

UNIVERSITY OF CAPE TOWN



The relationship between assets under management and mutual fund performance. Does size matter? A South African investigation.

By

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Commerce Degree.**

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Acknowledgment and Declaration

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I hereby declare that I have read and understood the regulations governing the submission of Master of Commerce dissertations, including those relating to length and plagiarism, as contained in the rules of the University, and that this dissertation conforms to those regulations.

Abstract

This study investigates whether there is a potential relationship between mutual fund size and mutual fund performance using South African data. Academic studies on the relationship between mutual fund size and mutual fund performance has produced inconclusive results to date, with five potential outcomes being found, namely no relationship, a positive, a negative, a U-shaped, or an inverted U-shaped relationship.

Using monthly gross and net of fee data from two mutual fund categories as defined by The Association for Savings and Investment South Africa “ASISA”, namely equity (ASISA category South African EQ General) and multi-asset high equity (ASISA category South African MA Equity), the ten-year period from 2011 to 2020 was analysed. Additional to traditional risk-adjusted performance measures and unlike any previous South African studies, the study made use of performance measures based on well-known multi-factor asset pricing models. Furthermore, the potential for non-linearities in the relationship between mutual fund size and performance was also for the first time taken into consideration in the South African context with the inclusion of a quadratic equation in the regression specifications. Following a portfolio approach or ranking analysis, regression techniques were used to test for linear and quadratic relationships between mutual fund size and performance measures.

The regression analysis based on the portfolio approach found that there is a convex quadratic or U-shaped relationship between South African mutual fund performance and mutual fund size. The relationships were also found to be statistically significant. The findings of the study imply that there is an intermediate mutual fund size range (between approximately R43 million and R2.6 billion) where the trade-off between benefits of economies of scale (larger funds) and the flexibility to take more active equity positions and be nimbler in execution (smaller funds), can result in lower-than-average risk-adjusted fund performance. Furthermore, the results show that size is an important fund characteristic in understanding the continued performance of mutual funds in South Africa and can assist investors in choosing which mutual fund they can invest in.

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CHAPTER ONE: INTRODUCTION

One of the most popular ways for retail investors to get exposure to equity markets are through financial products called mutual funds, in South Africa mutual funds are commonly known as “unit trusts”. Mutual funds are investment vehicles which enable investors to pool their money to be professionally managed in a single investment vehicle or structure. Mutual funds invest in marketable instruments either under the guidance of an investment manager or in replication of a recognised market index. A mutual fund under the guidance of an investment manager is considered to be actively managed, whereas a mutual fund replicating a recognised market index is considered to be passively managed. Mutual funds offer investors the advantages of customer services which includes record keeping, the ability to move money around among funds, portfolio diversification, professional management at low costs and “mark-to-market” valuation for their assets (Fernando, Klapper, Sulla, Vittas, 2003). Although an investor outsources the investment management to an investment manager or passive management provider, the investor still bears the investment risk of the mutual fund. Despite this risk mutual funds have become very popular globally. The ongoing popularity of mutual funds globally (Fernando, Klapper, Sulla, Vittas, 2003) is evident in the growth in their assets under management (AUM)¹ of more than 14 percent in 2020, and net sales² growth of 21.48 percent from 2019. At the end of 2020 there were 126 457 individual open-end mutual funds worldwide³. These mutual funds held assets under management of \$63.059 trillion, and their popularity saw net inflows⁴ of over \$2.6 trillion. Globally, equity mutual funds dominate, representing 45 percent of the assets held in mutual funds, followed by bond mutual funds, which hold 21 percent of these assets (The International Investment Funds Association, 2021).

South Africa has also experienced this explosive growth in mutual funds (or unit trusts) from the industry’s humble beginnings in June 1965, when the Sage Fund of R600 000 was launched (Meyer-Pretorius & Wolmarans, 2006). By the end of December 2020, the assets under management of the South African mutual fund industry had increased to over R2.7 trillion, with strong net inflows reaching R212 billion for the year. Furthermore, South African investors had a choice of 1 686 mutual funds - an increase of 76 mutual funds during 2020. The South African mutual fund landscape⁵ is dominated by multi-asset (or balanced) mutual funds, which account for 46% of the mutual fund industry AUM,

¹ AUM refers to the mutual fund size total value.

² Net sales/Inflows are new flows plus reinvested dividends less redemptions plus net exchanges

³ This number excludes so-called “funds-of-funds”.

⁴ Net inflows are new flows plus reinvested dividends less redemptions plus net exchanges.

⁵ This excludes worldwide funds, regional funds and global funds.

followed by interest bearing mutual funds, which hold 35%, South African equity mutual funds with 17% and South African real estate mutual funds at 2%. (Association for Savings and Investment South Africa, 2020)

The strong growth in mutual funds can also be ascribed to the robust and effective regulatory frameworks in the countries where mutual funds are available to investors. In South Africa mutual funds are regulated by the Financial Services Conduct Authority (FSCA), which was previously known as the Financial Services Board (FSB). The legislation that regulates mutual fund administration, management and the sale of collective investments in South Africa is known as the Collective Investment Schemes Control Act (Act No. 45 of 2002), or more simply, as "CISCA". The Association of Savings and Investments South Africa (ASISA) is the industry body which assists the Financial Services Conduct Authority with the regulation of the industry. The majority of ASISA members are South Africa's asset managers, collective investment scheme management companies, linked investment service providers, multi-managers and life insurance companies (ASISA, 2019).

CISCA has four collective investment scheme categories, with the most predominate being "collective investment schemes in securities" (Kopke, 2015). ASISA has further developed classifications to promote investor awareness and understanding of different mutual fund portfolio types, assist with the comparison of mutual fund portfolios within and across classification categories, and assist with the assessment of potential risks of investing in a particular type of mutual fund portfolios. ASISA has a two-tier classification regime. The first ASISA tier classifies mutual funds into the following four categories i) South African portfolios (a mutual fund that invests at least 60% of its assets in South African markets), ii) worldwide portfolios (a mutual fund that invests in both South Africa and foreign markets), iii) global portfolios (a mutual fund that invests at least 80% of its assets outside South Africa with no restriction on the geography of assets) and iv) regional portfolios (a mutual fund that gives exposure of at least 80% to specific country or geographical region outside South Africa). The second ASISA tier follows on from the first tier, and classifies mutual funds in terms of investments strategy and asset allocation. There are four classifications i) equity portfolios, ii) multi-asset portfolios, iii) interest bearing portfolios and iv) real estate portfolios (ASISA, 2018)

The growth and popularity of mutual funds around the world, and more specifically in the United States of America, other highly developed countries and more recently developing countries, has led to a wealth of ever-increasing academic literature and studies on the performance of mutual funds, as well as on the factors that explain their performance. Furthermore, the literature is mostly country specific and follow the structure-conduct-performance paradigm (Fernando et al, 2003). One of the

topics of research that has attracted attention over the past few years in academic literature is the relationship between mutual fund size and mutual fund performance. Practitioners use both theoretical and empirical perspectives to understand the relationship (Chan, Faff & Gallagher, 2009). Some researchers argue that there are advantages to scale due to the fact that research costs, administration costs, overhead expenses and brokerage commissions do not increase in direct proportion to mutual fund size (Yan, 2008). Thus, the fund benefits from economies of scale. Other research practitioners, however, believe that a large mutual fund size detracts from fund performance because of trading costs associated with liquidity (Chen et al, 2004), as well as increased price impact associated with large transactions (Perold and Salomon, 1991). In this view, the fund is impacted by diseconomies of scale.

Most studies addressing the relationship between mutual fund size and performance focus on U.S. equity mutual funds (Ding, Zheng & Zhu, 2015). Despite a significant amount of U.S based research on this topic, the debate on whether mutual fund size impacts performance continues, because academic literature has not reached a clear consensus or outcome on the nature of the relationship (Bodson, Cavenaile & Sougne, 2011). In South Africa the relationship between mutual fund size and mutual fund performance is also not clear, in part due to very limited research done to date.

The lack of apparent consensus on the relationship between mutual fund size and mutual fund performance could be due to the fact that existing empirical evidence identify broadly led to five possible outcomes, namely i) no relationship - mutual fund size has no impact on performance⁶, ii) a negative relationship – mutual fund size detracts from performance⁷, iii) a positive relationship⁸ – mutual fund size benefits performance, iv) a quadratic u shape relationship – mutual fund size initially detracts from performance until an inflection point is reached thereafter mutual fund size benefits performance⁹, but thereafter detracts from performance and v) a quadratic inverted-u shape relationship – mutual fund size benefits performance until an optimum size is reached , but thereafter detracts from performance¹⁰.

