td>15</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Portfolio possibilities</td>
<td>16</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Treynor-Black asset allocation model</td>
<td>19</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Time series and cross sectional regressions</td>
<td>65</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Rolling cross sectional regression results</td>
<td>66</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Rolling cross sectional $R^2$ for unit trust funds</td>
<td>67</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>AUM</td>
<td>Assets under management</td>
<td></td>
</tr>
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<td>BGI</td>
<td>Barclays Global Investor</td>
<td></td>
</tr>
<tr>
<td>BHB</td>
<td>Brinson, Hood and Beebower</td>
<td></td>
</tr>
<tr>
<td>CAPM</td>
<td>Capital asset pricing model</td>
<td></td>
</tr>
<tr>
<td>CDO</td>
<td>Collateralised Debt Obligations</td>
<td></td>
</tr>
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<td>CML</td>
<td>Capital Market Line</td>
<td></td>
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<td>DJIA</td>
<td>Dow Jones Industrial Average</td>
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<td>EMH</td>
<td>Efficient Market Hypothesis</td>
<td></td>
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<td>ETF</td>
<td>Exchange Traded Funds</td>
<td></td>
</tr>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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</tr>
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<td>GFC</td>
<td>Global Financial Crisis</td>
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<td>GM</td>
<td>Geometric mean</td>
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</tr>
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<td>HEI</td>
<td>Hensel, Ezra and Ilkiw</td>
<td></td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<td>MPT</td>
<td>Modern Portfolio Theory</td>
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<td>MVO</td>
<td>Mean Variance Optimisation</td>
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<tr>
<td>LOS</td>
<td>Level of Significance</td>
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</tr>
<tr>
<td>RANVA</td>
<td>Risk Adjusted Net Value Added</td>
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</tr>
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<td>RBZ</td>
<td>Reserve Bank of Zimbabwe</td>
<td></td>
</tr>
<tr>
<td>RFR</td>
<td>Risk Free Rate</td>
<td></td>
</tr>
<tr>
<td>SAA</td>
<td>Strategic asset allocation</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>Stochastic dominance</td>
<td></td>
</tr>
<tr>
<td>SML</td>
<td>Security market line</td>
<td></td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>SR</td>
<td>Sharpe ratio</td>
<td></td>
</tr>
<tr>
<td>TAA</td>
<td>Tactical asset allocation</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
<td></td>
</tr>
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<td>U.S</td>
<td>United States of America</td>
<td></td>
</tr>
<tr>
<td>ZSE</td>
<td>Zimbabwe Stock Exchange</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

The actual importance and the determination of asset allocation has been the subject of considerable debate and misunderstandings for a long period. Many investors agree that asset allocation is important, but many have also failed to answer to the question of how important (Idzorek, 2010 p22). Asset allocation is widely regarded as one of the most important decisions an investor faces. The ultimate goal of investment management is to construct portfolios that are optimal with respect to some pre-specified investor objectives. According to the paradigm of modern portfolio theory that originated with Markowitz (1952), the exercise of constructing optimal portfolios is ultimately one of the balancing expected returns against their contribution to portfolio risk.

In the investment management industry, it is commonly accepted that an investor’s initial strategic asset allocation decision is the most important determinant of the portfolio’s investment performance (Ibbotson, 2010 p23). (Idzorek 2010 p 31) noted that investors understand that asset allocation is important; it is the answer to the question of how important which remains unanswered in most cases.

It was highlighted by (Ibbotson 2000p 24), that many researchers in trying to determine the importance of asset allocation divided returns into two components: asset allocation and active management. In his 2000 study Ibbotson recognised that market movements dominate variation in return. Most prior studies did not break out market movements, but included it in the asset allocation component he highlighted. In that study he also found out that asset allocation determines 100 percent of return level.
This was also confirmed by (Xiong et al, 2010p 2-9) they noted that previous studies attributed the bulk of fund performance to asset allocation, leaving little room for active management. They showed that, by taking market movements into account changes the results significantly. Their study breaks out market movements and recognises the market caused most of the variations in returns, this new analysis led to new conclusions they noted.

This is consistent with (Solnik and McLeavey 2003p 87) who highlighted that a portfolio’s total return can be decomposed into three components: (1) the market return, (2) the asset allocation policy return in excess of the market return, and (3) the return from active portfolio management. As a result of splitting out the components of return, it is possible to pinpoint and clarify the contribution of each component.

(Xiong et al 2010 p1) noted that some confusion surrounds the use of time-series as well as cross-sectional regressions in trying to determine the importance of asset allocation. Usually cross-sectional regressions will naturally lead to the removal of market movements. This means that, the cross-sectional results obtained in most literature are equivalent to analyses of excess market returns even though the regressions were performed on total returns. In contrast, time-series analyses of total returns will not naturally remove market movements. Time-series analyses of excess market returns and cross-sectional analyses of either total or excess market returns, however, will give consistent answers in most cases he noted.

The main purpose of this study is to determine the portion of performance of a fund that can be attributed to asset allocation policy relative to active management and market movement in Zimbabwe. The study will make a contribution to literature since there are no similar studies focusing on developing countries like Zimbabwe.

This chapter outlines the background to this study, problem statement, study objectives and its importance, justification of the study, scope of the research, dissertation outline and chapter summary.
1.1 BACKGROUND TO THE STUDY

Investors understand that asset allocation is important, but to ascertain the level of importance is difficult. A portfolio’s performance depends on three interrelated decisions: security selection, market-timing, and an investor’s policy, or long-term, asset allocation. Once an investor has determined a policy allocation to stocks, bonds, and cash, this allocation can be implemented through a passive indexing strategy which simply aims to mirror the returns of the stock, bond, and cash benchmarks that make up the policy allocation or through active management. An actively managed strategy attempts to exceed the expected return of the policy allocation through security selection and or market-timing, (Vanguard Group, 2010 p1).

In their seminal paper in 1986, “Determinants of Portfolio Performance,” Brinson, Hood, and Beebower (BHB), concluded that asset allocation is the primary determinant of portfolio return variability, with security selection and market-timing playing minor roles. This conclusion has caused a great deal of confusion in both the academic and financial communities regarding the importance of asset allocation to portfolio performance (Ibbotson 2000 p2). The question of the precise role of asset allocation has remained unanswered.

(Ibbotson 2010 p3) noted that, the BHB methodology incorrectly ascribed all 100 percent of the return variation to asset allocation, whereas, in fact, all the variation came from stock selection and general market movement. Only if market movement is counted as part of asset allocation policy would (BHB) give the appropriate answer he noted.

According to (Idzorek 2010 p 4), one of the primary sources of confusion surrounding the importance of asset allocation is the interpretation of the BHB studies results which have been widely misunderstood hence misinterpreted in most cases. He noted that a number of investors and fund managers have mistakenly believed that the results meant that 93.6 percent of a portfolio’s return level. In one of the many analyses that BHB carried out, they found that the policy mix explained 93.6 percent of the average funds’ return variation over time (as measured by the R-squared of
the regression) the keyword he highlighted “being variation”. The BHB’s landmark article however unintentionally created the fallacy that about 90 percent of return levels come from asset allocation. This has created a gap between in literature which must be filled.

(Xiong et al 2010 p 1) noted that, in an attempt to ascertain the contribution of asset allocation many researchers ended up in another confusion surrounding the use of time series and cross sectional regressions. Usually cross-sectional regressions will naturally remove market movements. Therefore, the cross-sectional results found in most literature are equivalent to analyses of excess market returns even though the regressions were performed on total returns. In contrast, time-series analyses of total returns will not naturally remove market movements. Time-series analyses of excess market returns and cross-sectional analyses of either total or excess market returns, however, are consistent with each other in most cases he noted.

Many studies have emphasised the importance of asset allocation policy versus active portfolio management. The studies by Brinson, Hood, Beebower (1986) (BHB) followed by many others (Brinson et al., 1991; Ibbotson and Kaplan, 2000; Vardharaj and Fabozzi, 2007) has shown that policy returns account for more than 90 percent of the return of most mutual and pension funds. (Xiong et al, 2010 p 2-9) however, highlighted that most of these studies did not take into account that a substantial portion of both the fund’s return and the policy return is driven simply by market movements.

These studies were carried out in developed countries like U.S and the U.K were markets are highly developed and regarded efficient. This study will focus on Zimbabwe a developing country. The study covers the period from 2009 to 2012. The Zimbabwean economy was emerging from a decade of hyperinflation, negative interest to positive growth of the economy (Reserve Bank of Zimbabwe first quarter monetary policy statement, 2009 p 4).

This research study focuses on the period in which the world economy was showing signs of recovery from the Global Financial Crisis (GFC). According to the International (Monetary Fund (IMF), 2009p 10) investment flows were initially the
most affected by the crisis, reversing from inflows of $18.7 billion in 2006 to outflows of $16.7 billion in 2008. These outflows affected Sub-Saharan Africa’s frontier economies the hardest as foreign investors fled the region’s stock markets for safer, more liquid investments at home. Moreover, as financial instruments and stock markets became less attractive to financial investors, speculative capital shifted more into alternative investments such as oil and energy, minerals and agricultural commodities and products, which led to the 2004-08 commodity price booms.

1.2. RESEARCH PROBLEM

Considerable confusion surrounds the importance of asset allocation and the use of both time-series and cross-sectional regressions in determining the importance of asset allocation. Most investors and fund managers appreciate the importance of asset allocation however many cannot ascertain the actual importance, and this needs to be addressed. The purpose of this study is to answer this question and alleviate a significant amount of the long-running confusion surrounding the importance of asset allocation by using time-series and cross-sectional regressions. This study will fill the gap in literature on the impact of asset allocation on investment portfolios in Zimbabwe.

1.3. RESEARCH OBJECTIVES

1. To determine the role of asset allocation on portfolio performance in Zimbabwe.

2. To determine if variation in portfolio returns is explained by asset allocation policy.

3. To determine the importance of asset allocation versus active portfolio management in explaining portfolio performance.

4. To determine the impact of market movement relative to asset allocation in explaining return variations using both time series and cross sectional regressions.
1.4. RESEARCH QUESTIONS

1. What percentage of total return levels is explained by asset allocation policy in Zimbabwe?

2. How important is asset allocation policy in determining portfolio return variation?

3. What is the impact of asset allocation compared to active management in explaining portfolio performance?

4. What is the impact of asset allocation relative to the impact of market movement in explaining return variations?

5. Does active management add value to an investment portfolio?

1.5. RESEARCH PROPOSITION

The researcher proposes that portfolio performances in Zimbabwe are influenced by the asset allocation policy.
1.6. JUSTIFICATION OF THE STUDY

Most prior studies were confined to funds in the US and European markets, very little attention have been given to developing markets. The situation is quite desperate in Africa with researches mainly focusing on the South Africa. This study tries to plug that gap by studying the importance of asset allocation in the Zimbabwe fund management industry.

This study will help in identifying and alleviating a significant amount of the long-running confusion surrounding the importance of asset allocation relative to active management and market movement. Also the confusion surrounding both time-series and cross-sectional regressions in determining the importance of asset allocation will be resolved. The study will make a contribution to literature since there are no similar studies focusing on developing countries like Zimbabwe.

This current study will benefit individual and institutional investors as it will help them to channel resources and pay particular attention to the most important factors that impact portfolio returns. The study seeks to establish the importance of asset allocation decisions in determining portfolio returns. This study will recommend appropriate action to be adopted that can lead to superior returns.

1.7. SCOPE OF THE STUDY

The study will focus on various aspects to determine the impact of asset allocation on portfolio returns. Similar to (Vardharaj and Fabozzi, 2007 p 65), this study estimated the asset allocation policy return for each fund by using return-based style analysis. In coming up with the actual importance of asset allocation among funds as it pertains to return variations, the study will use both cross-sectional and time series regression. It will be shown that a cross-sectional regression performed on portfolio returns is equal to a cross-sectional regression performed on excess returns, because the cross-sectional regression procedure removes the market return that is
inherent in other portfolios of funds being analysed. After identifying the inherent market return as the weighted average return of the funds being analysed, total returns are converted into market-excess returns by subtracting the market return. As in previous time series studies, total returns will be used to estimate the explanatory power of asset allocation policy.

Compared to time series regressions, in which the results are highly dependent on the type of return used (total return or excess market return), cross-sectional regressions on total returns are equivalent to cross-sectional regressions on excess market returns. Cross-sectional regressions naturally remove the applicable market movement from the peer group, essentially resulting in the same analysis as using excess market returns so they will also be used in this study.

The study will focus on 240 individual investors, 33 unit trust funds and 180 pension funds managed by the 16 registered asset management companies in Zimbabwe. The research commenced in February 2013 and this draft will be submitted at the end of April 2014.

This empirical analysis encompasses 4 years of return data from February 2009 to December 2012. The study commences when Zimbabwe adopted the multiple currencies replacing the Zimbabwean dollar. During this period all the registered fund managers were all operational thereby eliminating survivorship bias from the study. During this period the economy went through different cycles, the study will reveal the importance of asset allocation decisions across those cycles.
1.8. DISSERTATION OUTLINE

This study is divided into five chapters each representing a specific stage of the study. The contents of each chapter are briefly outlined below:

CHAPTER 1: INTRODUCTION

The chapter outlines the background to this study which puts the environment into perspective, problem statement. It also spells out the rational of undertaking the study. Also considered are, study objectives, study questions, research proposition, and some relevant theories to this study are also discussed.

CHAPTER 2: LITERATURE REVIEW

The chapter reviews theoretical and empirical literature on asset allocation policy. It is widely agreed by many researchers and fund managers that asset allocation accounts for a large part of the variability in the return levels on a typical investor’s investment portfolio. This study will reveal that the variation in time-series returns for a typical fund comes from general market movement. The remaining variation comes equally from asset allocation policy and active management.

CHAPTER 3: METHODOLOGY

The chapter highlights the research design to be used in this study, the sampling method, population and the study sample. The data collection methods and data analysis are also highlighted in this chapter. It is also determined in this chapter that this study is quantitative and deductive in nature.

CHAPTER 4: RESULTS AND DISCUSSION
This section presents the analysis of the data and also the interpretation of the results obtained from the research. Statistical models were used to calculate the arithmetic mean of return for each fund. Regression analysis was also used to test relationships. The component of return attributable to asset allocation was determined and also the contribution of active management. These statistical procedures were used to synthesise the data and come up with logical results in this chapter.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This chapter is made up of the aggregate of results from the study. The actual impact of asset allocation on return variations and levels is highlighted. Recommendations on how to achieve superior results on portfolios are also discussed in this chapter. Potential areas of further study and research pertaining to the factors impacting performance of portfolios are also highlighted.
1.9. CHAPTER SUMMARY

This chapter outlines the background of the study, problem statement which anchors the whole research. The rational of undertaking the current study was also highlighted in the chapter. The potential benefits of this research as well as specific literature related to this study were highlighted. Fund managers in most cases understand that asset allocation is important, but apportioning the level of importance compared to active management and market movement could be difficult to many. This study will make contribution to literature by answering this question in the context of Zimbabwe investment portfolios.

Theoretical and empirical frameworks are presented in the following chapter based on literature regarding the importance of asset allocation and methods of determining its importance. Having established the importance of asset allocation it must implemented using different investment strategies which are also highlighted in this study.
CHAPTER 2

LITERATURE REVIEW

2.0. INTRODUCTION

In this chapter, the study focuses on literature discussing the importance of asset allocation relative to active management and market movement to portfolio performance. The study presents theoretical and empirical evidence on the relative importance of active management, asset allocation and market movement in portfolio performance. The chapter firstly focuses on the theories on asset allocation and portfolio construction, followed by a comparative analysis of active management and indexing. This section concludes by making an analysis on portfolio performance measurement. The chapter ends with empirical details on the impact of asset allocation on return variability and levels.

2.1 THEORETICAL LITERATURE ON ASSET ALLOCATION

According to (Brown et al 2010p 1) asset allocation is the process by which returns are maximized for a given level of risk by allocating to low or negatively-correlated asset classes (namely stocks, bonds, real estate, commodities) it is widely regarded as one of the most important decisions an investor faces. The ultimate goal of this process is to construct portfolios that are optimal with respect to some pre-specified objectives. According to the paradigm of modern portfolio theory that originated with Markowitz (1952), the exercise of constructing optimal portfolios is ultimately one of the balancing expected returns against their contribution to portfolio risk.

(Brown et al 2010 p 1) indicated that there are two types of asset allocation decisions. Strategic asset allocation decisions are made for the long-term, in some cases measuring 3-10 years. The BHB study's findings addressed strategic allocation, also referred to as policy, or static, allocation. A plan's strategic allocation is set by an investor or policy committee after considering the desired return and risk tolerance. When the share of one or more asset classes drifts too far, the investor may "rebalance" periodically, but the goal is to return the asset
classes to their original apportionment, not to capitalize on current market conditions.

Tactical asset allocation decisions are short-term in nature, reflecting either a risk or investment opportunity resulting from the recent mispricing of a specific asset or asset class. The same asset allocation target does not apply to everyone. The asset allocation target may be different due to an individual’s risk tolerance, need for income, unique circumstances. The BHB study’s 90% figure did not apply to these short-term moves. In fact, the study classified this as a form of active management, along with security selection, and found that it contributed little to quarterly returns (Prahl, 2013 p 4).

(Collomb 2004 p 67) noted that any security-specific selection decision is preceded, either implicitly or explicitly, by an asset allocation decision. Asset allocation is therefore the most fundamental of investment decisions. Studies by Ibbotson 2000 estimated that the asset allocation decision accounts for 91.5 percent of the variation between returns on different portfolios and 100 percent in return levels of a portfolio. Since asset allocation explains over 90 percent of the return and volatility in the return of an investment portfolio, getting this decision right will set one on the path to achieving one’s long-term investment objectives.

According to (Lummer and Riepe 2004 p 8) the asset allocation problem is frequently addressed through a static analysis, based on Markowitz’s mean-variance model. Modern portfolio theory was founded on the theory that there is an efficient frontier on which one’s investment portfolio can lie. The proper percentages of asset classes with different risk/reward profiles are combined to create this perfect investment portfolio. To minimize a portfolio’s total risk; diversification of investments among imperfectly correlated assets produces an efficient frontier of investment portfolios. Unit trust funds, pension funds represent such portfolios.
2.1.1 ASSET ALLOCATION AND PORTFOLIO THEORY

(Campbell and Viceira 2002 p 154) posits that the general aim of modern portfolio theory (MPT) is to optimise investment under given investor utility or risk preferences. MPT gives a theoretical base to asset allocation decisions in investment management. Markowitz (1952) formally put forward the mean variance optimisation framework where the investors expected return (mean) and his risk tolerance or volatility (variance) as the only portfolio characteristics which influence his utility. If the return distributions are normal that is can be defined by two parameters of mean and variance only, the optimisation rule would hold irrespective of whether investors’ utility function is quadratic or not. If one has the information on expected mean returns, standard deviation (risk) of returns, and the correlation between different asset classes, one can construct optimal set of portfolios which lie on the mean variance efficient frontier. Based on the mean variance optimisation model, rational investor behaviour is expected to follow a utility which increases with mean (return) and decreases with return variance (risk).

According to (Correia et al 2000 p 90) modern portfolio theory is on the culmination of the work of various researchers, but was pioneered by Markowitz (1952) and later Sharpe (1964). Markowitz developed the basic portfolio model at a time when investors were seeking a measure to quantify the risk variable. (Bodie et al 2005 p 223) stated that according to Markowitz the variance of the rate of return is a meaningful measure of portfolio risk under a reasonable set of assumptions.

Under these set of assumptions, a single asset or portfolio of assets to be efficient if no other asset or portfolio of assets offers higher expected return with the same (or lower) risk or lower risk with the same (or higher) expected return.

2.1.2 EFFICIENT FRONTIER

(D’Ambrosio 1976 p326) states that the portfolios on the efficient frontier dominate all portfolios below the frontier; this envelope curve that contains the best of all these possible combinations is what is referred to as the efficient frontier. Specifically, the
efficient frontier represents that set of portfolios that has the maximum rate of return for every given level of risk, or the minimum risk for every level of return.

Figure 2.1 efficient frontier

Figure 2.1: Typical mean-variance diagram of the assets opportunity set with the bank account and the capital market line. MPT compares the portfolio’s means $\mu$ and variances $\sigma^2$ out of the opportunity set of all possible portfolios that consist of risky assets.

If the market contains a risk-free asset that can be short-sold, the opportunity set is extended by the line through the risk-free asset that is tangent to the efficient frontier in the mean-variance space. Since all optimal portfolios lie on that line, it is called capital market line and its slope is the market price of risk. The point of contact is the market portfolio, as in Figure 2.1. MPT provides a neat separation between the capital market opportunities and the agent risk preferences. The former is given by the mean-variance set of possible portfolios and it is efficient frontier or the capital market line whenever there is a risk-free asset in the market.
An investor will target a point along the efficient frontier based on his utility function and his attitude toward risk. No portfolio on the efficient frontier can dominate any other portfolio on the efficient frontier. All of these portfolios have different return and risk measures, with expected rates of return that increase with higher risk. It was noted by (Reilly and Brown 2003 p 256) that because of the benefits of diversification among imperfectly correlated assets, it would expected that the efficient frontier is made up of portfolios of investments rather than individual securities.

2.1.3 THE EFFICIENT FRONTIER AND INVESTOR UTILITY

According to (Bodie et al 2005p157) investors assign utility to competing investment portfolios based on the expected return and risk of those portfolios. Portfolios with attractive risk return characteristics are assigned higher utility values. The utility value of a portfolio will increase if expected return increases and decrease if the expected variability (risk) decreases.

(Collomb 2004 p 14) highlighted that utility functions were originally designed as a tool for choosing between alternatives that would produce different random wealth variables. The two main principles in their construction are non-satiation (that is more wealth should be preferred to less) and risk aversion (at least for most individuals) that respectively translate into having an increasing and concave mapping of wealth to the utility it yields.

(Luenberger 1998 p 345) noted that it is important to appreciate that in a one-period setting where the utility function is quadratic or the asset returns are all normal, maximizing the expected value of the utility function is equivalent to solving the Markowitz mean-variance problem.

The curve in figure 2.1 shows that the slope of the efficient frontier curve decreases steadily as you move upward. This implies that adding equal increments of risk as you move up the efficient frontier gives one diminishing increments of expected return. To evaluate this slope, (Reilly and Brown 2003 p 230) calculated the slope of the efficient frontier as follows:
An individual investor’s utility curves specify the trade-offs he is willing to make between expected return and risk. In conjunction with the efficient frontier, these utility curves determine which particular portfolio on the efficient frontier best suits an individual investor. Two investors will choose the same portfolio from the efficient set only if their utility curves are identical. Figure 2.2 shows two sets of utility curves along with an efficient frontier of investments.

![Utility Curves and Efficient Frontier](image)

**Figure 2.2 Investor utility curves (Reilly and Brown p 256)**

Transferred to investment under utility, the actual optimal portfolio is chosen on the capital market line according to the risk preferences of the investor. His utility function can be visualized by utility indifference curves (contour lines) in the mean-variance diagram. For concave utility functions the curves are increasing and convex. Therefore, the optimal investment is the point where the indifference curve is tangent to the capital market line.

According to (Reilly and Brown 2003 p 330) the optimal portfolio is the portfolio on the efficient frontier that has the highest utility for a given investor. It lies at the point of tangency between the efficient frontier and the curve with the highest possible

\[
\Delta E(R_{\text{port}}) / \Delta \sigma_{\text{port}} \quad (2.1)
\]
utility. A conservative investor’s highest utility is at point X in figure 2.2, where the curve $U_2$ just touches the efficient frontier. A less-risk-averse investor’s highest utility occurs at point Y, which represents a portfolio with a higher expected return and higher risk than the portfolio at X. The curves labelled $U_1$ are for a strongly risk-averse investor (with $U_3 \leq U_2 \leq U_1$). These utility curves are quite steep, indicating that the investor will not tolerate much additional risk to obtain additional returns. The investor is equally disposed toward any $E(R), U$ combinations along a specific utility curve, such as $U_1$. The curves labelled $U_1', (U_3', U_2', U_1')$ characterize a less-risk-averse investor. Such an investor is willing to tolerate a bit more risk to get a higher expected return.

The concept of a unique market portfolio and a certain market price of risk motivate the well-known capital asset pricing model (CAPM), which was originated by (Treynor 1962).

### 2.1.4 THE MARKET PORTFOLIO

(Merton 1971 p 304) stated that the proportions of wealth that are invested in the risk-free and the risky asset are derived by “finding the locus of points in the mean-variance space of composite returns which minimize variance for a given mean, and then by finding the point where a line drawn from the risk-free asset is tangent to the locus”, as in Figure 2.1. The locus point is often called market portfolio. This analysis is analogous to Modern Portfolio Theory (MPT) which was first introduced by (Markowitz 1952).

(Bodie et al 2005 p 345) noted that since portfolio M lies at the point of tangency, it has the highest portfolio possibility line, and everybody will want to invest in Portfolio M and borrow or lend to be somewhere on the CML. This portfolio must, therefore, include all risky assets. If a risky asset were not in this portfolio in which everyone wants to invest, there would be no demand for it and therefore it would have no value. It will mean that the market is in equilibrium, it is also necessary that all assets are included in this portfolio in proportion to their market value. If, for example, an asset accounts for a higher proportion of the M portfolio than its market value justifies, excess demand for this asset will increase its price until its relative market
value becomes consistent with its proportion in the M portfolio. This portfolio that includes all risky assets is referred to as the market portfolio.

An investor who is more risk averse than the market would choose a positive fraction of the riskless asset and invests the remainder into the market portfolio. An aggressive investor bearing more risk than the market would borrow at the risk-free rate in addition to his funds at hand and invest the entire amount in the market portfolio, thereby leveraging his wealth. There would be no need for any portfolio other than the market portfolio (Infanger, 2006 p 207).

2.1.5 TREYNOR- BLACK MODEL

The Treynor–Black model captures the essence of how risk and return should be taken into account when constructing a portfolio of assets. In active portfolio management it has cited been cited as a key quantitative tool used by active portfolio managers (Taggart, 1996 p203). The model makes two important points relative to more complex portfolio optimisation methods in that it requires little information and it expresses the solution for optimal portfolio in a simple, algebraic formula (Taggart, 1996 p204).

According (Bodie et al 2005 p 324) the radical step taken by Treynor and Black in their model is to maintain the overall quantitative framework of the efficient markets approach to portfolio selection while simultaneously introducing a critical violation of the efficient markets theory. Individual portfolio managers could process information about the future performance of certain securities that is not reflected in the current price or reflected in the current price or projected market return of the asset. The quantitative performance measure for a single asset used by Treynor and Black is alpha (α), the projected return of the security over and above its market risk adjusted return. The optimal portfolio would then lean towards securities with projected outperformance (α>0) and away from securities with projected underperformance (α<0).
2.1.5.1 OUTLINE OF THE TREYNOR- BLACK MODEL

The model built on foundation that analysts can only produce quality analysis on a small number of securities. The model assumes that there is a passive market portfolio \( M \) and portfolio managers can estimate the expected return \( E(r_M) \) and risk \( \sigma_M \) for the broad market (passive portfolio). Portfolio managers can also estimate abnormal return \( \alpha \) for analysed securities. Portfolio managers can find optimal weights of analysed securities to create an active component \( (A) \) and then combine \( A, M \) and a risk free asset to achieve efficiency.

If one assumes that securities are fairly priced that is the maximum return one can get is the market return, the rate of return for security \( (i) \) will be given by the formula:

\[
R_i = R_f + \beta_i (R_M - R_f) + \varepsilon_i 
\]

Where
\( R_i \) = Expected return on security \( i \)
\( R_f \) = Risk free rate
\( R_M \) = Expected return on the market
\( \varepsilon_i \) = Error term
\( \beta_i \) = firm specific risk premium

\[
\beta = \frac{\text{COV} (R_i, R_M)}{\sigma_{RM}} 
\]

The Treynor Black model assumes that security analysts have the ability to analyse and come up with undervalued securities. For each security analysed, the return will be given by the formula:

\[
R_i = R_f + \beta_i (R_M - R_f) + \varepsilon_i + \alpha_i 
\]

Alpha \( (\alpha_i) \) represents the abnormal expected return attributable to the mispricing of the security. Treynor- Black model argues that there will be a significant number of non zero alpha to encourage fund managers to engage active security analysis otherwise there would be no need for assuming extra risk. The portfolio consisting of these securities can be called portfolio \( A \). This can then be combined with the market portfolio to ensure diversification. This optimisation process is shown below:
Figure 2.3 Treynor- Black Asset Allocations

The market portfolio (M) representing passive portfolio management lies on the efficient frontier that is tangent to the dotted capital market line (CML). Combining the market portfolio (M) with the active portfolio (A) provides an active risky portfolio. This portfolio lies on the Capital Allocation Line. This illustrates that the passive portfolio is inefficient since there is another portfolio (P) that can constructed using active management to come up with a higher return. The gradient of the CAL is steeper than that of the CML. This means portfolios on the CAL have a higher return at the same level of risk as portfolios on the CML. Investors wishing to determine whether their manager is really adding value by using the Treynor black model can check using the Sharpe measure which is the ratio of reward to variability.
2.1.5.2 STOCHASTIC DOMINANCE

According to (Guo 2012 p 7) stochastic dominance (SD) is another possible approach to optimal portfolio selection. (Ogryczak and Ruszczynski 2002 p 80-90) proved that the optimal mean-variance portfolio is also optimal in second-order stochastic dominance sense and vice-versa he noted.

It can be concluded that risky asset X stochastically dominates (in the first-order) risky asset Y, if and only if \( Eu(X) \geq Eu(Y) \) for every utility function (that is for every non-decreasing function). If this holds only for the concave utility function (for every risk-averter), it can be said that X stochastically dominates Y in the second-order. This can be applied in the portfolio selection problem as a search for a portfolio that no risk-averse agent would want to choose. SD serves as a supplement instead of replacement for the mean variance approach (Meyer, Li, and Rose, 2004 p 6).

Three basic classes are used to analyse stochastic dominance of utility functions which are characterised by the assumptions based on wealth preferences and risk aversion of the investor: non-satiation, risk aversion and decreasing absolute risk aversion. As a result the optimal selection rules defined as being necessary and sufficient for the maximisation of the expected utility in these general utility classes lead to the efficient set which is identical to the efficient set of the first-, second- and third-degree stochastic dominance.

The primary category of utility functions \( (U_i) \) which characterises the first degree stochastic dominance, is defined by the non-satiation, that is more is preferred to less \( (U(r) \geq 0) \). Based on the assumption that an individual is faced with two alternative portfolios P and Q, for utility maximisation with utility function from this category, a necessary and sufficient condition for the portfolio P to dominate portfolio Q according to (Bawa 1978, p. 255-271), (Breuer et al 1999, p. 308) is:

\[
F_P(r) \leq F_Q(r),
\]

Where \( F(r) \): cumulative return probability distribution
All individuals who exhibit any form of risk aversion and who tend to prefer more than less are included in the second class of utility functions ($U_2$). That is, they show non-decreasing and weak concave utility ($U(r) \geq 0$ and $U(r)'' \leq 0$). The second-degree stochastic dominance assumes a maximiser of the expected utility with the utility function from this class. In this class the primary and sufficient condition for the portfolio $P$ to dominate portfolio $Q$ according to (Bawa 1978, p. 255-271), (Breuer et al (1999), p. 310) is that:

$$\int F_p(s) \, ds \leq \int F_Q(s) \, ds$$

This condition requires for all return $r$, that the area below the cumulative probability distribution $F_P$ is smaller (or equal) than the area below the $F_Q$. The second-degree stochastic dominance has to be applied when the cumulative probability distributions cut each other.
In the third class of utility function \((U_{DARA})\), it can be assumed that a decision maker who is risk averse with decreasing absolute risk aversion and prefers more than less. So, he has non decreasing, weak concave utility with decreasing absolute risk aversion:

\[ U(r) \geq 0, U'(r) \leq 0, \frac{-U''(r)}{U'(r)} < 0. \]

A necessary and sufficient condition for the portfolio \(P\) to dominate portfolio \(Q\) for the expected utility maximiser with the utility function belonging to this class according to (Breuer et al 1999, p. 36) is:

\[ \int\int F_P(t) \, dt \, ds \leq \int\int F_Q(t) \, dt \, ds \]

This condition is referred as the third-degree stochastic dominance he noted. To obtain stochastic dominance-efficient set of portfolios, one has to compare pair wise the return probability distributions of all assets. Hence, the theoretically appealing direct evaluation of return distribution of investment is practically seldom helpful, as on the one hand one often does not know the exact return probability.
distribution, and on the other hand the optimisation algorithm for selecting stochastic dominance efficient portfolios has never been developed it was noted by (Breuer et al 1999 p 37).

According to (Frowein 2000, p. 3) if portfolio P is preferred for portfolio Q based on the first-degree stochastic dominance, also by the second-degree stochastic dominance the same will hold:

\[ P \succ_{FSD} Q \Rightarrow P \succ_{SSD} Q \]

Similarly, if portfolio P is preferred for portfolio Q by the second-degree stochastic dominance, this also implies by the third-degree stochastic dominance:

\[ P \succ_{SSD} Q \Rightarrow P \succ_{TSD} Q \]

2.1.6 PORTFOLIO PERFORMANCE MEASUREMENT AND EVALUATION

This section outlines the theory and practice of evaluating the performance of investment portfolios. The major aim of performance evaluation is to distinguish skilled from unskilled investment managers. A cross sectional comparison of returns can distinguish winners from losers, (Yan 2011 p 25).

2.1.6.1. PEER GROUP COMPARISONS

According to (Reilly and Brown 2004 p 1101), peer group comparison is the most common manner of evaluating portfolio managers’. It allows for the collection of returns produced by a representative universe of investors over a specific period of time and displays them in a simple box plot format. To aid the comparison, the universe is typically divided into percentiles, which indicate the relative ranking of a given investor.
2.1.6.2 COMPOSITE PERFORMANCE MEASUREMENT

Composite portfolio performance measures have the flexibility of combining risk and return performance into a single value. There are three frequently applied composite measures and these are; Treynor, Sharpe and Jensen measures, they are discussed in the ensuing sections.

2.1.6.2.1 TREYNOR’S PERFORMANCE INDEX

(Treynor, 1965 p63-75) was the first researcher to develop a composite measure of portfolio performance. He measured portfolio risk with beta, and calculated portfolio’s market risk premium relative to its beta:

\[ \text{Treynor} = \frac{R_P - R_f}{\beta_P} \]  

(2.5)

Where:

- \( R_P \) = Portfolio’s actual return during a specified time period
- \( R_f \) = Risk-free rate of return during the same period
- \( \beta_P \) = beta of the portfolio

Whenever \( R_P > R_f \) and \( \beta_P > 0 \) a larger Treynor’s performance index is realised, meaning a better portfolio for all investors regardless of their individual risk preferences. A negative Treynor’s performance index may be attained; when \( R_P < R_f \) and \( \beta_P < 0 \). If Treynor’s performance index is negative because \( R_P < R_f \) the portfolio’s performance is judged to be very poor. However, if the negativity of Treynor’s performance index comes from a negative beta, fund’s performance is very good. Finally when \( R_P - R_f \) and \( \beta_P \) are both negative, Treynor’s performance index will be positive, but in order to qualify the fund’s performance as good or bad an evaluation to assess whether \( R_P \) is above or below the security market line pertaining to the analysis period should be carried out (Reilly and Brown, 2003 p 1103).
2.1.6.2.2 SHARPE’S PERFORMANCE MEASURE

Sharpe (1966) came up with a composite index identical to the Treynor measure, the only difference being the use of standard deviation, instead of beta, in measuring the portfolio risk, in other words, it uses the total risk of the portfolio rather than just the systematic risk.

In a passive portfolio or index, the ratio is given by:

\[ S_m = \frac{R_m - R_f}{\sigma_m} \]  \hspace{1cm} (2.6)

Sharpe’s performance index compares portfolios to the capital market line (CML) rather than the security market line (SML) as suggested by the formula. Sharpe index, evaluates funds performance based on both rate of return and diversification (Sharpe, 1966 p 87). For a completely diversified portfolio Treynor and Sharpe indices would give identical rankings.

For the combined portfolio, the ratio is given by:

\[ S_p = \frac{R_p - R_f}{\sigma_{mp}} \]  \hspace{1cm} (2.7)

If the measure for the combined portfolio is greater than the measure for the market portfolio, then it follows that the active strategy would have beaten the passive strategy.

2.1.6.2.3. JENSEN’S ALPHA

(Jensen, 1968 p389-416) came up with the following formula based on realised rates of return; it also makes an assumption that CAPM is empirically valid:

\[ R_p = \alpha_p = R_f + \beta_p (E(R_m) - R_f) \]  \hspace{1cm} (2.8)

Where:

- \( R_p \) = Portfolio’s actual return during a specified time period
- \( R_f \) = Risk-free rate of return during the same period
\[ R_M = \text{Return of a market portfolio} \]
\[ \beta_P = \text{beta of the portfolio} \]
\[ \alpha_P = \text{Jensen’s alpha} \]

Subtracting \( R_f \) from both sides the formula below is obtained:
\[
R_i - R_f = \beta_i (R_m - R_f) + \epsilon_i.
\]

The equation indicates that risk premium earned on a portfolio is equal to the market risk premium times \( \beta_i \) plus a random error term. In this form, one would not expect an intercept for the regression equation, if all securities are in equilibrium. But if certain superior portfolio managers can persistently earn positive risk premiums on their portfolios, the error term \( \epsilon_i \) will always have a positive value. In such a case, according to Jensen, an intercept value which measures positive differences from the model must be included in the equation as follows;

\[
R_{jt} - R_f = \alpha_j + \beta_j (R_m - R_f) + \epsilon_i. \tag{2.9}
\]

Jensen uses \( \alpha_j \) as a performance measure. A superior portfolio manager would have a significant positive \( \alpha_j \) value because of the consistent positive residuals an inferior portfolio manager, on the other hand, would have a significant negative \( \alpha_j \). Average portfolio managers who have no forecasting ability but can still be considered to be inferior, would earn as much as one could expect on the basis of the CAPM.