⁶ Hibbert (2003) found no relationship between mutual fund size and performance within South African mutual funds. Using only equity mutual funds and more recent data, Kopke (2015) also found no relationship between mutual fund size in South Africa.

⁷ Chen et al. (2004) find that mutual fund size detracts from performance due to liquidity reasons arising from trading costs.

⁸ A positive relationship is found by Elton, Gruber & Blake, (2012), and is ascribed to economies of scale. The study focused on American mutual funds.

⁹ In Brazil Malaquias, De Sarvas & Oliveria, (2016) found evidence of a u-shaped relationship using a sample of multimarket funds. Both small and large funds are performance maximisers.

¹⁰ Using a general framework, Bodson, Cavenaile & Sougne. (2011) find that there is an inverted U shape relationship between US mutual fund size and performance. This suggests the existence of an optimal mutual fund size for maximizing performance.

With such a variability of results possible, Ding, Zheng and Zhu (2015) show that the direction of causality could be impacted by the performance measure used in a particular study. Risk adjusted performance measures like the Sharpe Ratio, Treynor Ratio, Jensen's Alpha and Information Ratio are the performance measures usually used in the relationship studies between mutual fund size and mutual fund performance (see, for example, Kopke, 2015; Yan, 2008; and Indro et al, 1999). In South Africa, there is no evidence of superior performance from general equity mutual funds, potentially indicating a lack of performance persistence (Gilbertson & Vermaak, 1982; Mbiola, 2013). Moreover, South African mutual fund managers are found to be unable to display good performance in both selectivity skills and market timing abilities (Tan, 2015).

1.1. Research problem and purpose

This study is motivated by the apparent lack of consensus in international academic literature on the relationship between mutual fund performance and size, as well as the lack of research on this topic in developing countries in general, and South Africa in particular. The purpose of the study is therefore to seek further clarity on this question, within the South African investment environment and institutional context, especially amongst retail mutual funds available for investors in South Africa. The South African investment environment and institutional context is unusual as the country is an emerging market with a well-regulated, sophisticated, and mature savings and investment industry and well-developed mutual fund industry, which is not the norm for most developing countries.

The main hypothesis for the study is:

H_{1o} = There is no statistically significant relationship between South African mutual fund performance and mutual fund size

H_{1a} = There is a statistically significant relationship between South African mutual fund performance and mutual fund size

In addition to the above hypothesis, the following sub-hypotheses for this study are:

Positive relationship:

H_{2o} = The relationship between South African mutual fund performance and mutual fund size is positive

H_{2a} = The relationship between South African mutual fund performance and mutual fund size is not positive

Negative relationship:

H_{3o} = The relationship between South African mutual fund performance and mutual fund size is negative

H_{3a} = The relationship between South African mutual fund performance and mutual fund size is not negative

Non-linear relationship:

H_{4o} = The relationship between South African mutual fund performance and mutual fund size is non-linear

H_{4a} = The relationship between South African mutual fund performance and mutual fund size is not non-linear

1.2. Novelty and contribution

In line with other studies the basic CAPM-based risk adjusted performance measures are used in this study. However, unlike previous studies done in South Africa and only selectively in some international studies, the well-known Fama and French Three-Factor (Fama and French, 1993), Carhart Four-Factor (Carhart, 1997) and Fama and French Five-Factor (Fama and French, 2015) multifactor performance models are also used as risk-adjusted performance measures in this study to reduce the variability of results and to increase robustness. Using a portfolios approach or ranking analysis methodology in line with other studies and using regression analysis to test whether there is a size-performance relationship and optimal mutual fund size, this study also goes beyond most previous South African studies by not only statistically testing for a linear relationship, but also including a quadratic term in the regression specification to tests for a possible quadratic relationship (*i.e.*, for a possible optimal fund size with respect to performance). This aspect, which has previously been investigated in a study by Yan (2008), has not previously been extended to a developing market, and is therefore also novel in the South African context. Thus, if a more empirically derived optimal mutual fund size range can be found, it would be of benefit to both retail investors and the investment industry.

Due to the important savings role mutual funds play in South Africa, this study is intended to explore the exact nature of the performance relationship to scale for South African mutual funds. South Africa has a weak savings culture and in 2019 the gross savings rate was less than 15% of GDP (Stanlib, 2020). Furthermore, South Africa is unusual as there is an overconcentration in the local mutual fund industry, with over 53% of industry assets under management managed by only six asset management

companies (27four, 2021). The results of this study could also be useful to local investors who are faced with many choices when making investment decisions with regards to mutual funds. A simple measure like fund size can be used, in combination with fund ratings provided by service providers like Morningstar, to choose the best fund for their needs.

The rest of this study proceeds as follows: Chapter 2 provides the literature review. Chapter 3 presents the data and methodology used, Chapter 4 describes the results and analysis of the study, and Chapter 5 concludes.

CHAPTER TWO: LITERATURE REVIEW

The growth and popularity of mutual funds has led to much research on their performance (Kopke, 2015). The premise of active management is that an actively managed mutual fund will outperform the market in which it invests. Thus, good investment managers are ones who experience positive risk-adjusted net returns, by efficiently using the money they receive to gather information and eventually act on it (Perold & Salomon, 1991). Risk-adjusted performance measures are the mainstay of mutual fund performance comparison and measurement and, together with the asset pricing models on which they are based, are discussed in the following sections.

2.1 Theoretical Asset Pricing Models

2.1.1 Modern Portfolio Theory

The study of mutual fund performance is grounded in the classical work of Markowitz (1952). Using two assumptions, namely that investors maximise future anticipated returns, and that they are risk averse (i.e., that variance of return is undesirable for investors), Markowitz (1952) shows that one can assemble a portfolio with an assortment of assets that can maximise expected return for a stated level of risk. In Markowitz' model a stochastic return at time t is achieved after an investor selects a portfolio at time $t-1$ (Fama & French, 2004). The general form of the model for n different assets is as follows (Markowitz, 1952):

Portfolio Return:

$$E(R_p) = \sum_i w_i E(R_i) \quad \text{Equation 1}$$

Where:

R_p is the return on the portfolio

R_i is the return in asset i

w_i is the weighting of component asset i

Portfolio Volatility:

$$\sigma_p^2 = \sum_i \sum_j w_i w_j \sigma_{ij} \quad \text{Equation 2}$$

Where $\sigma_{ij} = \sigma_i \sigma_j \rho_{ij}$ is the sample covariance of the periodic returns on two assets

Implicit in the portfolio selection process is diversification and the law of large numbers, which cannot be accepted when applied to a portfolio of securities, as diversification cannot reduce all the risk. This implies that the portfolio with the maximum expected return may not be the one with the lowest

variance. There is a trade-off that all investors must accept – increase expected return by adding more risk, or decrease risk by giving up expected return. However, the trade-off will be assessed differently by each investor given their specific risk tolerance level (Markowitz, 1952).

2.1.2 The Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (or asset pricing model) was created to attempt to answer the first stage in the process of selecting a portfolio, which was not solved for by Modern Portfolio Theory. At the time, many practitioners were developing their own capital asset pricing models. However, the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965a) is regarded as the starting point of asset pricing theory (Fama & French, 2004). Within financial literature the model developed by Sharpe, Lintner and Black (the SLB Model)¹¹ is regarded as the de-facto CAPM, which builds on Modern Portfolio Theory. The CAPM turns the Modern Portfolio Theory's algebraic condition on asset weights into mean-variance-efficient portfolios, and a testable prediction of the relation between risk and expected return, by identifying a portfolio that must be efficient if asset prices are to clear the market of all assets (Fama & French, 2004). In order for the CAPM to hold, some assumptions additional to that of Markowitz's are added, as follows (Watson & Head, 2007):

- Complete agreement: all investors agree on the joint distribution of asset returns from $t - 1$ to t , and this distribution is the true one.
- Investors hold diversified portfolios: investors will only require a return for the systematic risk of their portfolios, since unsystematic risk has been removed and can be ignored. Unsystematic risk is specific risk associated with individual assets or a portfolio which can be diversified away. Systematic risk is market risk or risk that is common for all market assets or participants.
- Single-period transaction horizon: a standardised holding period is assumed as to make it possible to compare returns on different securities.
- Investors can borrow and lend at the risk-free rate of return and this does not depend on the amount borrowed or lent.