Jensen’s performance measure, similar to Treynor’s criterion, will not make an analysis on the ability of fund managers to diversify as the risk premiums are calculated in terms of \( \beta \). When the value is positive, then the fund made excess returns. A positive value in the Jensen's alpha indicates that a fund manager has managed to beat the index based on his stock picking skills.

2.1.6.3 COEFFICIENT OF DETERMINATION

The coefficient of determination, \( R^2 \), is defined as the fraction of the total variation that is explained by the univariate regression between dependent variable \( y \) and independent variable \( x \).
Factor models are usually evaluated on the basis of their ability to explain the variance of returns that is; on the basis of their $R^2$. Specifically, the coefficient of determination is defined as:

\[
R^2 = \frac{\text{Explained variation}}{\text{Total variation}} = \frac{\text{Total variation} - \text{Unexplained variation}}{\text{Total variation}}
\]

\[
R^2 = 1 - \frac{\text{unexplained variation}}{\text{Total variation}} = 1 - \left(\frac{\sigma^2_\varepsilon}{\sigma^2_x}\right)
\]

(2.10)

Where;

$\sigma^2_x$ = the variance of $x$

$\sigma^2_y$ = the variance of $y$

$\sigma^2_\varepsilon$ = the unexplained or residual variance

The right hand side of this expression is one minus the proportion of variance ‘unexplained’ to the total variance of the fund return. Given the total returns of the funds and the estimated policy returns, the performance attribution can be examined using three different approaches.

### 2.1.7. ACTIVE AND PASSIVE STRATEGIES

According to the, (Vanguard Group 2010 p 2) ,once an investor has determined a policy allocation to stocks, bonds, and cash, this allocation can be implemented through a passive strategy which simply aims to mirror the returns of the stock, bond, and cash benchmarks that make up the policy allocation or through active management. An actively managed strategy attempts to exceed the expected return of the policy allocation through security selection and or market-timing.

According to (Collomb 2004 p102) the Gaussian modelling of stock price movements had a major impact on the asset management industry. It raised the question of whether active management was really possible or whether it was some kind of
charlatanism. Furthermore, in a brief sweep at the issues, the reasoning was the following: (i) if markets are efficient, they reflect instantaneously a lot of exogenous and unpredictable information, hence their price movements are unpredictable; (ii) if prices are unpredictable, at least in direction; there is little reason to believe an active manager is really adding value doing stock picking.

Collomb 2004 noted that there was a flurry of studies on the performance of portfolio managers to see if they were performing better than the market. This was a natural endeavour if one believed markets were unpredictable. Some of the few references in chronological order include the studies by Treynor, Sharpe and Jensen (Treynor 1965, Sharpe 1966, Jensen 1968, Jensen 1969), all written between 1965 and 1969.

Most of these studies underlined was that, net of management fees, active managers were on average doing no better than the market overall. It suddenly seemed that active management was more a matter of luck than real talent. Some argued that investors were just as well of investing in a general market index. This led several banks like Wells Fargo to pioneer the development and marketing of index funds to their clients as early as 1971 (Bernstein 2003 p 76).

2.1.7.1 ECONOMIC PREDICTABILITY AND RANDOM RETURNS

(Collomb 2004 p104) noted that, a major argument used by fundamentalists is that the economic reality of a business is usually changing at a slow pace. It should therefore be reasonable to expect some predictability (whether medium-term or long-term) in the associated financial returns. He used an example of valuing a stock using a discounted cash flow (“DCF”) analysis of its future dividends. It is often the case that a firm’s dividend policy is predictable a few months or years in advance, usually displaying some serial correlation. Similarly, usually the operational accounting metrics used display some serial correlation. Hence it is not a priori unreasonable that there could be serial correlation in the company valuation itself if we believe there should be a certain correspondence between a company’s operational results and its stock price (all the more if we make the simplifying assumption that the company has no debt).
(Baird 2010 p3) highlighted that, this debate is again to be understood within the concept of market efficiency and the translation of economic realities (the state of a company's business) into financial information and prices. (Fama 1965, p 65) stated then that “in essence, there is as yet no general model of price formation in the stock market which explains price levels and distributions of price changes in terms of behaviour of more basic economic variables. Developing and testing such a model would contribute greatly toward establishing sound theoretical foundations in this area”.

**2.1.7.2 THE EFFICIENT MARKET CONCEPT**

According to (Fama 1970 p45) the efficient market hypothesis (EMH) says that at any given time, asset prices fully and quickly reflect all available information as informed investors compete aggressively to exploit available information. This eliminates opportunities to profit from mispriced securities. This is based on the idea that price movements do not follow any pattern or trend, prices respond to new information. This means that prices cannot be used to predict future price movements. This hypothesis can take any of the following forms:

1. **Weak-Form Efficiency**: The information set includes only the history of prices or returns themselves.

2. **Semistrong-Form Efficiency**: asserts that security prices adjust rapidly to the release of all public information; that is, current security prices fully reflect all public information (public information).

Strong-Form Efficiency: contends that stock prices fully reflect all information, public and private. This implies that no group of investors has access to private information that will allow them to consistently experience above-average profits. This extremely rigid hypothesis requires not only that stock prices must adjust rapidly to new public information but also that no group has access to private information.
2.1.7.3 ACTIVE INVESTMENT STRATEGY

According to (Americh et al 2012 p 8) an active manager will seek to outperform an index by achieving a higher return, taking lower risk or combining these two techniques. They noted that since active fund managers choose investments, they have the potential to outperform the market on the upside and limit losses when the market declines, relative to the index. Active management offers the advantage of expert analysis backed by research and experience. This means the expense ratio is generally greater, which impacts net returns. It also means there is a potential for net returns that outpace the market. However, there is no guarantee that actively managed funds will outperform their index.

(Elton et al 1996 p 133-157) demonstrated convincingly that a portfolio can be formed to persistently outperform passive strategies by employing Modern Portfolio Theory. (Hagstrom 2005 p 166) noted that renowned investor Buffett does not believe in Modern Portfolio Theory (MTP), he has managed to construct portfolios that have consistently beat the market in all environments.

Using modern portfolio techniques and four-index model (Elton et al 1996 p135) found out that active management and expenses partially account for the differences in performance together. On the other hand, past performance is found to be a good predictor of future performance both in the short and in the long run even after excluding the high expense-funds from the sample. Despite, utilising modern portfolio theory to form optimal portfolios based on past information results in a selection of portfolios which generate superior returns as opposed to a portfolio with an equal amount in each fund. In this respect, they concluded that a portfolio can be formed to persistently beat the passive portfolios. (Melih 2011 p 187) noted that the majority of the related studies provide contrary evidence that passive strategies outperform active strategies. He highlighted that there seem to be only two studies, Glode (2009 p 33) and Swinkels and Rzezniczak (2009 p 36) that defend the findings of Elton et al. (1996) by concluding that active investing outperforms passive strategies.
Researchers like Fama and French (2009b) noted that equilibrium accounting applies for any specified market, performance within that market is a zero-sum game before costs, and that any excessive outperformance of a group of active investors comes from worse than expected performance of another subset of investors. Similarly, inefficient or more volatile markets provide opportunities; however, picking the wrong manager hurts more than in more efficient markets (iShares, 2009).

(Fabozzi et al 2010 p 25) concluded that active management does not add value in developed efficient markets (at least in some parts, such as large cap), but active management does add value in inefficient or emerging markets. He noted that faith in the ability of asset managers to consistently add value in the aftermath of the Global financial crisis has been shaken. Many investors have concluded that active management actually destroys value. To the extent that investors can accept market returns, many are putting more assets under passive management.

2.1.7.3 PASSIVE INVESTMENT STRATEGY

(Arnerich et al 2012 p 8) noted that the manager of a passive fund will seek to achieve the return of a particular index, before expenses nothing more, nothing less. Typically, passive funds own most of the same securities, and in the same weightings, as their respective indexes. Passive fund managers make no “active” decisions, potentially resulting in less trading which reduces fund expenses as well as potential taxable distributions to shareholders. The performance of a passive fund should mirror the index it’s tracking, which means the fund will share both the ups and downs of the index.

According to (Solnik and McLeavey 2003 p 688), there are four methods that can be used in constructing a passive portfolio, full replication, sampling, quadratic optimisation and synthetic. Full replication involves purchasing all the securities in the index proportion to their weights in the index. This technique ensures close tracking but may be suboptimal they noted. Since this involves buying many securities which could result in higher transaction cost hence managers can use sampling. Sampling involves buying a representative sample of the stocks in the index. Large cap securities can be bought in proportion to their weights while the
smaller cap securities are purchased so that their aggregate characteristics approximate the underlying benchmark. The major drawback for this technique is that the returns from such a portfolio will not track the returns from the benchmark index due to tracking error. On the other hand, quadratic optimisation or programming involves the use of historical data to determine the composition of the portfolio that will minimise tracking error.

In a synthetic replication a stock index can be replicated using a futures contract on the index plus a cash position. The fair pricing of the futures ensures that the index is closely tracked and that transaction costs are low. They noted that for some investors, legal aspects regarding the use of derivatives constrain the implementation of this approach on a global scale. (Solnik and McLeavey 2003 p 289) also highlighted that the other problem is that futures contracts tend to be written on indexes based on a subset of the bond market, while natural market benchmarks are broadly based indexes, stocks and swaps are also used.

(Fabozzi et al 2010p 10) noted that even if a given asset manager can produce a positive portfolio alpha, the magnitude of the alpha is much smaller than the magnitude of returns that can be ascribed to market swings. He considered the swings in value from market highs at the beginning of 2007 to year-end 2009. During this brief span, the S&P 500 Index lost more than half of its value by March 2009 and finished 2009 at around only 65 percent from the March low he noted. It was highlighted that no alpha can compensate for these movements. The period of 2007–2009 was more volatile than usual, but in just over 20 years, there have been at least five periods (1987, 1994, 1997–1998, 2000–2002, and 2007–2009) during which market valuations experienced large swings. Market swings are much larger than the (eventually) few percentage points above a benchmark that an investor can hope to gain from active management.
2.1.7.4 THE FUTURE OF ASSET ALLOCATION

(Lummer and Riepe 2004 P9) noted that the goals and importance of asset allocation will not change, but the mechanisms by which investors seek to achieve those goals will be new. The goal of the asset allocation decision, was, is, and will be to select a combination of assets that will generate a return sufficiently high and safe so as to offset some future liability. It is also safe to say that asset allocation decisions will have a continuing large role in explaining portfolio returns. The mechanisms of implementing the asset allocation decision will be quite different.
2.2. EMPIRICAL LITERATURE

According to (CFA Institute 2012 p1) asset allocation dependent upon the assertion that different asset classes’ gives returns which will not perfectly correlate and portfolio diversification helps in optimising risk-adjusted returns. They noted that the topic on asset allocation was largely unexplored until 1986, when (BHB) sought to explain the importance of asset allocation policy on pension funds returns. In their seminal paper, “Determinants of Portfolio Performance”, BHB noted that asset allocation is the primary determinant of a portfolio’s return variability, with security selection and active management playing minor roles. BHB’s 1986 study focused on the quarterly returns of 91 large U.S. pension funds over a 10 year period, by comparing the returns to those of an index with the same average asset allocation. They used time-series regression and it yielded an average R-squared of 93.6 percent, this led BHB to come to a conclusion that asset allocation is responsible for 93.6 percent of the variation in a portfolio’s quarterly returns.

In the investment management industry, it is commonly accepted that an investor’s initial strategic asset allocation decision is the most important determinant of the portfolio’s investment performance (Brinson et al., 1986, 1991; Bogle, 1994). Asset allocation is the most important factor determining fund performance. According to Brinson, Singer and Beebower (1991), asset allocation can determine at least 90 percent of variability in returns across time for a typical fund. Extending their findings, Ibbotson and Kaplan (2000 p 4) noted asset allocation policy explaining approximately 40 percent of variation in returns among funds and even 100 percent of return levels on average.

According to (Ibbotson 2010 p 4), since the year 2000 several authors have revisited the Brinson study, updating or challenging it. Some researchers have confirmed the study’s conclusions. Others have criticised the study or, more accurately, its interpretation by the investment industry and raised doubts about its applicability to general investors.

In their seminal studies, Brinson, Hood, and Beebower (BHB) (1986) and (BHB) (1991) document the overwhelming contribution of asset allocation to the return
performance of a sample of pension funds. The BHB work divided portfolio returns into two components: asset allocation and active management (Ibbotson and Kaplan 2000 p3).

(Idzorek 2010 p 2) noted that the influential study, “Determinants of Portfolio Performance,” by BHB, found that asset allocation policy mix explains 93.6% of the average pension funds’ return variation over time. In turn, it found active management accounted for the rest of the variation, less than 7%. That study, however, has been widely misinterpreted among investment professionals since it was published. Many investment professionals misinterpret the results to mean a fund’s return level comes almost all from asset allocation policy, noted Idzorek.

(Ibbotson 2000 p 3) had also noted that this conclusion has caused a great deal of confusion in both the academic and financial communities. He highlighted that in a survey by Nuttall and Nuttall (1998), out of 50 writers who quoted Brinson, only one quoted him correctly. Approximately 37 writers misinterpreted Brinson’s work as an answer to the question, “What percent of total return is explained by asset allocation policy?” and five writers misconstrued the Brinson conclusion as answer to the question, “What is the impact of choosing one asset allocation over another?”

**2.2.1. CRITISISM OF BHB STUDIES**

(Hansel et al 1991 p 23) argued that the Brinson results were not informative because bull and bear markets explain most of the variation in returns. In other words, “a rising tide raises all boats.” William Jahnke (1997 p 18), however, asserted that the Brinson results were irrelevant because Brinson did not ask the right question. Jahnke believed that a more appropriate question would be one that probed the difference in returns between funds. Stevens, Surz, and Wimer (1999 p23) also argued that Brinson was asking the wrong question, but they felt the most relevant question pertains to the relationship between asset allocation and returns, not volatility.

Using time-series regressions of fund returns on benchmark returns, Brinson, Singer, and Beebower (1991) showed that asset allocation explains, on average, 91.5 percent of the variation in quarterly total fund returns. In other words, they concluded
that total fund returns are largely unrelated to the level of active management. The more than 90 percent of the variability of a portfolio’s performance over time is due to asset allocation. Brinson et al were measuring the relationship between the movement of a portfolio and the movement of the overall market. He found that more than 90 (as measured by the $R^2$) percent of the movement of one’s portfolio from quarter to quarter is due to market movement of the asset classes in which the portfolio is invested, (Kaplan, 2010 p1).

Unfortunately, their time-series results were not very sensitive to each fund’s asset allocation policy because most of the high $R^2$ came from aggregate market movement. Ibbotson and Kaplan (2000) and Hensel, Ezra, and Ilkiw (HEI 1991) pointed out that most of the variation in a typical fund’s return comes from market movement. The funds differ by asset allocation, but almost all of them participated in the general market instead of just holding cash,(Kaplan, 2010 p2).

It was noted however by (Kaplan, 2010 p3) that many investors mistakenly believed that the BHB (1986) result (that asset allocation policy explains more than 90 percent of performance) applies to the return level (the 100 percent answer). BHB, however, wrote only about the variation of returns, so they likely never encouraged this misrepresentation.

(Xiong et al, 2010 p 28) noted that the keyword from these findings is variation. Unfortunately, the over “90 percent” has been widely misinterpreted. Many practitioners incorrectly believed the number means that 90 percent of a fund’s return level comes from a fund’s asset allocation policy. This is not true; the truth is that in aggregate 100 percent of portfolio return levels comes from asset-allocation policy he highlighted.

2.2.2. RETURN ‘LEVELS’ VERSUS RETURN ‘VARIATIONS’
According to (Ibbotson 2010 p 4) the BHB studies on the importance of asset allocation has resulted in a 25-year debate, which unfortunately is the source of arguably the most prolific misunderstanding among investment professionals. They made a regression analysis on the time series returns of each fund on a weighted combination of indexes reflecting each fund’s asset-allocation policy. In one of the many studies that BHB carried out, they noted that asset allocation policy explained 93.6 percent of the average funds’ return variation over time (as measured by the R-squared of the regression).

(Idzorek, 2010 p27) highlighted that it is imperative to distinguish between return levels and return variations. He noted that in most cases, investors are concerned far more about return levels than with return variation. The famous 90 percent number does not mention concerning return levels, despite many fund managers mistakenly believe. He also noted that it is common to have a high R-squared, indicating that the return variations in the asset-class factors managed to explain the return variations of the fund under study, and realise that the weighted-average composite asset-allocation policy benchmark showing rather a different return level than the fund under study. This was mainly the case in BHB’s study Idzorek noted. Despite of the high average 90 percent R-squared of their 91 separate time-series regressions, in BHB study the average geometric annualized return of the 91 funds in their sample was 9.01percent versus 10.11percent for the corresponding policy portfolios. This is proof that asset allocation explains more 100 percent of a fund returns level.

(Idzorek, 2010 p 29) noted that even though 90 percent is the number which every practitioner remembers 112 percent (10.11percent divided by 9.01percent) of return levels in BHB sample was as result of asset-allocation policy. He concluded that, when it comes to portfolio returns levels, asset allocation has higher explanatory power over the other factors. In total at least 100 percent of return levels are as a result of asset allocation. This is a mathematical truth that stems from the concept of an all-inclusive market portfolio and the fact that active management is a zero-sum game. This fundamental truth is somewhat boring; therefore, it is often lost in the debate, even though it is by far the most important result he noted.
Ibbotson and Kaplan, 2000 p 26) presented a cross sectional regression on annualized cumulative returns across a large universe of balanced funds over a 10-year period and found that about 40 percent of the variation of returns across funds was explained by policy. (Vardharaj and Fabozzi, 2007 p59-07) applied Ibbotson and Kaplan methodology by using similar techniques for equity funds and found that the R squared were time-period sensitive and that approximately 33 percent to 75 percent of the variance in fund returns across funds was attributable to differences in asset allocation policy. (Xiong, et al 2010 p4), demonstrated, the actual percentage of the variation of returns among funds that is explained by policy is sample specific.

(Kaplan, 2010 p1) highlighted that it is not necessarily 40 percent, as in Ibbotson and Kaplan (2000), but has been measured across a wide range of values. He noted that these answers are empirical observations specific to the individual funds, the time period analyzed, and the method of estimation. For any given portfolio, the importance of asset allocation policy (the passive return) versus the active return (timing, security selection, and fees) depends on the preferences of the fund manager. For a long-only passive index product, asset allocation policy dominates both portfolio return levels and variation.