The additional CAPM assumptions ensure that the market portfolio is on the efficient frontier for the asset market to clear. The efficient frontier is the portfolio which generates the maximum expected return for a given amount of risk. If this is the case the algebraic relation that holds for any minimum variance portfolio must hold for the market portfolio. With this knowledge, the well-known Sharpe (Sharpe, 1964) and Lintner (Lintner, 1965a) CAPM model is derived.

¹¹ Sharpe (1964), Lintner (1965a) and Black (1972)

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) \quad \text{Equation 3}$$

Where:

$E(R_i)$ is the expected return

R_f is the risk-free rate

β_i is the beta

$E(R_m)$ is the expected return of the market

$E(R_m) - R_f$ is the market risk premium

Despite the CAPM having a poor empirical record in financial literature (Fama and French, 2004) it is still widely used (Hawaldar, 2011). The continued attraction to the CAPM is that it is intuitively easy to apply and to interpret. Furthermore, it provides a good understanding of the relation between expected return and risk. In relation to mutual fund performance, the Capital Asset Pricing Model (CAPM) was the gateway for the development of risk-based performance measures.

2.2 Risk-adjusted performance measures

The most popular risk-based measures used in mutual fund performance measurement, particularly in the investment industry, are the Sharpe ratio developed by Sharpe (1966), Jensen's Alpha developed by Jensen (1968), the Treynor Ratio developed by Treynor (1965).

2.2.1 The Sharpe ratio

The reward-to-variability ratio now commonly known as the Sharpe Ratio was created by William Sharpe to explicitly connect the relationships between recent developments in capital theory of the time and alternative models of mutual fund performance and subject these alternative models to empirical tests (Sharpe, 1966). This measure, developed as an indicator of mutual fund performance, was one of the first to incorporate risk, linking it to capital asset pricing under conditions of risk theory like the CAPM. Furthermore, the ratio made it possible for cross sectional comparison of mutual funds. The ratio is defined as:

$$SR_p = (R_p - R_f)/\sigma_p \quad \text{Equation 4}$$

Where;

SR = the Sharpe Ratio

R_p = return on portfolio

R_m = return for the period

R_f = risk free interest rate

σ_p = standard deviation of the annual rate of return

In the Sharpe Ratio, the numerator describes the reward received for bearing risk above the riskless asset, and the denominator describes the actual risk experienced. Thus, the ratio is a measure of reward per unit of risk, with a high ratio being more desirable. As a predictor measure of mutual fund performance, Sharpe found that differences in mutual fund performance can be predicted by the reward-to-variability ratio, but not perfectly. To get this result Sharpe considered the ten preceding years (1944 – 1953) for the 34 mutual funds he had used and calculated the reward-to-variability of all 34 during this period and ranked them from highest to lowest Sharpe (1966)

2.2.2 The Treynor Ratio

The Treynor ratio, also known as the reward-to-volatility ratio, is similar to Sharpe Ratio, but defines risk somewhat differently. Thus, according to Treynor (1965) there is more than one kind of risk in a diversified mutual fund, namely stock market volatility and individual asset/security volatility. The Treynor ratio is defined as:

$$T = R_m - R_f / \beta_m \quad \text{Equation 5}$$

Where:

T = the Treynor Ratio

R_m = mutual fund return for the period

R_f = risk free interest rate

β_m = Beta of investment

The numerator describes the reward received for bearing risk above the riskless asset, and the denominator describes the market volatility experienced. The Treynor Ratio is a more of a relative ranking tool and not a mutual fund performance predictor. However, it is still relevant as a risk adjusted performance measure for mutual fund comparison.

2.2.3 Jensen's alpha

Jensen's risk based mutual fund performance measure is directly built on the theory of the capital asset pricing model (CAPM). This absolute performance measure is a measure to evaluate a portfolio manager's ability to generate returns through successful prediction of security prices which are higher than those which we could expect given the level of riskiness of his or her portfolio (Jensen, 1968). Using the well-known CAPM formula,

$$E_R = R_f + \beta(R_m - R_f) \quad \text{Equation 6}$$

Jensen derives a general model which can be used to test the predictive ability of a fund manager, as follows:

$$R_{jt} - R_{ft} = \alpha_j + (\beta_j + \epsilon_{jt})[R_{Mt} - R_{Ft}] + U_{jt} \quad \text{Equation 7}$$

Where:

R_{jt} = Portfolio return

R_{ft} = Risk – free rate of return

R_{Mt} = Return of the market

α_j = alpha term

β_j = Beta or systematic risk

ϵ_{jt} = a normally distributed random variable

U_{jt} = error term

To test the model Jensen (1968) used a sample consisting of returns for 115 open end mutual funds in the US for which net asset and dividend information was available for the ten-year period 1955 to 1964. To test the model an ordinary least squares regression was used, and based on the statistical results Jensen concluded that the 115 mutual funds were on average not able to predict security prices well enough to outperform a buy and hold strategy. Furthermore, there was also little evidence that any individual fund could significantly do better than that which is expected from mere random chance (Jensen, 1968)

2.3 Multi-Factor Models

Multi-factor models are considered as extensions of the capital asset pricing model (CAPM), which is a single factor model. A multi-factor model employs a set of different factors in its computations in order to analyse and explain market phenomena, as well as equilibrium prices of an asset (Robeco, n.d). The three best known multi-factor models found in the academic literature are the Fama-French Three-Factor Model (Fama & French, 1993), Carhart Four-Factor Model (Carhart, 1997) and Fama-French Five Factor Model (Fama & French, 2015)

2.3.1 Fama-French Three-Factor model

The Fama-French Three Factor Model is an extension of the capital pricing model (CAPM). As the name of the model suggests it has three factors, excess return, size and value. The model was developed

after Fama and French (1992) using non-financial companies' stock information, formed 100 portfolios based on size and pre ranking betas and found that size and value have the explanatory power to describe the majority of stock returns (Fama & French, 1992). Fama and French (1992) developed their factor model after observing that small cap shares and shares with high book-to-market ratios also known as value shares usually do better than the market portfolio. Small Capitalisation shares are shares of companies which are considered to have a market value of between \$300 million and \$2 billion. Using their model Fama and French (1993) contend that the size and value factors capture a dimension of systematic risk that is not captured by market beta in the Capital Asset Pricing Model (CAPM) and explains the majority of the portfolio returns (Robeco, 2020). The Fama-French Three-Factor Model is defined as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_m - R_f)_{it} + \beta_iSMB_{it} + \beta_iHML_{it} + \varepsilon_{it} \quad \text{Equation 8}$$

Where;

R_{it} = the return of percentile i at time t less the risk-free rate

R_{ft} = the risk free rate at time t

α_{it} = the multifactor model alpha of percentile i at time t

R_{mt} = return of the market at time t

β_i = the multifactor loadings of percentile i

SMB_{it} = the return of the size factor

HML_{it} = the return of the value factor

2.3.2 Carhart Four-Factor model.

The Four-Factor Model developed by Carhart (1997) was developed by using Fama and French's (1993) Three Factor Model and adding an additional factor capturing Jegadeesh and Titman's (1993) one-year momentum anomaly Carhart's inclusion of the Jegadeesh and Titman's (1993) one-year momentum was due to the Fama and French (1993) Three-Factor Model's inability to explain cross-sectional variation in momentum-sorted portfolio returns. The Carhart Four-Factor Model is defined as follows:

$$R_{it} = \alpha_{it} + \beta_iMKT_{it} + \beta_iHML_{it} + \beta_iSMB_{it} + \beta_iMOM_{it} + \varepsilon_{it} \quad \text{Equation 9}$$

Where;

R_{it} = the return of percentile i at time t less the risk-free rate

α_{it} = the multifactor model alpha of percentile i at time t

β_i = the multifactor loadings of percentile i

MKT_{it} = the return of the market index

HML_{it} = the return of the value factor

SMB_{it} = the return of the size factor

MOM_{it} = the return of the momentum factor

Using data from of equity mutual funds from 1962 to 1993 Carhart (1997) found that the 4-factor model can explain considerable variation in returns with sensitivities to the size and momentum factors being responsible for most of the explanation.