2.2.3. IMPORTANCE OF ASSET ALLOCATION ON RETURN LEVELS

In trying to determine the importance of asset allocation (Idzorek, 2010 p 29) came up with a question, ‘what causes certain funds to underperform and others to over perform in a particular peer group and over a time period?’ He noted that in contrast with the “100 percent number” that stems from a mathematical identity, the answer to this question is as a result of practical studies.

In trying to ascertain the role of asset allocation among portfolio funds many have used cross-sectional regression rather than a time-series regression. (Ibbotson and Kaplan, 2000p1-8) noted that, the “40%” number comes from a cross-sectional regression, the “90%” comes from a time-series regression, and the “100%” comes from the ratio of realized policy return to fund return. In another article, (Vardharaj and Fabozzi, 2007 p 59-70) performed a series of cross-sectional regressions in which the ensuing $R^2$s varied widely.
(Idzorek, 2010 p 29) noted that historically, the cross-sectional regressions have been usually performed on total returns; because of this, some may have mistakenly interpreted the R-squared figure as a representation of the overall importance of asset allocation in a portfolio. This was also confirmed by (Xiong, et al 2010 p 2). They showed that, a cross-sectional regression performed on total returns is equivalent to that performed on “market-excess” returns. This they highlighted that it is because the cross-sectional regression procedure will naturally remove the common “market” return that is found in the peer group of fund returns under study.

(Idzorek, 2010p 29) concluded that in total, at least 100 percent of return levels are as a result of asset allocation. Mostly return variations are dominated by the common market factor embedded within the funds being which are being studied. When the common market factor is removed, on average for typical funds, almost half of the return variations come from detailed asset-allocation decisions in excess of the market movement and about half of the return variations come from active management, however this result is not constant it changes from over different periods. For aggregate return levels, asset allocation is the most dominant factor.

The findings by Idzorek 2010 confirm the findings by Ibbotson 2000. (Ibbotson 2000p 6) divided the compound annualized asset allocation policy return by the compound annualized portfolio return over a given time period. He created a portfolio of benchmark asset classes that matches a balanced fund’s asset allocation policy. After creating the portfolio he then, divided the return of the benchmark portfolio by the fund’s return. He found out that, on average, the policy benchmarks match the actual portfolios, so the ratio is 1.0, or 100 percent. Policy benchmarks match the actual portfolios because, if one averages the universe of funds, one gets the index on average, active management does not provide a return greater than the index. So, about 100 percent of the return amount is explained by asset allocation policy.

In their study, (Ibbotson and Kaplan 2000 p 2) looked at the impact of asset allocation policy on balanced mutual funds and pension funds. They extrapolated their findings for the long-term individual investor who maintains a consistent asset allocation and leans toward index funds. They found out that asset allocation
determines about 100 percent of performance regardless of whether one is measuring return variability across time, return variation between funds, or return amount.

Consistently these findings were confirmed by (Ibbotson, 2010p 26) using data from pension and balanced mutual funds, they concluded that 90 percent of the variability in returns of a typical fund across time is explained by policy, about 40 percent of the variation of returns among funds is explained by policy, and on average about 100 percent of the return level is explained by the policy return level.

(Fabozzi et al 2010 p 10) highlighted that it is time to put asset allocation back on top. They noted that almost 20 years after Brinson, Singer, and Beebower’s (1991) influential paper on the importance of investment policy in explaining, on average, more than 90 percent of the variation of returns over time, along with the period of 2007–2009 in which investors’ wealth was affected by fundamental asset allocation decisions, most investors are in agreement about the predominant role of asset allocation in protecting investments and delivering returns. They further highlighted that there is now a greater understanding on the part of institutional investors that asset allocation is the issue rather than active management.

Fabozzi et al 2010 further highlighted that investors have must realise that changing the manager of, say, European equities from manager A to manager B which might be painful and costly is not so important. But the big calls are what matter for example, a move from emerging markets to commodities or from bonds to real estate. Asset allocation is what makes the difference. Asset allocation will clearly be a significant driver of returns in the future.

According to (Ibbotson 2010 p1) asset allocation policy gives us the passive return (beta return), and the remainder of the return is the active return (alpha or excess return). The alpha sums to zero across all portfolios (before costs) because on average, managers do not beat the market. In aggregate, the gross active return is zero. Therefore, on average, the passive asset allocation policy determines 100 percent of the return before costs and somewhat more than 100 percent of the return
after costs. The 100 percent answer pertains to the all-inclusive market portfolio and is a mathematical identity at the aggregate level.

Ibbotson and Kaplan 2000 concluded that asset allocation ultimately accounts for all of the absolute level of performance of the portfolios they studied on average. They highlighted that the average fund performs slightly below the level one would expect for its asset allocation. This is because the average of all investors is the market itself, so the good managers and the bad tend to cancel each other out before expenses are considered. Since expenses do not net out across investors, the average return in a portfolio is pushed below the average return for the market.

2.2.4. EFFECT OF MARKET MOVEMENT ON PORTFOLIO RETURN VARIATION

The decision to be invested in risky assets that is; equities referred to as market movements. A market movement dominates asset allocation as well as active management, according to (Ibbotson Associates Inc 2010 p 2). (Idzorek 2010 p 2) noted that the market movement factor (represents) how much an investor want in equities. That is the most important decision an investor will ever make, how much they want to participate in the (equity) market and that decision will determine their return level over time. In 1991 BHB updated their earlier study that examined returns for a 10 year period and found a return variance of 91.5 percent, which essentially confirmed the results of their original study.

Ibbotson and Kaplan (2000 p 4) and Hensel, Ezra, and Ilkiw (HEI 1991 p 5) pointed out that most of the variation in a typical fund’s return comes from market movement. The funds differ by asset allocation, but almost all of them participate in the general market instead of just holding cash.

(Idzorek 2010 p 2) noted that the pioneering work of BHB (1986) (1991) and many others which followed divided returns into two components: asset allocation and active management. He highlighted that the BHB studies did not break out market movements but included it in the asset allocation component. He explained that the market was causing most of the variations in returns. Xiong et al. (2010) showed that a portfolio’s total return (net of all expenses and fees) can be decomposed into 3
components: (1) the market return, (2) the asset allocation policy returns in excess of the market, and (3) the return from active portfolio management (market timing, security selection, and fees). This recent work has shed a totally different light on previous analyses they noted.

According to (BHB, 1986 p43), more than 90 percent of variability of a portfolio’s performance over time is due to asset allocation. Brinson according to (Ibbotson, 2000 p4) is measuring the relationship between the movement of a portfolio and the movement of the overall market. It was noted by Ibbotson that, Brinson found out that more than 90 percent of the movement of one’s portfolio from quarter to quarter is due to market movement of the asset classes in which the portfolio is invested.

(Idzorek, 2010 p 3) noted that the study however, has been widely misinterpreted among investment professionals since it was published. Many investment professionals misinterpret the results to mean a fund’s return level comes almost all from asset allocation policy.

(Idzorek, 2010 p30) noted that the “90 percent” number is based on time-series regression on total returns, (Ibbotson and Kaplan, 2000 p 4) pointed out that, importantly the “90 percent” in return variations comes from the market’s overall movement, with small amount coming from the return variations from the granular asset-allocation decisions. The point was also further amplified by (Xiong et al 2010 p3), who highlighted that the “90 percent” number is a result of a time-series regression, typically on multiple asset-class factors.

(Hensel, Ezra, and Ilkiw 1991 p 65-72) and (Ibbotson and Kaplan 2000p 5) showed that market movement dominates time-series regressions on total returns. They identified the applicable market return, asset-allocation policy return in excess of the market return, and the return from active portfolio management. They realised that taken together, market return and asset-allocation return in excess of market return will dominate active portfolio management in most cases. This is consistent with the affirmation that market return plus asset-allocation return in excess of market return are the dominant determinants of return variations in an investment portfolio.
Consistent with Idzorek 2010 the (Vanguard group 2010 p6) noted that the BHB work divided returns into two components; asset allocation and active management. In this study they recognised that market movements dominate variation in return. They noted that Brinson study did not break out market movements, but included it in the asset allocation component. Their study breaks out market movements and recognises that market movements were causing most of the variations in returns.

As a result of splitting out the market movement component, “we were able to pinpoint the source of the (variations) over time,” (Idzorek 2010 p5) indicated. He added that this finding confirms the widely held belief that market return and asset allocation policy return in excess of market return are collectively the dominant determinant of total return variations, but it clarifies the contribution of each.

These findings are consistent with the results of a study by (Ibbotson and Kaplan 2000 p 6), they pointed out that the explanation in the variation in return is dominated by market movements embedded in the total returns. They noted that the BHB studies were focused only on the variability (risk) of returns and not on return levels or relative performance of a portfolio. Using 10 years of monthly returns for 94 balanced mutual funds and 10 years of quarterly returns for 58 pension funds and confirmed the BHB results, noting that asset allocation indeed explain about 90 percent of the period-to-period variability of a portfolio.

Ibbotson and Kaplan 2000 also in another study extended BHB research to consider asset allocations impact on the variation of returns among funds and the level of a typical fund's return. They clarified that merely 40 percent of return variation between funds is due to asset allocation, with the remainder being due to other factors, such as asset-class timing, the style within asset classes, security selection, and fees among others. They also highlighted that since the average of all investors is the market itself, with good managers and bad ones cancelling each other out, Ibbotson and Kaplan concluded (as BHB implied) that asset allocation will ultimately accounts for 100 percent of all the return levels.
Ibbotson (2010 p5) highlighted that only if we count (market movement) as part of asset allocation policy would (BHB) give us the appropriate answer. When it comes to active management, finding managers who can add alpha over the long term is hard to do, he said. Active management in general has not beaten the market in the long run. Outperforming the market is tough. There is very little evidence of persistence in performance of active managers.

This result is consistent with findings of (Evensky and Pfeiffer 2010 p 22) who noted that, active portfolio management subtracts value, on average, from the investor in expansions and recessions. Net of fees, investors lose roughly 1 to 2 percent per year. Any outperformance decays over subsequent business cycles where the return of all prior rank categories converges to a negative mean monthly alpha of 10 to 15 basis points.

Xiong et al (2010) studied returns for more than 5,000 mutual funds in the US in order to ascertain the importance of asset allocation policy versus active portfolio management. As a result of using cross-sectional regressions, they decomposed a portfolio’s return into its three components which are the market return, the asset allocation policy return in excess of the market return, and the return from active management. They noted that BHB did not separate the market returns from the incremental impact of asset allocation policy, they concluded that as follows: The bulk of a fund’s variation in time-series returns comes from general market movement, with the remainder split almost evenly between the specific asset allocation and active management.

2.2.5. EQUAL IMPORTANCE OF ASSET ALLOCATION AND ACTIVE MANAGEMENT ON RETURN VARIATION

In a study by (Xiong et al 2010 p1), they analysed both cross sectional and time series regressions by decomposing portfolio total returns into three components; (1) the market return, (2) the asset allocation policy return in excess of the market return, and (3) the return from active portfolio management. Their method is similar to suggestions put forward by (Solnik and McLeavey 2003 p 102).
They used three portfolio peer groups from the Morningstar U.S. mutual fund database, U.S. equity funds, balanced funds, and international equity funds. They used 10 years of return data (May 1999 - April 2009). Xiong et al used a sample of 4,641 U.S. equity funds, 587 balanced funds, and 400 international equity funds (Xiong et al 2010 p 2) highlighted that, usually cross-sectional regressions will naturally remove market movements therefore; cross-sectional results found in most literature are equivalent to analysis of excess market returns even though the regressions were performed on total returns. On the other hand, time-series analysis of total returns does not naturally remove market movements. Most importantly time-series analysis of excess market returns and cross-sectional analysis of either total or excess market returns, gives similar results. It was concluded by (Xiong et al, 2010 p 6) that after the removal of market movements asset allocation and active management are equally important in determining portfolio return differences within a universe of funds.

They noted that, excess market asset allocation policy and active portfolio management have about an equal amount of explanatory power after removing the applicable market effect. For the U.S. equity funds, asset allocation policy excess market return accounts for 48 percent of the excess market return variations for the average equity funds; active portfolio management accounts for 41 percent. The residual 11 percent is a result of the interaction effect. For the balanced funds, policy excess market return and active portfolio management account for 36 percent and 39 percent of the excess market return variations, respectively.

These findings are consistent with (Idzorek 2010 p 4) who highlighted that asset allocation, on average “drives 100 percent of the level of aggregate returns,” which is a number determined by another study and confirming somewhat the misinterpretation, asserting that asset allocation accounts for about 90 percent of the level” of return. Asset allocation beyond market movements into other classes and subclasses just like active management explains only 12.5 percent of the variation in performance, he noted.
(Ibbotson 2010p 3) concluded that in general (after adjusting for interaction effects), a significant portion of a portfolio's variation in time-series returns comes from general market movement, with the remaining portion split roughly proportionately between the specific asset allocation policy and active portfolio management.

2.2.6. WHY RESULTS MAY VARY

(Idzorek, 2010p 30), tried to answer questions on some investors' minds regarding variability like: What portion of the variation in fund return differences is attributable to fund asset allocation policy differences? Or why does Why does one's return differ from one's colleagues return? He highlighted that based on the “40%” number which is associated with cross-sectional analysis, he pinpointed that dramatic changes over time in cross-sectional fund return dispersion explain why different researchers may get very different cross-sectional results. He also noted that most researchers have simply run one cross-sectional regression and present the corresponding regression results, rather than a series of cross-sectional regressions results. More specifically, cross-sectional fund dispersion variability is the primary cause of the period-by-period cross-sectional $R^2$ variability.

(Idzorek 2010 p 6) further highlighted that, many in the academia and fund managers base their analysis on one cross-sectional regression and present the corresponding regression results, instead of a series of cross-sectional regression results. He further noted that, as a result of performing a time-series analysis on excess-market returns, he matched time-series regression analysis and cross-sectional regression analysis. The $R^2$s from a time-series regression on excess-market returns and cross-sectional regression on either type of return (total or excess-market) will give similar corresponding results. After making the necessary adjustments on the overall movement of the market, detailed asset-allocation decisions and active management gives an almost equal important result, which however vary considerably significantly with time.
2.2.7 TIME SERIES AND CROSS SECTIONAL REGRESSIONS

(Xiong et al p1) noted that some considerable confusion surrounds both time-series and cross-sectional regressions in determining the importance of asset allocation. Cross-sectional regressions will naturally remove market movements which means, the cross-sectional results in prior literature are equivalent to analyses of excess market returns even though the regressions were performed on total returns. On the other hand, time-series analyses of total returns do not naturally remove market movements. In most cases the time-series analysis of excess market returns and cross-sectional analyses of either total or excess market returns, will give similar answers.

2.2.8. TIME SERIES REGRESSION

It was noted by (Xiong et al 2010 p 3) that, in previous time series studies, total returns were used in the following regression formula to estimate the explanatory power of asset allocation policy. The two regression variables are fund total return;

\[ (R_{it}) = b_0 + b_1 (P_{it}) + \varepsilon_{i,t} \quad (2.1) \]

\((R_{i,t})\) and policy total return \((P_{i,t})\), \(b_0\) and \(b_1\) are the regression coefficients, and \(\varepsilon_{i,t}\) is the residual return (the difference between the realized fund return and the predicted fund return).

He highlighted that one problem with the time-series analysis of total returns is that the results are dominated by overall market movement. To further analyse the relative importance of asset allocation policy and active management within a peer group, a more applicable approach is to use excess market returns instead of total returns as the regression variables for the time series. Thus, the regression equation for excess market returns is:

\[ R_{i,t} - M_t = b_0 + b_1 (P_{i,t} - M_t) + \varepsilon_{i,t}. \quad (2.2) \]
When carrying out a time-series analysis of excess market return, Equation 2.1 is very different from Equation 2.2 because the market return ($Mt$) varies over time. They referred to Equation 2.2 as the “excess market return time-series regression”.

### 2.2.9. CROSSECTIONAL REGRESSION

(Idzorek 2010 p 3) highlighted that, unlike time series regressions in which the results are highly dependent on the type of return used (total return or excess market return); cross-sectional regressions on total returns are equivalent to cross-sectional regressions on excess market returns. Cross-sectional regressions naturally remove the applicable market movement from the peer group, essentially resulting in the same analysis as using excess market returns. Technically, the intercept of the regression is different, but the remaining regression coefficients and $R^2$ are the same. Consistent with Idzorek 2010 (Xiong et al 2010 p4) noted that, cross-sectional regressions naturally remove the applicable market movement from the peer group, essentially resulting in the same analysis as using excess market returns. They reiterated this point because in most studies on this topic, researchers performed cross-sectional regressions on total returns and failed to recognise the natural removal of the applicable market movement. This key observation was also made by (Solnik and Roulet 2000 p 35) who stated that, the cross-sectional method looks at relative returns. In this context, the relative return is the excess market return.

(Xiong et al 2010 p 4) noted that, for single-period cross-sectional regressions; Equation 2.1 is intrinsically identical to Equation 2.2 because the market return ($Mt$) is a constant in the single period (no matter how long the period is) that is inherent in a cross-sectional regression. This point is critical in correctly interpreting the cross-sectional regression results. Since the market movement is naturally removed during the cross-sectional analysis, the resulting $R^2$ is an indication of the relative importance of detailed asset allocation versus active management after removing market movement. Furthermore, because the market movement is naturally removed in the cross-sectional analysis, to interpret the typical low $R^2$ from a cross-sectional analysis as a statement regarding the overall or total importance of asset allocation or as a basis for deciding how much market exposure to take is incorrect.
(Idzorek 2010 p 1) noted that the decision on how much market movement you want to participate in is the big decision of plan sponsors or other investors. That is the most important decision an investor will ever make, how much they want to participate in the (equity) market and that decision will determine their return level over time.

2.6. CONCEPTUAL FRAMEWORK

Many studies and researches on the importance of asset allocation, since the pioneering work by Brinson et al in 1986, 1991; followed by Bogle 1994; Ibbotson and Kaplan 2000 using data on US mutual and pension funds, and Blake et al. (1999), using data on U.K. pension funds, also Drobetz and Kohler 2002 using German and Swiss balanced mutual funds concluded that asset allocation decisions are the major determinant of return variation over time. Studies by Idzorek (2010), Ibbotson 2010, Xiong et al 2010 found out that, while asset allocation decisions are the major determinant of return levels over time, they are considerably less important in explaining return variations.
It is important to note that these studies mainly focused on US and UK markets. Since such studies are an empirical study that is, highly dependent on the fund, the peer group, and the period being analysed. This study focused on the question of the importance of asset allocation relative to active management and market movement on the performance of Zimbabwean pension fund portfolios, unit trust funds and on individual investors’ portfolios. As a result of splitting out the market movement component, this study will be able to pinpoint (better) the source of the variations over time.

This study focuses on a smaller market which could be less efficient than markets already considered in literature. As far as the researcher knows, no studies have so far addressed similar issues for pension funds, unit trusts and individual investor portfolios in a developing country, taking market movements into account.

2.7. CHAPTER SUMMARY

The chapter focused on the theoretical and empirical studies which highlighted the importance of asset allocation. Most prior studies noted the importance of asset allocation but they differed somewhat in answering the how question. When determining return variability most studies, decomposed portfolio returns into two parts asset allocation and active management. Using this analysis market movement was taken as part of asset allocation. This led to many different conclusions on the importance of asset allocation. Some confusion also surrounded the interpretation of the BHB results, many researchers interpreted return levels to mean return variation leading to long run confusion in many studies. The use of time series and cross
sectional regressions in trying to determine the impact of asset allocation on a portfolio created some confusion some failed to notice that cross sectional regressions naturally removes market movements. Studies in 2010 by Idzorek showed that in aggregate, 100 percent of return levels come from asset allocation. In the same year Xiong et al highlighted that return variations are dominated by the common market factor embedded in the funds being analysed. After removing this common market factor, on average for typical funds asset allocation and active portfolio management play an equal role in excess of the market movement. Most of the variation in time-series returns for a typical fund comes from general market movement. Many researchers concurred that after establishing the asset allocation policy investment portfolios must be passively managed.

The next chapter takes a look at the methodology of the study, the research design, sampling frame, research procedure, data collection and analysis.

CHAPTER 3

RESEARCH METHODOLOGY

3.0. INTRODUCTION

According to, (De Wet, 1997 p10), one of the important parts of a research activity is developing an effective research design. This will satisfy the most suitable methods of investigation, the nature of the research instruments, the sampling plan and the types of data that is quantitative. This section gives an introductory discussion on the research methodology and design strategy used in the study and focuses on the
research design, research method, research format, research technique, the population, sampling procedure, sampling type, sampling technique and data analysis which are applicable to this study.

This study focused on the importance of asset allocation relative active portfolio management and market movement on portfolio performance in Zimbabwe. The main objective of the study was to determine the actual contribution that is attributable to asset allocation, active management and market movement in explaining portfolio performance.

3.1. RESEARCH DESIGN

Research design is a roadmap for conducting the study. It sets the direction which the researcher will follow for him to achieve the main objective and study questions. It can be viewed as the master plan that spells out methods and procedures to be followed when collecting and analysing the required data. As a framework it is developed to meet specific problems and opportunities, (Tustin et al 2005 p82).

This research has an ex post facto design meaning that historical data about the performance of portfolios that could not be manipulated by the researcher was used in the study. The study can be categorised as longitudinal, as the performance of the funds was analysed over an extended period (from 2009-2012). The study can also be described as correlational since it is trying to establish the relationship between portfolio performance and asset allocation, active management and market movement.

This research is an empirical investigation based on; secondary data collected from the Institute of Investment Managers of Zimbabwe, Aon Zimbabwe, and Marsh Employee benefits. The period under examination is from 2009 up until 2012, when Zimbabwe was coming out from a period of hyperinflation and had just adopted the multicurrency system to replace the Zimbabwean dollar. This was a unique period as Zimbabwe had no currency of its own, meaning reduced functions of the Reserve Bank of Zimbabwe (RBZ). The bank was rendered more of a regulatory entity rather
than monetary controller. Therefore, it was interesting to examine the importance of asset allocation in such an environment and make credible analysis to establish actual impact of policy in the performance of portfolios, and therefore, a quantitative study was suitable for this research.

The population of interest in this study was defined as all 330 pension funds, 36 unit trust funds and 600 individual investment portfolios managed by asset management companies in Zimbabwe. During the period of the study there were 16 operating asset management companies in Zimbabwe. This study applied the probability sampling method. The sample was randomly selected from the population of all investment portfolios managed by asset management companies in Zimbabwe.

A time series analysis on total returns was used in the following general regression formula to estimate the explanatory power of asset allocation policy.

\[ R_{i,t} = \theta_0 + \theta_1 P_{i,t} + \epsilon_{i,t} \quad (3.1) \]

Unlike in time series regressions, in which the results are highly dependent on the type of return used (total return or excess market return), cross-sectional regressions were also used on total returns which are equivalent to cross sectional regressions on excess market returns. Cross-sectional regressions naturally remove the applicable market movement from the peer group, essentially resulting in the same analysis as using excess market returns.

3.2. RESEARCH PHILOSOPHY

According to (Bailey, 1982 p24), methodology means the philosophy of the research process. This includes the assumption and values that serves as a rationale for research and the standards or criteria the researcher uses in interpreting data and drawing final results.

According to (Creswell 2007 p111), positivism (quantitative) and phenomenology (qualitative) methods are two broad paradigms to research often used in social
studies and research. Positivism approach is deductive, seeks to explain causal relationships between variables, normally uses quantitative data, employs control to allow the testing of hypothesis and it uses highly structured methodology to facilitate replication.

Positivism regards reality as stable and observable, and therefore describable from an objective point of view. A positivism approach was adopted in this study because it allows for the collection and analysis of statistical data that is historic in nature about investment performances. It also allows the researcher to have some control over the research process.

In quantitative research variables and relationships are the central idea. Quantitative research is useful in providing detailed planning prior to data collection and analysis because it provides tools for analysing concepts, planning the design stages and dealing with population and sampling issues. In addition this type of research utilises a deductive model in testing the relationship between variables and provide evidence for or against pre-specific hypothesis, (Neuman 2003p 86).

The main objective of this study is to determine the explanatory power of asset allocation in determining portfolio performance; it is a quantitative research all the mathematical models that were used were determined before the collection of data. In some cases where information was not readily available a simple specification of the ‘style analysis’ was employed it was originally developed by Sharpe (1992).

3.2.1. DEDUCTIVE RESEARCH APPROACH

There are two theoretical approaches to research which propose different ways of drawing conclusions when conducting a research. The inductive approach is “the logical process of establishing a general proposition on the basis of observation of particular facts”, (Zikmund 2000p 144). It involves collecting data and developing theory as a result of data analysis. The deductive approach is the process of deriving a conclusion from an unknown premise or something known to be true.
When deciding which approach to adopt (Saunders et al 2000 p 175), suggested a number of ways but the most important one is based on the nature of the topic. If there is a lot of literature about the topic a theoretical framework can be defined, it is often suitable to use the deductive approach. The time available for the study is another factor that needs to be considered.

This study is deductive, since theories on the same subject exist from other countries. Based on these theories a framework for this study was defined, this study is also guided by a defined timeframe so a deductive approach is the best option. In this study relationships between asset allocation and portfolio performances exist as performance depends on asset allocation so the risks data patterns failing to emerge are minimised.

3.3. RESEARCH STRATEGY

According to (Saunders et al 1997p 166), a research strategy is a general plan of how a researcher goes about answering the research questions. It specifies the sources from which the researcher intends to collect data and consider the constraints that the researcher will face.

(Yin 1994p 6), highlighted that the most important condition differentiating from among various research strategies is to identify the research question being asked. There are five main research strategies to use when collecting and analysing evidences: Experiment, Survey, Case study, Archival analysis and History. Each strategy has advantages and disadvantages depending on: type of research question, the researchers control over behaviour events, and focus on contemporary versus historical phenomena. The boundaries between the methods are not always sharp and clear they may overlap each other.

The research strategy is shaped by the characteristics of the research question asked. The main goal of this study is to determine the importance of asset allocation on portfolio performance in Zimbabwe. The study focuses on contemporary events
and the research questions of this study are in the ‘what’ form so the most appropriate strategy is survey. Surveys fall within the positivism paradigm, whose ontology perceives discovery of an apprehensible reality (Guba and Lincoln 1994 p113) about performance of funds managed by various institutions.

3.4. POPULATION AND SAMPLING TECHNIQUES

According to (Fraenkel and Wallen 1996 p 5), population is a group of individuals whom the researcher is interested in obtaining information from, making inferences and generalisations of the study. They also stated that the population can be in two categories, that is the target and the accessible population. The target population is the population to which the researcher would like to generalise and this population is rarely available or if it is available it is uneconomical to consider it in research. Therefore the population is one in which the researcher is able to generalise.

The population of interest in this study was defined as all 330 pension funds, 36 unit trust funds and 600 individual investment portfolios managed by asset management companies in Zimbabwe. During the period of the study there were 16 operating asset management companies in Zimbabwe.

3.4.1. SAMPLING METHOD

According to (Cooper and Schindler, 2003P 179), sampling can be described as the technique and procedure by which some elements of a given population are selected to represent the entire population for the study at hand. The primary purpose of sampling is that by selecting some elements of a population, the researcher can draw conclusions about the entire population if the sample is representative. A sampling method can be classified as either a probability or non-probability.

The ensuing section focuses on the analysis of the sampling method selected by the researcher for the study, and the motivation for selecting the sampling method is scrutinised. An analysis on the sample size that was used for the research study is taken into consideration, it further explains how the sample size was determined.
3.4.1.1. PROBABILITY SAMPLING

This study applied the probability sampling method. It is a sampling method which utilizes some form of random selection of elements from the population, (McNabb, 2002 p134). The population in the present study was all 330 pension funds, 36 unit trust funds and 600 individual investment portfolios managed by asset management companies in Zimbabwe. The researcher made sure that the sample that was drawn out of this population is representative. The probability sampling type ensures that every investment portfolio has a known chance of being selected for the purposes of the study.

3.4.1.2. SAMPLING TECHNIQUE

The sample was randomly selected from the population of all investment portfolios managed by asset management companies in Zimbabwe. According to, (Roberts-Lombard, 2002 p 112), random sampling method is unique since each member has an equal probability of being included in the sample. It requires a serial numbered list of population elements.

Each element was numbered from 1 to 330 for pension funds, 1to36 for unit trust funds and 1 to 600 for individual investors. A computerised random number generator was used to select a sample of 33 unit trust funds, 240 individual investors and 180 pension funds out of the whole population of 330 pension funds, 600 individual investors and 36 unit trust funds respectively. The study applied the random sampling technique for the study since each element of the population had an equal chance of being selected in the sample, resulting in the elimination of bias. The sample was selected from the list obtained from the Association of Investment Managers of Zimbabwe database which provided similar data from Aon Zimbabwe and Marsh Employee benefits.
3.4.1.3. SAMPLE SIZE

According to (Martins 1999 p 262), usually the correct sample size in a study is dependent upon the nature of the population for the study and the purpose of the study. The sample size in most cases depends on the population that is to be sampled.

The formula below was used for the calculation of the sample since it was relevant to studies where a probability sampling method was used (Roberts-Lombard, 2006 p 87):

Formula:
\[ n \geq \frac{N}{1 + \frac{Nd^2}{10000}}, \]

Where:
N= Total population under study
d= error estimate at 95%
n= sample size

Application:

1. \[ n \geq \frac{36}{1 + \frac{(36)(5^2)}{10000}} \]
\[ n \geq 33 \text{ unit trust funds} \]

2. \[ n \geq \frac{600}{1 + \frac{(600)(5^2)}{10000}} \]
\[ n \geq 240 \text{ individual investors’ portfolios} \]

3. \[ n \geq \frac{330}{1 + \frac{(330)(5^2)}{10000}} \]
\[ n \geq 180 \text{ pension funds} \]

3.5. DATA COLLECTION METHODS
According to, (Creswell 2007 p 110) data collection can be defined as a series of interacted activities aimed at gathering good information to answer emerging questions.

3.5.1. TRIANGULATION APPROACH

When conducting research scholars often utilise various mix of data collection in order to enhance the quality of research. One such phenomenon is the triangulation approach which may provide the right balance and mix of information by combining different setting but not aiding towards answering the same questions. (Tellis1997 p 5), mentions that ‘not all sources are essential in a research study; however it is multiple sources of data that are important to the reliability of the study’.

In the current study, most of the statistical data was obtained from the Institute of Investment Managers of Zimbabwe database on performance of investment managers in Zimbabwe. The study made use of secondary data to determine the importance of asset allocation in portfolio performance in Zimbabwe. The data is secondary, however it could be verified since it is published public information which is readily available, and the same information was also obtained from pension administrators like Marsh Employee Benefits and Aon Zimbabwe.

3.5.2. DATA ANALYSIS

According to, (Cooper and Schindler, 2003 p 87), this includes the reduction of gathered data to manageable volumes, creation of summaries, identification for developing patterns and applying statistical techniques. It also encompasses the interpretation of study’s findings in comparison with the research objectives and questions, and highlight if developing results are consistent with preset research hypotheses and related theories on the subject of study.

The “total return” of the portfolio or fund is the return net of all expenses and fees. The measure of the “market return” is the equally weighted return for a given period for all the funds in the applicable universe. The “asset allocation policy return” refers
to the static asset allocation (beta) return of the fund; intuitively, it is the policy return in excess of the market return that is the static asset allocation (beta) return less the market return. The “active portfolio management return” refers to the remaining returns from security selection, tactical asset allocation, and fees.

As a result of splitting out the market movement component, it allows for the determination (better) of the source of (variations) over time. In this study a portfolio’s total return as in (Solnik and McLeavey 2003 p108) also (Xiong et al 2010 p 1) was decomposed into three components which are: (1) the market return, (2) the asset allocation policy return in excess of the market return, and (3) the return from active portfolio management. Time-series and cross-sectional data were both used to determine the importance of asset allocation in explaining return variations.

To remove the dominance of the applicable market returns in the time-series analysis, excess market returns were used. Market returns and asset allocation policy returns were calculated for each year for each portfolio and then ran a time-series regression of the portfolio excess market returns against the asset allocation policy excess market returns.

In order to establish the true impact of asset allocation, the study determined the coefficient of determination between different return variables. Specifically, the coefficient of determination is defined as:

\[ R^2 = 1 - \frac{\sigma^2}{\sigma_y^2} \]  

(3.2)

Where:
\[ \sigma_x^2 = \text{the variance of } x \]
\[ \sigma_y^2 = \text{the variance of } y \]
\[ \sigma^2 = \text{the unexplained or residual variance} \]

To determine the impact of asset allocation on return levels, the geometric annualized asset allocation policy return was divided by the geometric annualized
portfolio return over the 4 year period. The risk adjusted returns were calculated using the Sharpe ratio.

In this study the researcher used Partial Least Square (PLS) for data analysis; it is a second generation data analysis technique according to (Bagozzi and Forenell 1982 p 27). It can be used to test the extent to which a research meets a standard for high quality statistical analysis. Linear regression, correlation tests, variance and covariance matrices were also used in the analysis of data.

3.5.3 VALIDITY AND RELIABILITY

As a general rule, truly scientific statements should be both reliable and valid (Coldwell and Herbst, 2004 p17). Research performed in this study was analysed in great depth to ensure validity. Care was taken in deciding on the data used for analysis and how the results were portrayed in an ethical manner. As all data used were from public sources and as such in the public domain, the research had minimal ethical risks and as such no ethical clearance was needed.

3.6. RESEARCH PROCEDURE

Return data of equity funds, pension funds and individual investors obtained from the Institute of Investment Managers of Zimbabwe. I considered funds that existed from February 2009 to December 2012. The final sample consisted of 33 unit trust funds, 240 individual investors’ portfolios and 180 pension funds. Similar to Xiong (2010), the study estimated the asset allocation policy return for each fund by using return-based style analysis as in (Sharpe 1992 p7-19).

As (Xiong et al. 2010 p1) have shown, the portfolio’s total return (net of all expenses and fees) can be decomposed into 3 components: (1) the market return, (2) the return from the asset allocation policy (its deviation from the market), and (3) the return from active portfolio management, depending on the pension funds’ ability to
tactically overweight or underweight asset classes, sectors, or securities relative to the policy.

In order to get meaningful information from the return data obtained the following notations were used in this study.

\[ R_{i,t} = \text{fund total return for fund } i \text{ in period } t \]
\[ P_{i,t} = \text{policy total return for fund } i \text{ in period } t \]
\[ M_t = \text{market return in period } t \]
\[ R_{i,t} - M_t = \text{excess market fund return for fund } i \text{ in period } t \]
\[ P_{i,t} - M_t = \text{excess market asset allocation policy return for fund } i \text{ in period } t \]
\[ R_{i,t} - P_{i,t} = \text{active management or active return for fund } i \text{ in period } t \]

3.6.1. TIME SERIES ANALYSIS

In order to make a time series analysis, total returns were used in the following regression formula to estimate the explanatory power of asset allocation policy:

\[ R_{i,t} = b_0 + b_1 P_{i,t} + \epsilon_{i,t} \quad (3.1) \]

The two regression variables are fund total return \( R_{i,t} \) and policy total return \( P_{i,t} \), \( b_0 \) and \( b_1 \) are the regression coefficients, and \( \epsilon_{i,t} \) is the residual return (the difference between the realized fund return and the predicted fund return). The coefficient of determination \( R^2 \), obtained measures the explanatory power of the model.

It was noted however that, one problem with the time-series analysis of total returns is that the results are dominated by overall market movement. To further analyze the relative importance of asset allocation policy and active management within a peer group, a more applicable approach is to use excess market returns instead of total returns as the regression variables for the time series. Thus, the regression equation for excess market returns is:

\[ R_{i,t} - M_t = b_0 + b_1 (P_{i,t} - M_t) + \epsilon_{i,t} \quad (3.2) \]
3.6.2. CROSS SECTIONAL ANALYSIS.

Cross sectional analysis is unlike time series regressions, in which the results are highly dependent on the type of return used (total return or excess market return), cross-sectional regressions on total returns are equivalent to cross sectional regressions on excess market returns. Cross-sectional regressions naturally remove the applicable market movement from the peer group, essentially resulting in the same analysis as using excess market returns.

In single-period cross-sectional regressions, Equation (3.1) is intrinsically identical to Equation (3.2) because the market return \( M_t \) is a constant in the single period (no matter how long the period is) that is inherent in a cross-sectional regression. This point plays a crucial role correctly interpreting the cross-sectional regression results. Since market movement is naturally removed during the cross-sectional analysis, the resulting \( R^2 \) is an indication of the relative importance of detailed asset allocation versus active management after removing market movement.

3.7. LIMITATIONS OF THE STUDY

According to (Best and Kahn 1993 p33), limitations are those conditions which are beyond the researchers control but can still have some influence on the conclusions drawn from the study. It is in most cases the availability of necessary resources, including time and access to interviewees may present constraints to the study.

The major limiting factor on the study was availability of data. Although most the data was obtained from the Institute of Investment Managers of Zimbabwe, not all of the 16 registered asset managers then, provide their return information regularly. To overcome this shortage in information, the study applied a simple specification of the ‘style analysis’ originally developed by Sharpe (1992).
It was also noted that not all asset management companies in Zimbabwe have unit trust funds as a product. The study was restricted to 13 companies that manage unit trust funds.