2.3.3 Fama-French Five-Factor Model.

With two additional factors namely profitability and investment, the Fama-French Five Factor Model is an expansion of the Fama-French Three Factor Model. Due to the two extra factors the model performs better than the Fama-French three Factor Model (Fama and French, 2015). Fama-French expanded the model as there was growing empirical evidence that the three-factor model misses much of the variation in returns attributable to profitability and investment. The Fama-French Three-Factor Model is defined as follows:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_i(R_m - R_f)_{it} + \beta_iSMB_{it} + \beta_iHML_{it} + \beta_iRMW_{it} + \beta_iCMA_{it} + \varepsilon_{it}$$

Equation 10

Where;

R_{it} = the return of percentile i at time t less the risk-free rate

R_{ft} = the risk free rate at time t

R_{mt} = return of the market at time t

α_{it} = the multifactor model alpha of percentile i at time t

β_i = the multifactor loadings of percentile i

SMB_{it} = the return of the size factor

HML_{it} = the return of the value factor

RMW_{it} = the return of the profitability factor

CMA_{it} = the return of the investment factor

2.4 Empirical evidence on the size-performance relationship for mutual funds.

As previously mentioned, the four types of findings reported in the academic literature with regard to the relationship between mutual fund size and mutual fund performance are (i) no relationship, (ii) a negative relationship, (iii) a positive relationship, (iv) a quadratic u-shape relationship and (v) a quadratic inverted-u shape relationship.

Only a few theories have been presented as possible reasons for the various types of relationships. Chen et al, (2004) put forward a “liquidity hypothesis”, in which liquidity (defined as a factor based on transaction costs) is seen as a major factor affecting the direction of the relationship. This “liquidity hypothesis” is anchored in the understanding that small mutual funds are nimble enough to move in and out of positions and adjust their investment views or add new investment ideas easily, whereas large mutual funds are inflexible and find it difficult to move in and out of positions. Furthermore, executing new investment ideas becomes difficult because of size (Ding, Zheng & Zhu, 2015; Pastor, Stambaugh & Taylor, 2015).

Expanding on the “liquidity hypothesis” Yan (2008) proposes a “transaction cost hypothesis”. The “transaction cost hypothesis” is anchored in the understanding that transaction costs can have a material impact (positive or negative) on performance based on the size of a mutual fund. There could either be economies of scale (costs decreasing as mutual fund size increases) or diseconomies of scale (costs increasing as mutual fund size increases) for mutual funds (Yan, 2008; Pastor, Stambaugh & Taylor, 2015). Another reason linked to liquidity is “flow of funds”.

Berk and Green (2004) developed a model that attempts to explain how this factor “flow of funds” can play a role in the type of relationship between mutual fund size and performance. The Berk and Green Model reveals that despite there being rational learning of fund performance and decreasing returns to scale in fund management, there should be no persistence in mutual fund performance in the presence of manager skill if capital markets are perfect. Decreasing returns to scale is an important assumption of the Berk and Green model. A two-step mechanism lies at the heart of the model, which is responsible for the removal of abnormal fund performance and its accompanying persistence (Ferreira, et al., 2016).

A summary of the relevant literature and respective findings is presented in Table 1, below, before the body of literature on the subject is discussed in more detail.

Table 2.1: Summary of select studies on the relationship between mutual fund size and performance

Author	Market	Result
Hibbert (2003) ¹²	South Africa	No relationship
Clark (2004)	United States of America	No relationship
Kopke (2015) ¹³	South Africa	No relationship
Chen et al, (2004)	United States of America	Negative relationship
Yan (2008)	United States of America	Negative relationship
Pollet & Wilson (2008)	United States of America	Negative relationship
Pillay, Muller & Ward, (2010)	South Africa	Negative relationship
Pastor, Stambaugh & Taylor, (2015)	United states of America	Negative relationship
Elton, Gruber & Blake, (2012)	United States of America	Positive relationship
Malaquias, De Sarvas & Oliveira (2016)	Brazil	U-shape
Ding, Zheng & Zhu (2015)	Asia	U-shape
Indro et al. (1999)	United States of America	Inverted u-shape
Tang, Wang & Xu, (2012)	Peoples Republic of China	Inverted u-shape
Bodson, Cavenaile & Sougne, (2011)	United States of America	Inverted u-shape

¹² Masters Dissertation

¹³ Masters Dissertation

2.4.1 Examples of studies finding no relationship

In South Africa Hibbert (2003), using data covering the period 1990 to 1999, found no statistically significant evidence that suggests a relationship between mutual fund size and risk-adjusted mutual fund performance. It is important to note that unlike other studies, Hibbert (2003) included mutual funds with different investment styles such as sector specific funds and balanced funds, instead of focusing on only equity mutual funds as most similar studies do. Hibbert (2003) further found that economies of scale were not present in the South African mutual fund industry, given the lack of statistically significant relationship between South African mutual fund size and their costs. This seems contrary to the economies of scale argument. However, Hibbert (2003) argues that his findings may be due to cost savings of the lower negotiated transaction fees by large funds being negated by additional transaction fees that must be entered into by large funds in order to fill larger deal orders.

Using graphical modelling to determine any dependencies that may exist between mutual fund performance and mutual fund size, Clark (2004) finds for the most part U.S mutual fund size does not affect U.S mutual fund performance. In line with other studies Clark (2004) made use of only actively managed funds. However, similar to Hibbert (2003), mutual funds with different investment styles were included in the study and only bond and international mutual funds were excluded. By classifying the mutual funds further into size quintiles based on stock holdings of large-capitalisation companies (market values greater than \$10 billion), mid-capitalisation companies (market capitalisations between \$2 billion and \$10 billion), and small-capitalisation companies (market values between \$300 million and \$2 billion), Clark (2004) further finds that only in small-cap funds does mutual fund size affect mutual fund performance. He postulates that this may be due to the often-cited liquidity issues in small-cap funds.

Kopke (2015) examines whether there is any prima facie relationship between mutual fund size and mutual fund performance in South Africa. The study examined South African actively managed general equity mutual funds over a ten-year period, but excluded funds which have been in existence for less than eighteen months to avoid upward bias. The mutual funds were also ranked into five different quintiles based on the size the mutual fund. This ranking analysis is popular in studies on this topic (see, for example, Chen et al., 2004; Clark, 2004; and Yan, 2008). Using only linear regression analysis Kopke (2015) finds that there is no statistically significant relationship between mutual fund size and mutual fund performance across the entire sample. However, without empirical testing or evidence Kopke (2015) claims that there may possibly be an inverted u-shape relationship between mutual fund

size and mutual fund performance, and postulates a simply derived optimal fund size range in South Africa to be between R912 million and R1.930 billion.

2.4.2 Examples of studies finding a negative relationship

Chen et al., (2004) found a negative relationship between mutual fund size and mutual fund performance. In their study they documented that fund returns, both gross and net of investment costs, decline with lagged fund size, even after accounting for various performance benchmarks. These researchers reason that the negative effect of the relationship is due to liquidity. To test this “liquidity hypothesis”, a liquidity factor based on trading costs was included in the study, and it was found that this association is most pronounced among funds that have to invest in small and illiquid stocks. A reason given for this result is that mutual funds that invest in small stocks will likely need new stock ideas as the mutual fund grows in size, as small stocks are notoriously illiquid. Additional to this the paper hypothesises that organisational diseconomies like hierarchy costs are also a cause for mutual fund size eroding mutual fund performance. Chen et al (2004) further investigate the effect of family fund size on performance. Fund families are a grouping of different types mutual funds that are from the same investment manager. Controlling for fund size, it was found that the relationship between mutual fund size and mutual fund performance is actually positive for a fund family. A possible explanation for this is that at the fund family level, where all the assets are aggregated, investment managers are able to benefit from economies of scale coming from lower trading costs and trading commissions, and can also potentially earn higher stock lending fees. The data used for this study consisted of 3439 distinct diversified U.S equity mutual funds spanning the period 1962 to 1999. For a fund to be included in the sample the fund’s assets under management and monthly returns had to be reported, and additionally it was required that funds have at least one year of reported returns. Furthermore, funds with less than \$15 million in assets under management were excluded to avoid upward bias. The methodology of the study made use of cross-sectional variation, which was deemed fit by Chen et al (2004), as it was argued that measuring the effect of fund size on performance using cross-sectional regressions is more robust and less subject to the regression to the mean bias as compared to the fixed effects method.