3.8. CHAPTER SUMMARY

The chapter examined the research methodology. The scope of the study, the sampling method and the sampling technique, the organisation of the research were discussed. The chapter also examined the secondary data used for the research study. The study was established to be longitudinal and correlational in nature, it was also noted that the research is quantitative and deductive in nature. The population
of the study was established, probability and random sampling were used to choose the sample for the study. The sample size was also calculated for each for each peer group of funds under study. The research strategy adopted for this study was survey. Furthermore, the chapter focused on the statistical packages used in data analysis.

In the following chapter the research results are discussed. The chapter focuses on the returns of the unit trust funds, pension funds and individual investors. Tables and figures were used to aid the analysis of the data.

CHAPTER 4

FINDINGS AND DISCUSSION

4.0. INTRODUCTION

This chapter focuses on the analysis, interpretation and discussion of the pension, unit trust and individual investors fund returns. According to (Proctor, 2000p 273), in most cases the analysis and interpretation of data are closely related. In data analysis, the collected data is broken up into small groups or elements which the researcher examines separately, and translates them into immediate results. In interpretation, the immediate results will be translated into integrated and meaningful general references and findings. The findings must be relevant to the objectives of the research study at hand. If both data analysis and interpretation are not carried out properly, the success of the study is difficult to attain in most cases.

4.1. DATA ANALYSIS

Return data of equity funds, pension funds and individual investors obtained from the Institute of Investment Managers of Zimbabwe. The study considered funds that existed from February 2009 to December 2012. The final sample consisted of 33 unit trust funds, 240 individual investors’ portfolios and 180 pension funds.

<table>
<thead>
<tr>
<th>TABLE 4.1 DISTRIBUTIONS OF RESPONDENTS IN ALL CATEGORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PENSION FUNDS</td>
</tr>
</tbody>
</table>

In all cases the policies used by the funds including individual investors were not readily available; returns based style analysis was run on each fund to determine the overall best fit benchmark (the policy for each fund for the entire period). The asset classes used in the style are shown in tables’ 1a-1c below, along with the average fund exposure to each asset class. The average $R^2$ value from the style analysis was 82 percent giving me the confidence that the benchmark used in style analysis was a good fit.

A total of 60 percent of all unit trust funds were actively managed during the period of study and 40 percent were passively managed. Total funds under management were $200 million with the highest fund had $100m and the smallest had 1 million.

### Table 4.1a: UNIT TRUST FUNDS AVERAGE ALLOCATIONS

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Average Fund Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimbabwe Stocks</td>
<td>98%</td>
</tr>
<tr>
<td>Zimbabwe bonds</td>
<td>1.2</td>
</tr>
<tr>
<td>Cash</td>
<td>0.8</td>
</tr>
<tr>
<td>Other</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 1b: PENSION FUND AVERAGE ALLOCATIONS

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Average Policy Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimbabwe Stocks</td>
<td>70%</td>
</tr>
<tr>
<td>Zimbabwe Bonds</td>
<td>10.0</td>
</tr>
<tr>
<td>Cash</td>
<td>5.0</td>
</tr>
<tr>
<td>Real Estate</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
</tr>
</tbody>
</table>
Compared to unit trust funds 30 percent of all pension funds were passively managed 70 percent were actively managed during the period of study. The total assets under management in the pension funds were $1.59 billion. The largest fund had $904 million, and the smallest fund had just $0.94 million in assets, the pension fund study uses 4 years data for 180 funds.

It was also noted that 80 percent of individual investors funds are passively managed and 20 percent are actively managed.

**Table 1c: INDIVIDUAL INVESTOR AVERAGE ALLOCATIONS**

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocks</td>
<td>95%</td>
</tr>
<tr>
<td>Bonds</td>
<td>4.5</td>
</tr>
<tr>
<td>Cash</td>
<td>0.5</td>
</tr>
</tbody>
</table>

100.0

The benchmark used was the Zimbabwe stock exchange (ZSE), (Ibbotson 2010 p2) noted that in practice, any benchmark that includes the stock market will capture most of the market movement because stocks are much more volatile than other asset classes.

The above data shows that most funds about **64 percent** were actively managed and **36 percent** were passively managed. It is quite amazing why investors select active investing despite overwhelming evidence that it underperforms passive portfolios. It is possible to form some opinion, in regard to such trading tendencies. It could be as a result of overconfidence which leads to active trading. It is also possible that, investors are mostly guided by financial press. Most fund managers advertise that they can provide superior returns through active trading thereby affecting investors. This also goes against the idea that past performance is not a good predictor of future performances. This trend of investing is consistent with the observation by (Elton et al 1996 p 139); however, there seem to be only two studies,
Glode (2009) and Swinkels and Rzezniczak (2009) that defend the findings of Elton et al. (1996) by concluding that active investing outperforms passive strategies.

This evidence contradict others such as Casarin et al. (2008), Corner et al. (2009), Fama and French (2008) and French (2008) who document that actively managed mutual funds underperform passive investing.

Table 1d: HISTORICAL ANNUAL RETURN VARIANCES AND CORRELATIONS OF THE PORTFOLIOS

<table>
<thead>
<tr>
<th></th>
<th>Unit trusts</th>
<th>Pension funds</th>
<th>Individual investors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual return</td>
<td>5.82%</td>
<td>6.23%</td>
<td>12.38%</td>
</tr>
<tr>
<td>Standard dev(σ)</td>
<td>6.99</td>
<td>4.29</td>
<td>10.9</td>
</tr>
<tr>
<td>Return correlations ρ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stocks &amp; bonds</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stocks &amp; cash</td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonds &amp; cash</td>
<td>0.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stocks &amp; real estate</td>
<td>0.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2. THE IMPORTANCE OF ASSET ALLOCATION IN EXPLAINING RETURN VARIATIONS.

The results were presented in three areas: a time-series regression on total returns, a time-series analysis of excess market returns, and a year-by-year cross-sectional analysis. Once policy return was calculated, the researcher then calculated the relative importance of asset allocation and active management as the percentage of the variation in actual returns that is explained by variations in the policy return, as measured by adjusted $R^2$. The adjusted $R^2$ is the percentage of year-to-year variation in the return of the fund that could be explained by concurrent variation in policy return.
To answer the question about relative importance of asset allocation among funds as it pertains to return variations; in most cases researchers use cross-sectional regression rather than a time-series regression. Vardharaj and Fabozzi 2007 performed a series of cross-sectional regressions in which the ensuing $R^2$s varied widely.

In this study both time series and cross sectional regressions were used to discuss the results. Historically, these cross-sectional regressions have been performed on total returns; because of this, some studies may have mistakenly interpreted the $R^2$ as a statement about total returns and the overall importance of asset allocation. In this study it was shown that a cross-sectional regression adjusted on a fund’s total returns is similar and identical to cross-sectional regression performed on market-excess returns, since the cross-sectional regression technique will result in the natural removal of the market movement inherent in the universe of funds under study. Following the highlighting, of common market return as the weighted average return of the funds under study, total returns of the funds were converted into market-excess fund returns by deducting the particular universe market return. When it comes to cross-sectional regression, it is not important which type of returns is used it could be total returns or excess-market returns. The resultant beta coefficient and $R^2$ from the cross-sectional regressions will always be similar; it is only the intercepts are which will vary. This result gives proof that a cross-sectional regression will naturally remove the common market factor that is market movement and, also of great significance, the regression coefficient ($R^2$) from a cross-sectional regression is not meant to be a statement on the aggregate importance of asset allocation on an investment portfolio.

4.2.1. TIME-SERIES REGRESSIONS ON TOTAL RETURNS.

In order to have a complete picture of total return time-series regression analysis, the total return was divided into its three components (1) the return related to the overall market, (2) the return related to asset allocation policy deviation from the applicable market, and (3) the return related to active portfolio management in the form of tactical asset allocation or security selection can be stated as:
\[ R_{i,t} = M_{t} + (P_{i,t} - M_{t})^+ (R_{i,t} - P_{i,t}). \] (4.1)

Table 4.1 shows the average time-series $R^2$ s of the three components in Equation 4.1 for all the funds in a given fund universe. It shows the three components’ average contributions to the total return variations for each fund universe.

In two (unit trust and pension funds) of the three fund universes, two important observations emerge from Table 4.1. First, the market movement component accounts for about 80 percent of the total return variations and dominate both detailed asset allocation policy differences and active portfolio management. In other words, market movement dominates the other two return components in time-series regressions on total returns. Combining market return and asset allocation policy return in excess of market return will result in a factor that dominates active portfolio management. The result is consistent with the widely held belief in the investment industry that market return and asset allocation policy return in excess of market return collectively are the dominant determinant of total return variations, the contribution of each component was clearly shown.

This observation is also consistent with such previous studies as HEI (1991), Ibbotson and Kaplan (2000) and Xiong et al 2010.

**Table 4.1: DECOMPOSITION OF TIME-SERIES TOTAL RETURN VARIATIONS IN TERMS OF AVERAGE $R^2$ s, FEBRUARY 2009–DECEMBER 2012.**

<table>
<thead>
<tr>
<th>Average $R^2$</th>
<th>Zimbabwe Pension Funds</th>
<th>Unit Trust Funds</th>
<th>Individual Investors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Movement ($R_{it} - M_{it}$)</td>
<td>79%</td>
<td>81%</td>
<td>78%</td>
</tr>
<tr>
<td>Detailed Asset Allocation Policy ($R_{it} - P_{it}$)</td>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Active Management ($R_{it} - R_{it}$)</td>
<td>8</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Interaction Effect</td>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Second, the results showed that excess market asset allocation policy return and active portfolio management have an equal level of explanatory power, with each accounting for around 10 percent for pension and unit trust funds. The term which
makes the three return components' of $R^2$'s add up to 100 percent can be described as the interaction effect. The negative interaction effect comes from the negative covariance between the total return and a residual term.

The study then made a deliberate focus on the second observation and investigated the contributions to return variations from both excess market asset allocation policy and active portfolio management after removing market movement. To my knowledge, available literature contains no record of this kind of time-series analysis of excess market returns, for developing economies like Zimbabwe.

4.2.2. TIME-SERIES ANALYSIS OF EXCESS MARKET RETURNS'.

When a time series of portfolio excess market returns is regressed against policy excess market returns it explicitly remove the overall market movement seen in the total return regression and, therefore, is more relevant for identifying the explanatory power of asset allocation within a particular peer group or universe of funds. The study decomposed fund excess market return into policy excess market return and active return $R_{i,t} - M_t = (P_{i,t} - M_t) + (R_{i,t} - P_{i,t})$ and then regressed the fund excess market returns on the corresponding policy excess market returns and active returns over time.

The researcher then regressed 4 years of $R_{i,t} - M_t$ on 4 years of $P_{i,t} - M_t$ (policy excess market return) and then on 4 years of $R_{i,t} - P_{i,t}$ (active return) for each fund. Table 4.2 summarizes the decomposition of excess market return variations for the three peer groups, again in terms of average $R^2$'s.

Table 4.2: DECOMPOSITION TIME-SERIES EXCESS MARKET RETURNS VARIATIONS IN TERMS OF AVERAGE $R^2$'s, FEBRUARY 2009–DECEMBER 2012

<table>
<thead>
<tr>
<th>AVERAGE $R^2$</th>
<th>Zimbabwe Pension Funds</th>
<th>Unit Funds</th>
<th>Trust Investors</th>
<th>Individual Investors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess market asset allocation policy: $R_{i,t} - M_t$ vs. $P_{i,t} - M_t$</td>
<td>48%</td>
<td>33%</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>Active portfolio management: $R_{i,t} - M_t$ vs. $R_{i,t} - P_{i,t}$</td>
<td>46</td>
<td>33</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Interaction effect</td>
<td>6</td>
<td>34</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
Overall, excess market asset allocation policy and active portfolio management have about an almost equal amount of explanatory power after removing the applicable market effect. For Zimbabwe pension funds, asset allocation policy excess market return accounts for 48 percent of the excess market return variations for the average pension funds; active portfolio management accounts for 46 percent. The residual 6 percent is a result of the interaction effect. For the unit trust funds, policy excess market return and active portfolio management account for 33 percent and 33 percent of the excess market return variations, respectively. The results for the individual investors’ funds are also consistent with policy accounting for 42 percent and active management explaining 45 percent.

This study’s analysis also indicates that excess market asset allocation policy has about the same explanatory power for excess market return variations as active portfolio management within a peer group of unit trust funds and pension funds. Hence after making adjustments for the market movement, it was observed that asset allocation and active management play an equal important in explaining return variations. Although active strategies and policy clearly have an impact on return variation, they play a subordinate role for most investor funds. This is consistent with Ibbotson and Kaplan 2000, Idzorek 2010 and Xiong et al 2010 who found similar results. This study however makes a further observation on individual investors which is not covered by most prior studies. The major variation between peer group results is as result of the wide fund dispersion as explained by the widely distributed $R^2$s this is consistent with findings by Xiong et al 2010.

It can extrapolated from the study that for the long-term investor who maintains a consistent asset allocation and leans toward index funds, market movement and asset allocation determines about 100 percent of performance regardless of whether one is measuring return variability across time, return variation between funds, or return amount. If each fund was invested passively (as in a combination of index funds) with the same asset allocation, there would be no variation at all between funds. On the other hand, if each fund was invested passively but with different asset allocations, all of the inter-fund variation would be due to market movement and asset allocation, since there would be no active management. This observation is
contrary to conclusions by BHB 1986, 1991, Drobetz and Koehler 2002, Ibbotson and Kaplan 2000 who noted that asset allocation determines all the variation in a portfolio or between funds. As was noted Ibbotson 2000 did not separate market movement, but included it in the asset allocation component. This study breaks out market movements and recognizes the market is causing most of the variations in returns.

The results from this study are lower than Brinson et al.’s (1986) finding of 93.6 percent for quarterly variation of pension fund returns. A possible reason for this is that this study analysed yearly return variation of a smaller number of funds with more varying active management behaviour. It is also possible that quarterly returns smooth the monthly volatility of fund returns, resulting in Brinson et al.’s higher numbers. This study’s results are close to Ibbotson and Kaplan’s (2000) finding of 81.4 percent for monthly variation in balanced fund returns also Xiong et al’s (2010) findings of 80 percent. The current study’s result is lower than Brinson et al’s 93.6 percent because pension fund managers are less active as a group than unit trust fund managers. More importantly Brinson et al treated market movement as part of asset allocation they did not separate the two. The general conclusion in all three studies is that market movement is the primary factor in explaining the return variability of a broadly diversified and actively managed portfolio.

Even in bear markets, market movements dominate return variability, asset allocation and active management plays an equally important role in explaining return variability. The same is true in generally rising markets, too. The Zimbabwean markets were generally described as bull markets in 2009, bear markets between 2010 and 2012.

The very high percentage of variance explained by market movements is linked to strong homogeneity in the equities sub-asset classes this observation is consistent with observations by (Hyde et al., 2007p 80). The high $R^2$s are primarily explained by the funds’ exposure to the capital markets in general. The correlation between stock markets, which represent on average 80 percent of pension funds’ asset allocation, 96 percent of unit trust funds and 94 percent of individual investors’ portfolios’ is above 80 percent.
When the individual investors category is considered asset allocation has the higher explanatory power and active management having a smaller explanatory power in terms of return variations. This could be as a result of different investment strategies used by funds. In this category 80 percent of the funds are passively managed, this resulted in minimal active management. Hence asset allocation is the driving force for return variability of funds in this regard. The study concluded that for an investor who leans toward index funds (passive strategy) asset allocation determines about 100 percent of return performance and market movement still accounting for most of return variability across time, return variation between funds. This observation is consistent with Ibbotson 2000. Switching from a somewhat granular list of asset-class factors to a single explanatory variable, such as the ZSE (single factor regression), typically leads to only a minor decrease in the average $R^2$.

4.2.3. CONSISTENT RESULTS FROM TIME SERIES AND CROSS-SECTIONAL R-SQUARED DISTRIBUTIONS

As a result of performing a time-series analysis on excess-market returns, I put time-series regression analysis and cross-sectional regression analysis on an even playing field. The $R^2$ s from a time-series regression on excess-market returns and cross-sectional regression on either type of return (total or excess-market) gave consistent answers, asset-allocation decisions in excess of market movement and active management are about equally important at explaining return variations. It can be seen from the two $R^2$ distributions that the results are consistent.

Figure 4.1 summarizes the distributions of $R^2$ s for the 33 unit trust funds under two different regression techniques: (1) time-series regressions of fund excess market returns on policy excess market returns and (2) cross-sectional regressions of fund total returns on policy total returns (as noted, this technique is equivalent to cross-sectional regressions of fund excess market returns on policy excess market returns). The vertical axis is adjusted for the 33 time-series regressions and a total of 4 cross-sectional regressions to make a cumulative distribution of 100 percent for
all of the regressions. It can be noted that from the two $R^2$ distributions that the results are consistent. These results confirm the earlier finding that cross-sectional regression is consistent with excess market time series regression.

![Figure 4.1: Time Series and Cross-Sectional R-squared Distributions for Zimbabwe Unit Trust Funds 2009-2012](image)

*Note:* I ran 4 cross-sectional regressions and 33 excess market time-series regressions.

In figure 4.1 by performing a time-series analysis on excess-market returns, I put time-series regression analysis and cross-sectional regression analysis on the same level for the first time. The $R^2$ from a time-series regression on excess-market returns and cross-sectional regression on either type of return (total or excess-market) gives consistent answers. The frequency in the vertical axis is rescaled for 33 time-series regressions and 4 cross-sectional regressions so that the cumulative distribution adds up to 100 percent for both sets of regressions. Empirically, with returns having been adjusted for the overall movement of the market, detailed asset-allocation decisions and active management have about similar explanatory power, although this result is affected by time horizon environment. This confirms the
studies by (Xiong et al 2010) who found almost similar results in a much different environment (US market).

The key insight that ultimately enabled this study to conclude that asset allocation policy return in excess of market return and active portfolio management are equally important is the realisation that cross-sectional regression on total returns is equivalent to cross-sectional regression on excess market returns because cross-sectional regression naturally removes market movement from each portfolio. I believe that this critical and subtle fact has been a source of confusion in prior studies and could have been overlooked by many researchers, especially when interpreting cross-sectional results compared to the overall importance of asset allocation.

The insight that cross-sectional regression naturally removes market movement leads to the notion that removing market movement from traditional total return time-series regression is necessary should one want to put the time-series and cross-sectional approaches on an equal footing. After putting the two approaches on an equal footing, figure 4.1 confirms that the values of $R^2$ for the excess market time-series regressions and the cross-sectional regressions (on either type of return) are consistent.

**4.2.4. YEAR BY YEAR CROSS-SECTIONAL ANALYSIS.**

In discussing the period-by-period cross-sectional regression results, this analysis used the results from the peer group of 33 Zimbabwe unit trust funds as the primary peer group. The other peer group, pension funds, analyses produced similar results.

Cross-sectional regressions are run for a single period, which is typically defined as one year. The study ran the analysis 4 times, once for each of the possible 4 yearly periods. Again, cross-sectional analysis naturally removes the average applicable market return and attempts to determine the excess market return relationship within a given universe of funds. The cross-sectional sample variance is the excess market return variance whether one uses the total returns or the excess market returns. In other words, the $R^2$ of the cross-sectional regression between $(R_{i,t} - M_t)$ and $(P_{i,t} - M_t)$
$M_t$ is the same as the $R^2$ of the cross sectional regression between $R_{i,t}$ and $P_{i,t}$ . The results came out as expected, more variability was found in the policy excess market return ($P_{i,t} - M_t$).

**Figure 4.2** and **Figure 4.3** show the results of the 33 separate cross-sectional analyses for the 4 yearly returns from February 2009 to December 2012. Since the study ran the cross-sectional regressions year by year, the horizontal axis has 4 points. For each year, the study regressed fund returns ($R_{i,t}$) on their corresponding policy returns ($P_{i,t}$).

![Figure 4.2: Rolling Cross-Sectional Regression Results for Zimbabwe Unit Trust Funds, February 2009–December 2012](image)
Figure 4.3: Rolling Cross-Sectional $R^2$ s for Zimbabwe Unit Trust Funds, February 2009–December 2012

Note: Each point represents a cross-sectional regression for a single year.

Taking the information in figure 4.2 and recalling that the formula for $R^2$ is 1 minus the variance in the unexplained residual returns divided by the cross-sectional fund return variance, plotted the rolling cross-sectional regression $R^2$ in figure 4.3. The average of the rolling regressions is around 33 percent, indicating that variations in asset allocation in excess of market movement explain 33 percent of the excess-market returns variation. This figure is higher than that observed by Ibbotson 2000 and Xiong et al 2010 the reason could be the periods on which the analysis was made they used quarterly data and this study used yearly data.
In Figure 4.2, the cross-sectional fund dispersion is defined as the standard deviation of cross sectional fund returns ($R_{it}$). It is very volatile. The residual error is the standard deviation of the regression residual $\sigma_e$ in equation 3.2.

As seen from Figure 4.2 the residual error is relatively stable, with about 80 percent of the values falling between 1 percent and 1.5 percent. The relatively low and stable residual errors imply that the multifactor model that describes fund returns (the return-based style analysis used to estimate the funds’ policy portfolio) works well.

Figure 4.3 shows the rolling cross-sectional $R^2$s, which range from 0 percent to 90 percent. From Equation 3.1 it can be seen that the volatility of the cross-sectional $R^2$ in Figure 4.3 is primarily the result of the volatility of the cross-sectional fund return dispersion in Figure 4.2, ($\sigma_y$ in Equation 3.1). A wider cross-sectional return dispersion was observed among individual portfolio returns, unit trust funds and pension funds during the bear markets from 2010 to 2012.

This observation is consistent with those by (De Silva et al 2001 p 83) who showed that the wider dispersion in funds was primarily the result of wide individual security return dispersions and had little to do with changes in the range of portfolio manager talent. The wide and varying fund dispersion in Figure 4.2 demonstrates that analyses performed for different periods can lead to very different results. This finding is a possible explanation of the wide range of cross-sectional results found in literature. The period-by-period cross-sectional $R^2$s are unstable, leading to the differences in previously reported $R^2$s.

Similar conclusions were highlighted by, Vardharaj and Fabozzi (2007) who studied a group of large and small U.S. equity funds. They reported that the $R^2$ ranged from 15 percent for 10-year (1995-2004) compounded cross-sectional fund returns to 72 percent for the 5-year (2000-2004) period. They attributed the variability in $R^2$ to fund sector or style drift over the 10-year period. Also in their analysis Xiong et al 2010, noted their study pertaining to partially overlapping periods, suggests that the primary reason is the wider dispersion of cross-sectional fund returns and that sector or style drift over the 10-year period is more likely a secondary factor.
The wide range in cross-sectional fund return dispersion, as shown by the solid line in figure 4.2 gives an explanation as to why different researchers are likely to get different results when attempting to investigate the relative importance of asset allocation to an investment portfolio.

To verify this finding, this study attempted to duplicate the Vardharaj and Fabozzi (2007) and Xiong et al 2010 results by decomposing the $R^2$. Using a similar universe of U.S. equity funds, it was possible to calculate the 5-year (2000-2004) and 10-year (1995-2004) annually compounded cross-sectional fund dispersions (8.39 percent and 3.13 percent for the 5-year and 10-year compounded returns, respectively). The estimated the residual dispersion was found to be 4.44 percent for the five-year compounded return, and thus, the $R^2$ is about 72 percent ($1 - 4.44^2 / 8.39^2$). It was also estimated that the residual dispersion was 2.88 percent for the 10-year compounded return, and thus, the $R^2$ is about 15 percent ($1 - 2.88^2 / 3.13^2$). The residual dispersions do not differ much (2.88 percent to 4.44 percent), but the fund dispersions differ considerably (3.13 percent to 8.39 percent). It was concluded that, the wide fund dispersion explains the widely distributed $R^2$s in Vardharaj and Fabozzi (2007), Xiong et al 2010 and this study.

Figure 4.3 shows the average of 4 cross sectional regressions ($R^2$s) to be approximately 33 percent. That is, on average, the excess market asset allocation policy explains about 33 percent of the cross-sectional excess market returns variances for the Zimbabwe unity trust fund universe. This result is consistent with the time-series analysis of excess market return results reported in Table 4.2.

It is clear from the above empirical analysis and discussion that most return variations comes from the market’s overall movement, while a much smaller amount comes from the granular asset-allocation decisions and active portfolio management. As a result of the removal of market movement, it is clear that asset allocation and active management an almost equal power in explaining return variations as shown by the returns in pension funds and unit trusts and individual investor funds.

In conclusion as a result, of examining period-by-period cross sectional results and highlighting the sample period sensitivity of cross-sectional results, it was possible to
explain why different researchers using the same regression technique can get widely different results. More specifically, cross-sectional fund dispersion variability is the primary cause of the period-by-period cross-sectional $R^2$ variability.

4.3. IMPACT OF ASSET ALLOCATION ON RETURN LEVELS

It was imperative to distinguish between return levels and return variations. According to (Ibbotson 2000 p4), return variation is the movement of a portfolio from quarter to quarter which is due to market movement of the asset classes in which the portfolio is invested. It was also realised that in most cases investors are concerned much about return levels compared to return variation.

4.3.1 THE STUDY’S EMPIRICAL PORTION OF RETURN IS EXPLAINED BY POLICY

Table 4.3 shows the average of fund return explained by policy for the three peer groups in this study. On average, policy accounts for a little more than all of total return in all cases except for the individual investors fund portion of this study, where the result is 99 percent. This means that, on average, the pension funds and unit trust funds did not add value above their policies due to the combined deleterious effects of timing, selection, and management fees and expenses. The individual investor funds in this study slightly outperformed their policies on average, which could be due to security selection and or timing.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Zimbabwe pension funds</th>
<th>Individual investors</th>
<th>Unit trusts</th>
</tr>
</thead>
<tbody>
<tr>
<td>RETURN</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To determine the impact of asset allocation on return levels, geometric annualized asset allocation policy return was divided by the geometric annualized portfolio return over the 4 year period. The risk adjusted returns were calculated using the Sharpe ratio. The results were 117 percent (13 divided by 11.1), 120 percent (12 divided by 10) and 99 percent (13 divided by 13.13) for pension funds, unit trust funds and individual investors respectively.

The study established that, on average, the policy benchmarks match the actual portfolios, so the ratio is 1. The policy return (actual return) ratio averaged over 1, showing that asset allocation explains more than 100 percent of the level of a fund’s returns. It could be that as a result of poor market timing skills, fund managers practicing active management, on average, have difficulty surpassing passively invested fund returns, and after taking into account the expenses and fees of investing. So, about 100 percent of a portfolio return level is explained by asset allocation policy. This observation is consistent with prior studies by Ibbotson and Kaplan 2000, Ibbotson 2010 and Idzorek 2010.

Table 4.3 reports the average and median return ratios for the three the funds under the study. As in Ibbotson and Kaplan (2000), policy accounted for more than all but one of the total returns. However, in contrast to their results, active management not only failed to add value above the policy benchmarks. In fact, it destroyed a significant portion of investors’ value. A median ratio of 110 percent implies that active management destroyed roughly 25 percent of the performance that would have been achieved by following a passive investment strategy on portfolios by fund managers.
This study found out that, on average, policy explains approximately 100 percent of investment returns. If a manager succeeds in adding value, the explanatory power of policy can be below 100 percent, with the difference between these percentages and 100 percent explained by manager value subtracted through timing, selection, and/or costs. If managers add value, the fraction of return explained by policy decreases, with the balance explained by the amount of value added. If managers subtract value, policy explains more than 100 percent with the balance explained by the amount subtracted.

The actual percentage of the returns among funds that is explained by asset allocation policy is sample specific. All answers in this study are empirical observations specific to the individual funds under study, the time period analysed, and the methods of estimation. For any given portfolio, the importance of asset allocation policy depends on the preferences of the fund manager.

This study concluded that, when it comes to returns levels, asset allocation has the highest explanatory power. Since in total, at least 100 percent of return levels come from asset allocation before the cost of managing a portfolio.

4.3.2 ASSET ALLOCATION AND VALUE ADDITION IN A PASSIVELY MANAGED PORTFOLIO

Using the information on individual investors’ funds this research tested the assertion, that asset allocation is related to value added to passively managed portfolio. I tested the null hypothesis that asset allocation is not related to risk-adjusted net value added (RANVA) on passively managed funds. I tested whether the coefficient on the fraction of assets under passive management equals zero (H₀: \( a_2 = 0 \)), against the alternative hypothesis that the coefficient on the fraction of assets under passive management does not equal zero (H₁: \( a_2 \neq 0 \)).

The critical value of the \( t \)-test is 1.99 at the 0.05 significance level and about 1.66 at the 0.10 level. Therefore, at the 0.10 significance level, I rejected the null hypothesis.
that asset allocation has no effect on fund returns, but I could not do so at the 0.05 significance level. These results are strong enough evidence to show that many investors have increased the use of passive management on defined asset allocation policies for investment fund assets (as shown by the proportion of funds that are passively managed in this study). This study interpreted the coefficient of asset allocation of 1.62, as implying that an increase of 10 percentage points in the proportion of the asset allocation policy in a passively managed fund was associated with a 0.162 in the return of the fund.

These results mean that, on average, the pension funds, unit trust funds except for individual investors did not add value above their policies due to the combined deleterious effects of timing, selection, and management fees and expenses. On a risk-adjusted basis, the overall mean and median results are even worse (greater subtraction of value), especially for pension funds.

When one makes a comparison with results with similar studies in the US it apparently clear that management fees and expenses are much higher in Zimbabwe, however, the difference seems too large to be explained by these two factors only. It was concluded that the quality of active management in this study’s sample of Zimbabwe unit trust funds, pension funds and individual investors is inferior compared to the sample of U.S. funds examined in Ibbotson and Kaplan (2000).

This result is consistent with the observation by (French 2008 p1535), that indexing outperforms a significant portion of active portfolios in equity and bond markets in the long run. He highlighted that the cost of active investing can be measured by the difference between the passive and actual estimates. On the basis of findings, the average difference over the period between 1980 and 2006 is 0.67percent. This indicates that if an investor switched his actively managed portfolio with a passive one, he would raise his annual return by 67 basis points on average over the period between 1980 and 2006. This evidence is confirmed by Casarin et al. (2008) and Corner et al. (2009) who documented that actively managed funds have negative attribution returns.

4.3.3 COMPARISON OF PRIOR STUDIES RESULTS WITH CURRENT STUDY
Table 4.5: COMPARISONS OF TIME-SERIES REGRESSIONS FOR PENSION FUNDS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average $R^2$</td>
<td>40%</td>
<td>38.0%</td>
<td>40%</td>
<td>48%</td>
</tr>
<tr>
<td>Median $R^2$</td>
<td>42</td>
<td>40%</td>
<td>39%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Active Return</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>-0.1%</td>
<td>-0.44%</td>
<td>-0.27%</td>
<td>-5.3%</td>
</tr>
<tr>
<td>Median</td>
<td>NA</td>
<td>0.18%</td>
<td>0.00%</td>
<td>-5.1%</td>
</tr>
</tbody>
</table>

Table 4.5 shows the average and median $R^2$s over all funds. The average $R^2$ is 48 percent, the median is 40 percent. These results confirm the Ibbotson and Kaplan (2000), Vardharaj and Fabozzi (2007) and Xiong et al (2010) results for U.S. data. Although these empirical observations are specific to the individual funds, the time period analysed, this study concluded that there is a marked difference in the degree of active management between U.S. and Zimbabwe given the contribution of active management.

It is also clear in table 4.5 that a striking difference exists in the magnitudes of active returns. Whereas the studies for the U.S. exhibit active returns of roughly zero (which is consistent with market efficiency), this study reported an average negative active returns of -5.3 percent per year for Zimbabwe. While the degree of active management could be similar, the importance of asset allocation on fund return levels and the quality of active management is obviously very different. While U.S. fund managers could not add value by deviating from their benchmarks, active asset management by Zimbabwe fund managers actually destroyed value. One reason for this difference could be that Zimbabwean markets were suffering from liquidity challenges, resulting in only a few heavily capitalised counters accounting for most of the daily trades. Zimbabwean markets can also be described as inefficient and most managers lack market timing skills.
This observation is contrary to findings by (Fabozzi et al 2010 p 25) who concluded that active management does not add value in developed efficient markets (at least in some parts, such as large cap), but active management does add value in inefficient or emerging markets.

4.3.4. THE ROLE OF ASSET ALLOCATION IN DIFFERENT MARKET ENVIRONMENTS

It was noted that, on average, 80 percent of an investment fund’s returns variation can be attributed to market movement. This study also showed that, on average, 100 percent of long-term return level of a fund is determined by its asset allocation policy. This means that the level of allocation to equities will determine the level of volatility of a portfolio in all environments. These results are presented in Table 4.6 for both the entire time period and interim periods encompassing different investment environments.

<table>
<thead>
<tr>
<th></th>
<th>Number of funds</th>
<th>Policy return as % of Actual Return</th>
<th>Policy Volatility as % of Actual Volatility</th>
<th>% of Actual Return Variation Explained by Policy Return Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Bear Returns</td>
<td>453</td>
<td>116</td>
<td>92</td>
<td>79</td>
</tr>
<tr>
<td>Bull markets</td>
<td>453</td>
<td>130</td>
<td>86</td>
<td>80</td>
</tr>
</tbody>
</table>

Even in bear markets, asset allocation explains 79 percent of return variation and over 100 percent of return levels, (the period 2010-2012 can be described as bear markets). The same is true in generally rising markets, too. In 2009, for example, Zimbabwe capital markets enjoyed bull markets in stocks and bonds, with profound changes in portfolio-management techniques this was as a result of the introduction of the multiple currencies. In 2009, almost all funds were up, despite their specific asset allocation or active management activities, mainly due to the adoption of the
multi currency system whereas in a year like 2010, almost all funds were down. This could be attributed to liquidity constraints in the economy. Even so, asset allocation remained paramount, with active strategies making a far less significant impact on portfolio performance.

A focus on investment returns must not ignore the risks attached to those returns. Assets with higher long term returns have these returns to compensate for their risk. All of the funds under study had a higher allocation towards equities, (historical inflation rates might have influenced greater investor allocations to equities), which means the higher returns available from equities come at the cost of higher risk. Assuming all investors were following their investment plan, then asset allocation decisions determines to a great extent the return levels and market movement accounts for much of the volatility of a portfolio in all business environments.
4.4. CHAPTER SUMMARY

Asset allocation ultimately accounts for all of the absolute level of performance of the portfolios. On average, more than 100 percent of the long-term performance of a fund is determined by its asset allocation policy. For aggregate return levels, asset allocation has the higher explanatory power than any other factor. The major source of investment return over time is the investor’s asset allocation decision.

With a portfolio return split into three elements which are, market return, asset allocation policy return in excess of the market return, and a return of active management, the study clarified the contribution to portfolio performance of each component. Most of portfolio return variations come from the market’s overall movement, after removing the market movement, asset allocation and active management play an equally important role in explaining return variations. This assertion was confirmed through both time series regression analysis and cross sectional regression analysis. After removing the market movement, on average for typical funds about half of the return variations comes from detailed asset-allocation decisions in excess of the market movement and about half of the return variations comes from active management, although this equal result can dramatically change from one period to the next. This research highlighted the contribution of each component and highlights the significant contribution obtained from the extent to one a portfolio is invested in equities (market movement). When passively managed funds are considered asset allocation and market movement are the determinant factors of return variation, with asset allocation still being the chief factor in determining return levels.

The following chapter draws the conclusions and recommendations of the study and suggests areas for further research, also potential areas for studies are highlighted.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS
5.0. INTRODUCTION

The chapter draws upon results from the previous chapters to make generalisations about the importance of asset allocation in determining the performance of funds in Zimbabwe. The chapter summaries the findings of the study and gives recommendations. This study attributed portfolio return levels of Zimbabwe pension funds, unit trust funds and individual investors’ portfolios to their respective asset allocation policies. It was observed that the factor which differentiates one fund type and its performance from the other is its underlying asset classes. Market movement is responsible for most of the funds volatility.

5.1. CONCLUSIONS FROM THE STUDY

THE IMPORTANCE OF ASSET ALLOCATION ON PORTFOLIO PERFORMANCE

Asset allocation is a very important determinant of portfolio performance; however its importance is nowhere near 90 percent of return variations of a portfolio. Instead, most time-series variation comes from general market movement. After the removal of market movements the study realised that, active management and asset allocation play an almost equal important role in determining portfolio return variations within a peer group. In a passively managed fund market movement and asset allocation account for return variation and levels. In aggregate, asset allocation is the primary factor in the cumulative long-run return of a diversified portfolio, for aggregate return levels, asset allocation has the highest explanatory power. The findings of this study suggest that establishing an asset allocation consistent with an investor’s goals, investment horizon, and risk tolerance should be the first priority. It is true that no investment strategy can help if you sit on the sidelines. A big part of effective investing is in the fundamental work of getting cash invested quickly, through strategic asset allocation, keeping it at the desired balance, and knowing one’s risk tolerance so one can resist the temptation to move out at the first sign of turbulence.

5.1.0. SPECIFIC STUDY CONCLUSIONS

5.1.1. Asset allocation is the chief factor behind long-run portfolio return levels.
Asset allocation is the process by which returns are maximized for a given level of risk by allocating to low or negatively-correlated asset classes. Asset allocation is a key determinant in attempting to meet one’s long term financial goals. It is the most important decisions an investor faces. Many investors and fund managers appreciate that asset allocation is a very important factor, and on average 100 percent of aggregate returns. For aggregate return levels, asset allocation is the chief determining factor.