Following on from the research of Chen et al (2004), Yan (2008), using both a time-series approach and cross-sectional approach, found a negative relationship between mutual fund size and mutual fund performance, which is explained by the role of liquidity. Yan (2008) expands Chen et al (2004) research by using more direct measures of liquidity, and takes into account the effect of investment style, which is believed to provide additional insight into the nature of the economies of scale in active fund management. With regard to investment style, Yan (2008) found that a pronounced negative

relationship between mutual fund size and mutual fund performance exists among growth and high turnover funds. Both these types of mutual funds have the characteristic of immediacy and therefore attract higher trading costs. The study used stock transaction data along with detailed stockholding for a comprehensive sample of U.S. actively managed equity mutual funds from 1993 to 2002. Two sets of liquidity measures for each fund's portfolio were created. The first set of liquidity measures was based on the quoted and effective spreads of all stocks held in a mutual fund's portfolio. The second set of liquidity measures was a function of the stock's market capitalisation as well as relative holding size, and was designed to capture the level of market impact of a mutual fund's portfolio. The effect of liquidity on the relation of mutual fund size and mutual fund performance was examined using a time-series portfolio approach and a cross-sectional regression approach. The cross-sectional approach was favoured as it allows for the controlling of other fund characteristics. The performance of each portfolio was evaluated by using four standard asset pricing models, namely the Capital Asset Pricing Model (CAPM), the Fama-French (1993) Three-Factor Model, the Carhart (1997) Four-Factor Model, and a conditional four-factor model (Ferson & Schadt, 1996).

Pollet and Wilson (2008) investigate how portfolio managers respond to increased mutual fund size, on the assumption that diminishing returns should alter investment behaviour. Thus, fund behaviour should respond to constraints imposed by growth regardless of whether diminishing returns to scale affect fund performance. To conduct the study two basic propositions are considered. The first is that, in the presence of liquidity costs, fund managers will slowly increase the number of distinct holdings in their portfolios in response to flows of new money. The response will be greater when liquidity costs are more severe. Secondly, fund managers will increase ownership in shares in response to new flows at a declining rate as the fund size grows. Pollet and Wilson (2008) measure the extent to which funds diversify in response to growth in asset size, using the returns, total net assets and management objectives of 1421 US mutual funds spanning the years 1975 to 2000, as well as each mutual funds' equity holdings over the period to determine its style. Similar to Chen et al (2004), mutual funds below \$100 million in assets under management were excluded in this instance due to upward performance bias. A regression using panel specification was used to test the data and to follow funds over time. The study finds that a negative relationship exists between mutual fund size and mutual fund performance, despite large and small-cap mutual funds diversifying their portfolios in response to growth. This is caused by the inability to scale an investment strategy as the mutual fund becomes large, and it is thus evident that insufficient diversification is not an effective measure when dealing with increased mutual fund size.

Using actual South African stock price data over the 18-year period from 1991 to 2008, Pillay, Muller and Ward (2010) construct and simulate random portfolios of different sizes. Limiting the portfolios

to forty randomly selected shares out of a population of 160 investable shares listed on the Johannesburg Securities Exchange (JSE), it is found that there is a negative relationship between fund size and fund performance. Liquidity is also in this instance believed to be a reason for this. Additionally, Pillay et al (2010) find that the negative relationship is more pronounced in portfolios that are larger than R5 billion, and postulates that actively managing large funds may be ineffective. It is further implied that there may be an optimal fund size in the South African market.

Using a novel approach of industry returns to scale by focusing on actively managed US equity mutual funds between 1979 - 2011 and taking into account the endogeneity of fund size Pastor, Stambaugh and Taylor, (2015) found strong evidence of a negative relationship between mutual fund size and performance at an industry level. The result is consistent with previous research from the US. To ensure that the biases created by the endogeneity of fund size were eliminated in the study, fund fixed effects were included in the regression model and a recursive demeaning procedure was created and used.

2.4.3 Examples of studies finding a positive relationship

Elton, Gruber and Blake, (2012) interrogate the Berk and Green (2004) model, which is based on the argument that despite there being rational learning of fund performance and decreasing returns to scale in fund management, there should be no persistence in mutual fund performance in the presence of manager skill should capital markets be perfect. Additionally, decreasing returns to scale is an important assumption of the Berk and Green (2004) model. Looking at all U.S mutual funds listed in the The Centre for Research in Security Prices (CRSP) database over a ten-year period 1999 to 2009, and excluding all international, index, sector, lifecycle, and flexible funds, as well as funds backing variable annuity products, in contrast to Berk and Green (2004) a weak but positive relationship is found between mutual fund size and mutual fund performance (*i.e.*, increasing returns to scale is found). Furthermore, the study also finds that expense ratios and management fees decline with increasing mutual fund size and positive performance. To resolve the conflict that is found in the study, Elton, Gruber and Blake (2012) speculate that mutual fund performance persistence continues because expense ratios decrease with size, and large mutual funds may have greater access to the best quality traders and analysts.

2.4.4 Examples of studies finding a U-shape (quadratic) relationship

Addressing Brazil, a South American country that has also seen substantial growth in mutual funds, Malaquias, De Sarvas and Oliveira (2016), using a portfolio approach where mutual funds were split into four quartiles based on size and monthly return data from January 2009 to March 2014, find evidence of a U-shaped relationship between mutual fund performance and size. A major difference

for this study was the use of multimarket funds¹⁴ instead of equity mutual funds, which is the common practice in most of the academic literature. However, to make the study comparable to other similar studies the “variable size” of each fund was used, which represents the natural logarithm of the monthly equity of each fund.

Ding, Zheng and Zhu (2015) find that, in contrast to U.S mutual funds, fund size benefits mutual fund performance in emerging Asia¹⁵. This difference can largely be attributed to improving liquidity conditions and minimal impact of transaction costs which occurred over the period that is covered by the study (May 2003 to February 2009). Fast economic and financial liberalisation saw the equity markets in emerging Asia perform very well and outperform the U.S equity market. The liquidity improvement (or lack of liquidity constraints) is contrary to previous research, which suggests that liquidity is an important consideration in the nature of the relationship between mutual fund performance and size (see, for example, Yan, 2008). Ding, Zheng and Zhu, (2015) argue that the high returns experience over this period are more than enough to cover transaction costs and to have an impact. Furthermore, the high returns attracted investors which led to more active trading, thus reducing constraints that usually effect the performance of large funds. Due to these unique circumstances, Ding, Zheng and Zhu (2015) find a U-shaped relationship between mutual fund performance and mutual fund size in emerging Asia during their sample period.

2.4.5 Examples of studies finding an inverted U-shape (quadratic) relationship

Indro et al (1999) studied a sample of 683 U.S actively managed non-indexed equity mutual funds over the period 1993 to 1995, using their returns, expense ratios, turnovers, net assets and fund classifications (growth-oriented managers, value-oriented managers and blend orientated managers). A series of multiple cross-sectional regressions was run, and it was found that once a mutual fund has exceeded it optimal size, the marginal returns become negative. Thus, once a mutual fund has exceeded it optimal size, the marginal returns become negative. This implies that a mutual fund needs to manage a minimum assets amount in order for it to benefit from the economies of scale derived from reduced trading costs and commissions, as well as fixed costs which do not rise in direct proportion to mutual fund size. Furthermore, Indro et al (1999) also investigated whether the above finding was linked to investment styles. Specifically, three investment styles, namely value¹⁶, growth¹⁷

¹⁴ Multimarket funds have the ability to invest in different asset classes

¹⁵ A broad classification was used. Funds with the following target market ASEAN, Asia ex-Japan Regional, China, Greater China, India, Indonesia, Malaysia, Malaysia & Singapore, Pakistan, Philippines, Thailand, Vietnam, Hong Kong, Singapore, Taiwan and South Korea

¹⁶ Value Investing is an investment style that seeks to exploit shares that are trading below their intrinsic value

¹⁷ Growth Investing is an investment style which focuses on shares of companies whose earnings are expected to increase or grow at an above-average rate

and blend¹⁸ were considered, and it was found that an inverted U-shape relationship is more pronounced and significant for growth style mutual funds than for value and blend style mutual funds. Thus, growth style mutual funds appear to gain more performance as they reach an optimal fund size compared to value and style mutual funds. This study by the Indro et al (1999) was motivated by what they believed was a failure to recognise diminishing returns to scale in active management by prior research. Moreover, these researchers argue that the expense ratio and turnover do not capture all transaction costs associated with active fund management, and that the correct asset size is important because of diseconomies of scale. Indro et al. (1999) identify four cost disadvantages which are associated with an increased growth in mutual fund size, and that negatively impact mutual fund returns. The four cost disadvantages are increased transaction costs due to the purchase of large blocks of shares which negatively effects the liquidity and informational asymmetry problem, thus widening the bid-ask spread, increased scrutiny of the fund by external individuals trying to find out the fund managers' stock selection or insights into the managers' information and market-timing strategy, operational inefficiency due to increased administrative burdens and, lastly, increased AUM growth could cause the fund manager to deviate from his/her stated investment philosophy or style in order to generate additional return.

Tang, Wang and Xu (2012) investigate whether scale and liquidity have an impact on the relationship between mutual fund size and mutual fund performance in China, using detailed holdings of all Chinese mutual funds for the period 2004 to the first half year of 2010. Using a ranking analysis approach, in line with other similar studies such as Chen et al (2004) and Yan (2008), as well as using quadratic cross-sectional regressions, it is found that there is an inverted u-shape relationship between mutual fund size and mutual fund performance in the Chinese market. The positive initial performance is thought to be caused by economies of scale obtained from lower brokerage commissions, as well as research and marketing costs not increasing in direct proportion to mutual fund size. Once a mutual fund exceeds an optimal size, however, the authors argue that liquidity has an impact and detracts from performance.

Bodson, Cavenaile and Sougne (2011) studied the potential relationship between mutual fund size and performance in a general framework, and also proposed a global approach to the relationship between mutual fund size and mutual fund performance by not only testing for a potentially linear, but also for a quadratic relationship. The study uses data of 2926 U.S mutual funds with monthly observations between January 2000 and June 2010. The sample contained 1652 equity mutual funds, 1044 bond mutual funds and 230 multi-asset mutual funds and, unlike most other studies of this nature, the sample was thus not limited to only equity mutual funds. To determine if a relationship

¹⁸ Blend Investing is an investment strategy which is a combination of value and growth investing

between mutual fund size and mutual fund performance exists, four risk-adjusted performance measures were used. Two of the performance measures used were CAPM based and two were based on a multifactor model. In order to test for the relationship two methods were used a linear regression approach as well as a quadratic (or non-linear) regression approach, the latter to test for non-linearities in the relationship between mutual fund size and mutual fund performance. With regards to the linear regression approach Bodson, Cavenaile and Sougne, (2011) find no robust evidence of either a positive or negative relationship between mutual fund size and performance. However, the results of the quadratic regression indicate a relationship between mutual fund size and mutual fund performance. This relationship is quadratic or of an inverted u-shape, which suggests that there is an optimal mutual fund size for maximising performance. Depending on the performance measures used, the optimal average mutual fund size is found to be between \$27.95 million and \$838.47 million in this study.

2.5 Conclusion

There is no consensus in the academic literature on the nature of the relationship between mutual fund size and mutual fund performance. United States based research dominates the field, and predominantly finds a negative relationship between fund size and performance. The common reason cited for this negative relationship is liquidity and diseconomies of scale. Ding (2016), however, cautions that the application of American results into other territories is questionable because of unique investment environments and institutional contexts. There is also no clear consensus in the growing body of work in developing markets on the nature of the relationship between mutual fund size and mutual fund performance. In China an inverted U-shaped relationship has been found (Tang, Wang & Xu, 2012) while in Brazil a U-shaped relationship was found (Malaquias, De Sarvas & Oliveira, 2016). The very limited South African academic literature on this topic finds no relationship between mutual fund size and mutual fund performance (Hibbert, 2003; Kopke, 2015), and leaves the possibility of a non-linear relationship unexplored. There is no empirically based evidence that suggests that there is a quadratic relationship in South Africa and what the corresponding empirically derived optimal size would be. Furthermore, South African academic literature is silent on the use of factor-model performance measures, which are used by many international studies¹⁹.

¹⁹ For example, Chan et al. (2009) use a four-factor model Fama-MacBeth approach, and the Fama-French Three Factor Model is also incorporated in the study of Tang, Wang & Xu, (2010).

CHAPTER THREE: DATA AND METHODOLOGY

In this chapter, the data that was used for this study, as well as the methodology employed, is described. In order to understand what the relationship between fund size and performance is, the best approach is to study mutual funds over a period of time, where trends and effects can be identified. Following on from this a time series study is the most appropriate approach to apply to this study.

3.1 Sample Selection

The sample selection process comprised of the following elements:

In line with other local and international studies (Indro et al., 1999; Yan, 2008, and Kopke 2015) the sample was limited to actively managed South African collective investment scheme securities. Due to the nature of the study and to ensure that there is a homogenous investment focus and enough data to be able to complete the study, only South African collective investment schemes classified by ASISA (The Association for Savings and Investment South Africa) as South African general equity funds (ASISA category *South African EQ General*) and South African multi-asset high equity funds (ASISA category *South African MA Equity*, were included in the sample. General equity funds must invest at a minimum 80% of their market value in equities and have a broad equities mandate, with the ability to invest in large, mid and small capitalisation shares. Unlike general equity funds, multi asset high equity funds are less restricted and can invest in multiple asset classes. With long term capital growth in mind, multi-asset high equity funds are allowed to have a maximum equity exposure of 75%. Based on the South African Balanced Manager Watch Survey, fund managers have maintained on average an equity exposure of 67.50% over the past three years 2018 - 2020 (Alexander Forbes, 2020). It is clear that equity returns are a large driver of returns for multi-asset high equity funds. Specialist sector equity, bond, international and mid to low multi-asset funds were excluded from this study, which is also consistent with prior studies (Indro et al., 1999; and Kopke, 2015).

The study covered the 10-year time-period between 2011 and 2020. This period was deemed appropriate due to its length and the fact that investment managers would have navigated their funds over unique and challenging financial market environments. Over this period financial markets experienced the European sovereign debt crises, which peaked between 2010 and 2012 (Wijffelaars & Loman, 2015) and the United Kingdom's historic European Union referendum vote (Goodwin & Heath, 2016). The emergence of Coronavirus (COVID-19) and subsequent Government mandated shutdowns, which limited economic activity around the world, also had a negative impact on financial markets.

For a fund to be included in the sample, it must have reported information on assets under management (AUM), both monthly gross returns²⁰ and net returns,²¹ for a full calendar year, and not be an institutional fund. In order to avoid funds entering the sample multiple times and to eliminate repetitive observations due to multiple fee classes, the fee class with the longest history was selected.

Index funds or passively managed mutual funds, which replicate the benchmark (the FTSE/JSE All Share Index with the code J203T), were excluded from the sample. The rationale behind this is that these funds have little discretion in their investment decisions and are expected to largely deliver returns in line with the FTSE/JSE All Share Index (ALSI), regardless of size and are not actively managed.

To avoid the double double-counting of assets under management, multi-manager and fund-of-funds mutual funds were also excluded from the sample.

Further, this study addresses survivorship bias. Survivorship bias happens when a study only considers active mutual funds that have survived for the time period under review and does not include historical data on mutual funds that have been closed or merged into another mutual fund. This can lead to unreliable and skewed results and interpretations. However, as indicated, in this instance the selected sample does not suffer from survivorship bias - both active and non-active mutual funds were included in the sample, the data were source from Morningstar and the database allows users to retrieve data of both active and non-active mutual funds from its database.

3.2 Data and data sources

Monthly returns and assets under management (AUM) figures were retrieved from the Morningstar mutual fund database. Additional information on the funds, where necessary, was obtained from the minimum disclosure document (MDD) of each mutual fund. For the factor models used in this study (see Section 3.3), the market, size, book-to-market, momentum, profitability and investment factors, required for the use of the Fama and French (1993) Three Factor Model, the Carhart (1997) Model, and the Fama and French (2015) Five Factor Model, as appropriate, were obtained from the Persec Securities database²².