5.1.2. Market (ZSE) yearly movement (variation) has a higher explanatory power in explaining the volatility of return in investment funds.

The decision to be invested in risky assets, that is, equities is referred to as market movements and is responsible for most of the variations in investor returns, while a much smaller amount comes from the return variations coming from the granular asset-allocation decisions. This conclusion was reached using both time series and cross sectional regressions. Cross-sectional regressions naturally remove market movements; therefore, the cross-sectional results in most literature are equivalent to analyses of excess market returns even though the regressions were performed on total returns. In contrast, time-series analyses of total returns do not naturally remove market movements. An analysis of excess market returns either through time-series analyses or cross-sectional of either total or excess market returns, however, will result in consistent results always.

5.1.3. Asset allocation and active management have equal importance in explaining return variations in all actively managed funds.

Having established that active management and asset allocation have an almost equal explanatory power in explaining return variations, it means that moving from smaller list of asset-class factors to a single explanatory variable, such as the ZSE (single factor regression), will in most cases result in smaller reductions in the resultant average R-squared. Combined market return and asset-allocation return in excess of market return will be dominant over active investment management. This assertion is consistent with conclusions in literature which highlight that the market return observed added to asset-allocation return in excess of market return will have a higher explanatory power on total return variations in a portfolio.
5.1.4. In a passively managed fund with the same asset allocation, market movement and asset allocation explain return variations (volatility).

This is true since there would be no active management. On average, active managers cannot outperform the returns derived from passive investment strategies. Active management actually subtracts value from portfolio returns. Strategic asset allocation policy gives us the passive return (beta return), and the remainder of the return is the active return (alpha or excess return). The alpha sums to zero across all portfolios (before costs) because on average, managers do not beat the market. In aggregate, the gross active return is zero. Therefore, on average, the passive asset allocation policy determines 100 percent of the return before costs and somewhat more than 100 percent of the return after costs. The 100 percent answer pertains to the all-inclusive market portfolio and is a mathematical identity at the aggregate level.

5.1.5. THE STUDY’S PROPOSITION

The study’s proposition stated that portfolio performances in Zimbabwe are influenced by the asset allocation policy. The study showed that asset allocation has a higher explanatory power when it comes to return levels of a portfolio and has an equal importance with active management when it comes to return variation with market movement being the main contributor. The study concludes and accepts that portfolio return levels in Zimbabwe are influenced by their asset allocation policies.

These conclusions held in all time periods and all observed investment environments over the time period, bull market or bear market.

5.2. RECOMMENDATIONS
The results of this study will have an impact on the performance of fund managers and individual investors. It was noted that asset allocation has the most explanatory power when it comes to return levels. Fund managers, pension fund trustees and individual investors should focus much attention on getting the correct asset allocation strategies within the risk-return profiles of investors'. In order to come with optimal portfolios the following recommendations will be useful.

5.2.1. ESTABLISH AN ASSET ALLOCATION STRATEGY

The findings of this study suggest that establishing an asset allocation consistent with an investor’s goals, investment horizon, and risk tolerance should be the first priority. The means of implementing this allocation through a passively managed approach or through actively managed strategies is a secondary consideration with a far smaller impact on the risk/return characteristics of a broadly diversified portfolio. Since asset allocation decision follows setting the objectives and constraints, it is clear that the success of the investment program depends on the first step, the construction of the policy statement. Also adding a new asset to your portfolio will be optimal if it meets the following condition:

\[ \frac{(E(R_{new}) - R_f)}{\sigma_{new}} > \frac{(E(R_P) - R_f)}{\sigma_P} \cdot \text{Corr}(R_{new}, R_P). \]

5.1

The condition above means that, in order to gain by adding the new asset to your current portfolio holdings the Sharpe ratio of the new asset needs to be larger than Sharpe ratio of the portfolio multiplied by the correlation of the new asset’s return with portfolio, p's return.

5.2.2. ADOPT THE USE OF PORTFOLIO OPTIMISATION TECHNIQUES

Given that asset allocation is the most important factor impacting investment return performance, designing the correct optimal portfolio mix of assets cannot be done solely by human intuition. Portfolios must be constructed, ensuring optimal trade off between portfolio risks and portfolio returns, through mean variance analysis. As a result of using optimisation techniques, portfolios can be constructed with allocations that provide investors with greater expected return, less risk or both. According to
mean variance analysis, investors can optimally select a portfolio from portfolios that lie on the efficient frontier.

5.2.3. USE MULTI-FACTOR MODELS IN PORTFOLIO SELECTION

Investors can make use of multi factor models in order to evaluate expected performance. Multifactor models offer a different dimension for investors to search for ways to improve investment portfolios. Investors should know which priced risks they are facing and analyse the extent of their exposure. This can be made possible with a multi factor model. The use of models enhances portfolio optimisation; they provide a more reliable outcome than intuition. Compared with single factor models, multifactor models offer a rich context for investors to search for ways to improve portfolio selection.

5.2.4. DIVERSIFY USING ALTERNATIVE INVESTMENTS

Investors should consider diversification in asset classes to protect assets from market movements and generate higher returns at acceptable risk levels. The investable universe that once centred on two asset classes’ equities and bonds has been greatly expanded by the inclusion of alternative investments, in the form of real estate, private equity, currencies, commodities, natural resources, intangibles and subject to regulatory approvals international stocks.

When used appropriately, alternative investments can potentially enhance the overall risk- return profile of investment portfolios. They have unique benefits but also have unique risks associated with them as non traditional investment strategies, and as such it is important that investors be comfortable with particular alternatives when incorporating them into their investment strategy. Therefore, it is important to clearly understand the objectives and constraints of each investor, to determine the suitability of incorporating them into their existing investment approach, as each individual's circumstances are quite unique. Alternative investments are not a substitute for traditional asset classes, and they may be better viewed as compliments for achieving the desired risk- return profiles. Alternative investments are very important for the strategic asset allocations by all investors.
An allocation to alternative investments may provide a different way to diversify your portfolio. Historically, alternative investments have exhibited low or even negative correlations with the stock market.

5.2.5. EQUAL IMPORTANCE OF STRATEGIC ASSET ALLOCATION ACTIVE MANAGEMENT IN EXPLAINING RETURN VOLATILITY

If the contribution of strategic allocation and active management is equal, the implication for investors is that, for those who choose to rely on portfolios of passive vehicles, they could be missing out on a significant source of performance and closing off any possibility of capturing alpha from active management. The choice to rely strictly on passive vehicles is, therefore, not nearly as inconsequential as many have been led to believe. As for active management, finding managers who can add alpha over the long term is a hard task. Active management in general has not beaten the market in the long run. Outperforming the market is tough. There is very little evidence of persistence in performance of active managers. It can be concluded that passively managing portfolios is ideal.

5.3.0 RECOMMENDATIONS FOR FUTURE STUDIES
The findings of the study have implications for future research. The following suggestions are made to give a guide for future studies in this area. This study can be replicated using a longer time horizon, like ten year duration making an analysis of the data on a monthly or quarterly basis.

5.4. CHAPTER SUMMARY
In aggregate, 100 percent of return levels come from asset allocation, for aggregate return levels, asset allocation has the highest explanatory power. Asset allocation is the chief factor to consider when it comes to return levels of a portfolio. When it comes to return variability its impact is minimal. Instead, most time-series variation comes from general market movement. After the removal of market movements asset allocation and active management play an almost equal important role in determining portfolio return variations within a peer group. Investors must adhere to their investment policies, which forms the basis of an asset allocation policy, which in turn is the primary source of investment return. Diversified optimal portfolios can be constructed through multifactor models, which will result in optimal risk return profiles for investors.

APPENDICIES
The study’s empirical and quantitative analysis includes five primary steps: 1) style analysis, which allows us to infer the funds’ policy allocations; 2) a simple calculation of policy returns using asset class benchmarks and policy weights inferred from style analysis; 3) a regression of the funds’ actual returns against their policy returns that gives us an adjusted $R^2$; 4) a calculation of the ratio of the return of a fund’s policy allocation to its actual return; and 5) a calculation of the ratio of the standard deviations of a fund’s actual and policy returns. The details of each calculation appear below.

1. ESTIMATION OF POLICY ALLOCATION USING STYLE ANALYSIS

The policy weights, or asset allocation, for each fund are estimated by performing returns-based style analysis over the entire history of the fund. Style analysis (Sharpe, 1992) is a statistical method for inferring a fund’s effective asset mix by comparing the fund’s returns with returns of asset class benchmarks. Style analysis is a popular attribution technique because it does not require tabulating the actual asset allocation of each fund for each month over time. Rather, style analysis facilitates return attribution by regressing the return of the fund against the returns of asset class benchmarks. The following regression is estimated:

$$R_{t, \text{fund}} = \alpha + W_{\text{Stock}} r_{ts} + W_{\text{Bond}} r_{tB} + W_{\text{Cash}} r_{tc} + \epsilon_t, \quad (A1)$$

Where:

- $W_{\text{Stock}}$ is the policy allocation to stocks,
- $W_{\text{Bond}}$ is the policy allocation to bonds,
- $W_{\text{Cash}}$ is the policy allocation to cash,
- $R_{ts}$ is the return on equity benchmark in period $t$, $r_{tB}$ is the return on bond benchmark in period $t$,
- $R_{tc}$ is the return on cash benchmark in period $t$,
- $\alpha$ is the excess return on the fund that cannot be attributed to the returns on benchmarks,
- $\epsilon_t$ is the residual that cannot be explained by the asset class returns.
In this study, style analysis requires not only that asset class weight parameters sum to 1, but also that each asset class weight is positive (no short sales).

2. CALCULATION OF POLICY RETURN

The policy return of the fund is calculated from the policy weights and returns on asset class benchmarks in the following way:

\[ R_{t \text{policy}} = W_{Stock} r_{tS} + W_{Bond} r_{tB} + W_{Cash} r_{tC} - \text{cost}, \quad (A2) \]

Where:
- \( W_{Stock} \) is the policy allocation to stocks,
- \( W_{Bond} \) is the policy allocation to bonds;
- \( W_{Cash} \) is the policy allocation to cash,
- \( R_{tS} \) is the return on equity benchmark in period \( t \),
- \( R_{tB} \) is the return on bond benchmark in period \( t \),
- \( R_{tC} \) is the return on cash benchmark in period \( t \), and \( \text{cost} \) is the approximate cost, as a percentage of assets, of replicating the policy mix using indexed mutual funds. The cost is assumed to be 2 basis points each month (approximately 25 basis points annually).

3. THE RATIO OF AVERAGE POLICY RETURN TO AVERAGE ACTUAL RETURN

Policy return as a percentage of the actual return of each fund is the ratio of its average policy return to its average actual return:

\[ \frac{\left( \frac{1}{T}\sum r_{tpolicy} \right)}{\left( \frac{1}{T}\sum r_{tfund} \right)} \quad (A4) \]

When average policy return is greater than average actual return, this ratio is greater than 100%.

4. THE RATIO OF POLICY VOLATILITY TO ACTUAL VOLATILITY
The policy volatility as a percentage of the actual return volatility of each fund is the ratio of standard deviation of the policy return to the standard deviation of the actual return:

\[
\frac{\left(\frac{1}{T-1}\sum[r_{tpolicy}-\text{average}(r_{policy})]\right)^{0.5}}{\left(\frac{1}{T-1}\sum[r_{tfund}-\text{average}(r_{tfund})]\right)^{0.5}} \quad \text{(A5)}
\]

When policy volatility is smaller than actual return volatility, this ratio is smaller than 100%.

5. REGRESSION OF ACTUAL RETURNS AGAINST POLICY RETURNS

The coefficient of determination, \( R^2 \), is defined as the fraction of the total variation that is explained by the univariate regression between dependent variable \( y \) and independent variable \( x \),

\[
R^2 = b_1^2 \left( \sigma_x^2 \sigma_y^2 \right) \quad \text{(A5)}
\]

\[
R^2 = 1 - \left( \sigma_x^2 \sigma_y^2 \right)
\]

Where

- \( b_1 \) = the regression’s slope coefficient
- \( \sigma_x^2 \) = the variance of \( x \)
- \( \sigma_y^2 \) = the variance of \( y \)
- \( \sigma_e^2 \) = the unexplained or residual variance

6. VARIANCES FOR TIME-SERIES AND CROSS-SECTIONAL REGRESSIONS

Under the single-factor market model, the fund return for fund \( i \) is

\[
R_{it} = \sigma_{it} + \beta_{it} M_t + \varepsilon_{it} \quad \text{(A6)}
\]

Where

- \( R_{i,t} \) = average return to fund \( i \) that is not related to the market return in period \( t \)
- \( \beta_i \) = the sensitivity of fund \( i \) to the return on the market
- \( M_t \) = market return in period \( t \)
- \( \varepsilon_{i,t} \) = an error term
7. TOTAL RETURN TIME-SERIES VARIANCE

I take a variance operator on Equation A6 to get the time-series variance for fund \( i \):

\[
\sigma^2_i = \beta^2_1 \sigma^2_m + \sigma^2_{\varepsilon_i} \quad (A7)
\]

Where

\( \sigma^2_{\varepsilon_i} \) is the variance of the residual amount \((\alpha_i + \varepsilon_i)\).

The first component is the systematic risk, and the second component is the fund-specific risk. Assuming that the monthly standard deviation of the market return is 25 percent and the beta of the fund relative to the market is 0.9, the estimated systematic (i.e., market) risk is

\[
\beta_i^2 \sigma^2 = 0.25^2 \times 0.009^2 = 0.0032 \quad (A7.1)
\]

8. EXCESS MARKET TIME-SERIES VARIANCE.

On the basis of Equations A6 and A7, it can be shown that the excess market time-series variance for fund \( i \) is:

\[
\sigma^2_{\text{excess}} = (\beta_i - 1)^2 \sigma^2_m + \sigma^2_{\varepsilon_i} \quad (A8)
\]

The excess market return variance is typically much less than the total returns variance because with total returns, \( \beta_i \) is close to 1 for a typical fund. With excess market returns, \( \beta_i - 1 \) is typically closer to 0 than it is to 1. This result can be seen by continuing with our example based on commonly observed values and comparing the following estimate with Equation A7.1:

\[
(\beta_i - 1)^2 \sigma^2_m = (0.9 - 1)^2 \times 0.25 = 0.0006 \quad (A8.1)
\]

9. CROSS-SECTIONAL VARIANCE
It can show that the cross-sectional variance, $\sigma_{\beta,t}^2$, is conditional on a realized market return of $M_t$. In a given period $t$, the cross-sectional variance is

$$\sigma_t^2 = \sigma_{\beta,t}^2 M_t^2 + \sigma_{\epsilon,t}^2$$

(A9)

Where

$\sigma_{\epsilon,t}^2$ is the cross-sectional variance of fund betas.

Equation A10 assumes that the fund-specific risk, $\sigma_{\beta,t}^2$, is the same for all the funds (hence, no fund subscript). Assuming that the monthly market return and standard deviation of fund betas are 1 percent and 0.3, respectively, an estimate of the first term in Equation A10 is

$$\sigma_{\beta,t}^2 M_t^2 = (0.3)^2 \times 0.01^2 = 0.000001$$

(A9.1)

Comparing Equations A7.1, A8.1, and A9.1, we can see that the time-series variance is much higher than both the excess time-series variance and the cross-sectional variance. Note that Equation A8 is comparable to Equation A9, which indicates that excess market time-series and cross-sectional regressions are on the same footing, and that market movement is removed from both.

10. RETURN VARIATIONS DECOMPOSITION

To determine the contributions to total return variations from the three components, we need to modify Equation A6 as follows:

$$R_{i,t} = b_{1M} M_t + b_{1P} (P_{i,t} - M_t) + b_{1s} (R_{i,t} - P_{it}) + \epsilon_{i,t}$$

(A10)

Where

$b_{1M}$, $b_{1P}$, and $b_{1s}$ are the regression coefficients between $R_{i,t}$ and $M_t$, between $R_{i,t}$ and $(P_{i,t} - M_t)$, and between $R_{i,t}$ and $(R_{i,t} - P_{it})$, respectively—that is,

$$b_{1M} = \frac{\text{cov} (R_{it}, M_t)}{\text{var} (M_t)}$$

(A11)

$$b_{1P} = \frac{\text{cov} (R_{it}, P_{it} - M_t)}{\text{var} (P_{it} - M_t)}$$

and

$$b_{1s} = \frac{\text{cov} (R_{it}, R_{it} - P_{it})}{\text{var} (R_{it} - P_{it})}$$
Note that Equation A10 is not a standard multiple regression equation. I chose $b_{1M}$, $b_{1P}$, and $b_{1S}$ in this particular way because I needed to decompose $R^2$ into its three components. Taking a covariance with $R_{i,t}$ on both sides of Equation A10, I obtained

$$
\text{Cov} (R_{it}, R_{it}) = b_{1M} \text{cov} (M_t, R_{i,t}) + b_{1P} \text{cov} [(P_{i,t} - M_t), R_{i,t}] + b_{1S} \text{cov} [(R_{i,t} - P_{i,t}), R_{i,t}] + \text{cov} (\varepsilon_{it}, R_{it}) \tag{A12}
$$

Combining Equations A11 and A12 and the first part of Equation A6, we obtain:

$$
R_M^2 + R_P^2 + R_S^2 + R_\varepsilon^2 = 1 \tag{A13}
$$

Where,

- $R_M^2$, $R_P^2$, and $R_S^2$ are the $R^2$s of the univariate regressions between $R_{i,t}$ and $M_t$, between $R_{i,t}$ and $(P_{i,t} - M_t)$, and between $R_{i,t}$ and $(R_{i,t} - P_{i,t})$, respectively. $R_\varepsilon^2$ is a balancing term and is proportional to the covariance between $\varepsilon_{i,t}$ and $R_{i,t}$; I called it "interaction effect" in Table 4.2. The same methodology can be applied to Table 4.3.

11. RISK ADJUSTED NET VALUE ADDED

Using the information on individual investors’ funds I tested the assertion, that asset allocation is related to value added to passively managed portfolio. I tested the null hypothesis that asset allocation is not related to risk-adjusted net value added (RANVA) on passively managed funds. I tested whether the coefficient on the fraction of assets under passive management equals zero ($H_0: \alpha_2 = 0$), against the alternative hypothesis that the coefficient on the fraction of assets under passive management does not equal zero ($H_a: \alpha_2 \neq 0$). The $t$-statistic to this hypothesis is

$$
(\hat{\alpha}_2 - \alpha_2)/s_{\hat{\alpha}_2}
$$

Where:

- $\hat{\alpha}_2$ = the regression estimate of $\alpha_2$
- $\alpha_2$ = the hypothesised value of the coefficient (0)
- $s_{\hat{\alpha}_2}$ = the estimated standard error of $\hat{\alpha}_2$
\[ t - \text{statistic} = \frac{1.62 - 0}{0.85} = 1.9 \]
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