²⁰ Gross returns – Total investment rate of return before deduction of fees and expenses

²¹ Net returns – Total investment return after the deduction of fees and expenses

²² See <https://www.persec.com/insights>

3.3 Methodology

The methodology used in this study largely follows that of Bodson, Cavenaile and Sougne (2011), Tang, Wang and Xu, (2012) and Ding, Zhen and Zhu, (2015) to investigate the relationship between mutual fund size and mutual fund performance. The study makes use of regression analysis to see how mutual fund performance varies with the size of mutual fund assets-under-management (AUM). Regression analysis is a reliable empirical method to identify variables that have an impact on a topic of interest.

To observe whether there is a relationship between mutual fund performance and size and in line with other studies (Bodson, Cavenaile, & Sougne., 2011; Tang, Wang & Xu, 2012; Malaquias, De Sarvas & Oliveira, 2016), the mutual funds were first sorted for each month according to the size of their assets-under-management. To ensure that there were enough data points for the regression when using a portfolio approach, the mutual funds were then grouped into trideciles (thirty groupings) for every one of the 120 months of the sample period on the basis of the size of their assets-under-management. For each tridecile the corresponding average size of the assets-under-management was calculated, as well as its equally weighted average return. This procedure was repeated for every month of the 10-year period to obtain a time series consisting of 120 monthly average mutual fund sizes and 120 corresponding equally weighted tridecile returns for both gross returns and net returns for each tridecile. In total 7,200 monthly data points were determined for the study; 3,600 gross of fee average decile returns for 120 months, and the same number of net of fee average returns.

3.3.1 Performance measures

To determine the relationship between mutual fund size and mutual fund performance, the Sharpe ratio (Sharpe, 1966), as well as two measures based on a single factor model, the well-known Capital Asset Pricing Model (CAPM), were used as performance indicators. The latter were Jensen's Alpha (Jensen, 1968) and the Treynor Ratio (Teynor, 1965). Furthermore, additional performance measures (alphas) based on the Fama-French (1993) Three Factor Model, Carhart's Four Factor Model (Carhart, 1997), and the Fama-French (2015) Five Factor Model were also used. A total of six different performance measure were therefore used in this study. For each tridecile the performance measures were calculated as follows:

i) The Sharpe Ratio:

$$SR_i = \frac{E[R_{it} - r_{ft}]}{\sqrt{Var [R_{it} - r_{ft}]}} \quad \text{Equation 11}$$

Where;

R_{it} = the return of tridecile i for month t

r_{ft} = the risk free rate at month t

ii) Jensen's Alpha:

$$\alpha_{it} = R_{ft} - [R_{ft} + \beta_{it} (R_{Mt} - R_{ft})] \quad \text{Equation 12}$$

Where;

α_j = Jensen's alpha of tridecile i for month t

R_{jt} = the return of tridecile i for month t

R_{ft} = Risk free rate of return at month t , for which the 3 – month STeFI value is used

R_{Mt} = Return of the market at month t (the market being the FTSE/JSE All Share Index)

β_i = Beta (or systematic risk) of tridecile i for month t

iii) The Treynor Ratio:

$$TR = \frac{E[R_{it} - r_{ft}]}{\beta_i} \quad \text{Equation 13}$$

Where;

R_{it} = the return of tridecile i for month t

r_{ft} = the risk free rate at month t

β_i = Beta or systematic risk of tridecile i at month t

iv) The Fama French Three-Factor Model:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_m - R_f)_{it} + \beta_iSMB_{it} + \beta_iHML_{it} + \varepsilon_{it} \quad \text{Equation 8}$$

Where;

R_{it} = the return of tridecile i at time t less the risk-free rate

R_{ft} = the risk free rate at time t

α_{it} = the multifactor model alpha of tridecile i at time t

R_{mt} = return of the market at time t

β_i = the multifactor loadings of tridecile i

SMB_{it} = the return of the size factor

HML_{it} = the return of the value factor

v) The Carhart Four-Factor Model:

$$R_{it} = \alpha_i + \beta_i MKT_{it} + \beta_i HML_{it} + \beta_i SMB_{it} + \beta_i MOM_{it} + \varepsilon_{it} \quad \text{Equation 9}$$

Where;

R_{it} = the return of tridecile i at time t less the risk-free rate

α_{it} = the multifactor model alpha of tridecile i at time t

β_i = the multifactor loadings of tridecile i

MKT_{it} = the return of the market index

HML_{it} = the return of the value factor

SMB_{it} = the return of the size factor

MOM_{it} = the return of the momentum factor

vi) The Fama French Five-Factor Model:

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_m - R_f)_{it} + \beta_i SMB_{it} + \beta_i HML_{it} + \beta_i RMW_{it} + \beta_i CMA_{it} + \varepsilon_{it} \quad \text{Equation 10}$$

Where;

R_{it} = the return of tridecile i at time t less the risk-free rate

R_{ft} = the risk free rate at time t

R_{mt} = return of the market at time t

α_{it} = the multifactor model alpha of tridecile i at time t

β_i = the multifactor loadings of tridecile i

SMB_{it} = the return of the size factor

HML_{it} = the return of the value factor

RMW_{it} = the return of the profitability factor

CMA_{it} = the return of the investment factor

The Alexander Forbes Three-Month Short-Term Fixed-Interest Index (STeFI) was selected as the risk-free rate for the study. The index comprises of the overnight interbank call rate and three-month Negotiable Certificate of Deposit (NCD) rates (Du Preez, 2011). As both constituents of the index are highly liquid and relatively safe it has been considered as a good proxy for the risk-free rate.

To obtain the portfolio beta the common portfolio beta formula below was used

$$\beta = \frac{Cov(r_i, r_m)}{Var(r_m)} \quad \text{Equation 13}$$

Where:

Cov = covariance

Var = variance

r_i = the return of tridecile i at time t less the risk-free rate

r_m = the of the market at time t less the risk – free rate

After calculating all the performance measures, the data be used for regression analyses consisted of 60 performance returns (representing each decile as well as 30 gross and 30 net returns for each of the six different performance measures chosen, as well as their corresponding average tridecile AUM sizes.

3.3.2 Regression Specification

To empirically test whether there is a relationship between mutual fund performance and mutual fund size, two regressions were performed, each of which regresses each of the six different performance measures (dependent variable) on the average tridecile size (independent variable). The natural logarithm of each tridecile assets-under-management is used due to issues of scaling. (Kopke, 2015; Chen et al., 2004). The two regressions used were a linear regression and a quadratic regression.

Prior research found that it is possible for a non-linear link to exist between mutual fund performance and mutual fund size (Tang, Wang & Xu, 2012). The difference between the quadratic regression and linear regression is the inclusion of the square of the logarithm of average assets under management in the quadratic equation. The quadratic equation attempts to isolate the assets-under-management and find a possibly more correct relationship than that offered by the linear expression. Furthermore,

the quadratic equation was found to be more robust as results from its use saw an improvement in R^2 data over the simple linear regression. The regression expressions used were as follows.

Linear regression:

$$Perf\ Measure_i = \alpha + \beta \ln(assets_i) + \varepsilon_i \quad \text{Equation 14}$$

Quadratic regression:

$$Perf\ Measure_i = \alpha + \beta \ln(assets_i) + \beta_2 \ln(assets_i)^2 + \varepsilon_i \quad \text{Equation 15}$$

Where;

$Perf\ Measure_i$ = the return of the calculated performance measures, namely the Sharpe Ratio, the Treynor Ratio, the Fama French Three-Factor Model, the Carhart Four-Factor Model, and the Fama French Five-Factor Model

α = the constant in the equation or the intercept.

$\ln(assets_i)$ = the natural logarithm of average assets under management.

$\ln(assets_i)^2$ = square of natural logarithm of average assets under management.

ε_i = the generic error term that is uncorrelated with all the other independent variables.

For this study the β in each regression is the coefficient that is of most interest. This is the coefficient that captures the relationship between mutual fund performance and mutual fund size. The α (or constant), while interesting, is not important for the study. In the next section the results and their implications are discussed.

CHAPTER FOUR: RESULTS AND DISCUSSION

The focus of this chapter is on the results of tests of the primary hypothesis, namely whether there is a statistically significant relationship between the size of South African mutual funds in terms of assets under management, and the risk-adjusted returns as determined using various factor-adjusted performance measures.

4.1 *Descriptive Statistics*

Table 4.1: Descriptive Statistics – Gross Returns

	3-Factor	4-Factor	5-Factor	Sharpe Ratio	Treynor Measure	Jensen's Alpha
Valid	30	30	30	30	30	30
Mean	-0.367	-0.425	-0.360	0.830	2.092	-1.224
Std. Deviation	0.073	0.087	0.085	0.274	0.611	0.778
Shapiro-Wilk	0.957	0.955	0.937	0.925	0.949	0.944
P-value of Shapiro-Wilk	0.256	0.229	0.073	0.036	0.162	0.115
Minimum	-0.530	-0.630	-0.510	0.310	0.800	-2.940
Maximum	-0.160	-0.170	-0.090	1.670	3.520	0.580

Table 4.2: Descriptive Statistics – Net Returns

	3-Factor	4-Factor	5-Factor	Sharpe Ratio	Treynor Measure	Jensen's Alpha
Valid	30	30	30	30	30	30
Mean	-0.494	-0.553	-0.487	0.316	0.782	-2.880
Std. Deviation	0.073	0.090	0.089	0.271	0.644	0.816
Shapiro-Wilk	0.969	0.945	0.951	0.939	0.949	0.958
P-value of Shapiro-Wilk	0.503	0.123	0.179	0.086	0.164	0.267
Minimum	-0.660	-0.770	-0.650	-0.300	-0.710	-4.920
Maximum	-0.290	-0.300	-0.220	1.050	2.300	-0.970

Tables 2 and 3 show the descriptive statistics of the return measures for both gross and net returns. For both gross and net returns the highest mean return was as observed on the Treynor measure at 2.09% and 0.78% respectively. The highest return was again also observed on the Treynor measure for both gross returns (3.52%) and net returns (2.30%).

The null hypothesis for the Shapiro-Wilk test was not rejected for most of the return measures whether gross or net as the p-values were greater than 0.05. This meant that the sample is normally distributed.

Figure 1 shows the number of mutual funds in the sample at the end of each year and the corresponding average assets under management for the sample. Over the period assets under management increased by 70% from 2011 to 2020, while the number of funds grew by an additional 77 funds (67%) over the period.

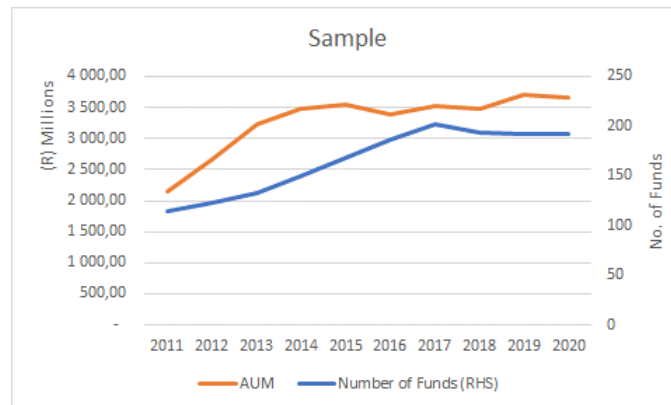


Figure 1: AUM and number of SA equity mutual funds

Figures 2 and 3 show the summary statistics for the average assets under management and 10 year returns for gross and net monthly returns for the sample. The lowest tridecile had on average AUM size of about R5.6 million and the highest decile had on average an AUM size of about R49 billion. What is evident from both gross and net returns is that there appears to be a slight positive relationship between mutual fund size and returns.

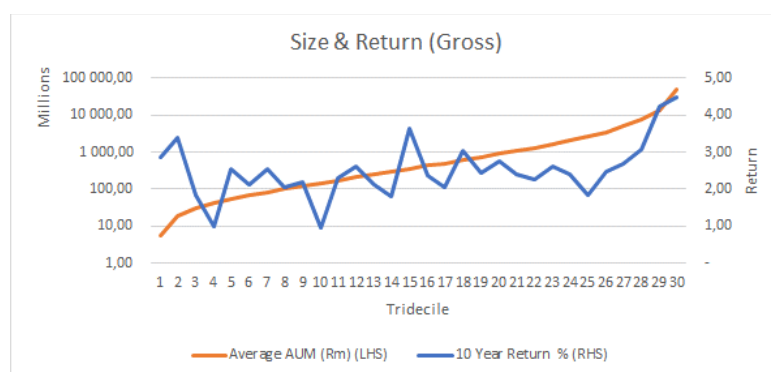


Figure 2: Sample Average AUM and 10-year gross return by tridecile

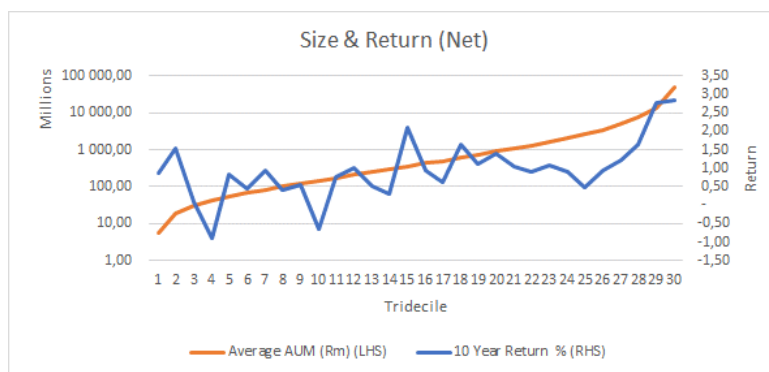


Figure 3: Sample Average AUM and 10-year net return by tridecile

Performance measures

i) The Sharpe Ratio

The Sharpe Ratio is persistently below 1 for most of the trideciles, indicating that the return is less than each unit of risk taken to achieve that return. The highest Sharpe Ratio is 1.67 gross of fees, and 1.05 net of fees, and is achieved by the largest tridecile. A slight positive relationship is observable between the Sharpe ratio and tridecile size, but there is some variability, and some indication of a possible U-shaped relationship overall.

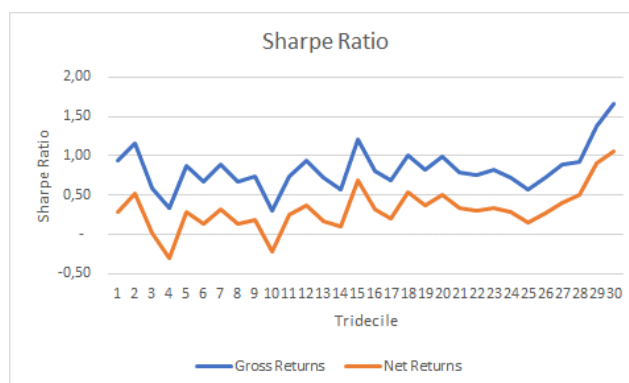


Figure 4: Sharpe ratio by tridecile

ii) Treynor Measure

Although not large, the Treynor measures achieved by the trideciles, both gross and net of fees, are persistently above zero. This indicates that the majority of the trideciles, both gross and net of fees, are able to earn returns above that of a risk-free investment. It needs to be remembered, however, that each individual tridecile represents an average across 120 months, each tridecile month consisting of a varying number of equally risk-adjusted weighted fund returns. In contrast to the results for the Sharpe Ratio, the highest average monthly Treynor ratio, both gross (3.52) and net (2.30) of fees, was achieved by the second largest tridecile.

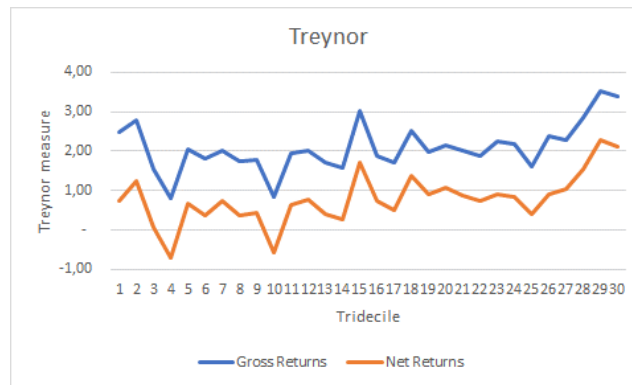


Figure 5: Treynor ratio by tridecile

iii) Jensen's Alpha

For all the trideciles the alpha is negative, which indicates a negative return on a risk-adjusted basis. The highest average monthly alpha achieved, both gross (0.58%) and net (-0.97%) of fees, was again achieved by the second highest tridecile.

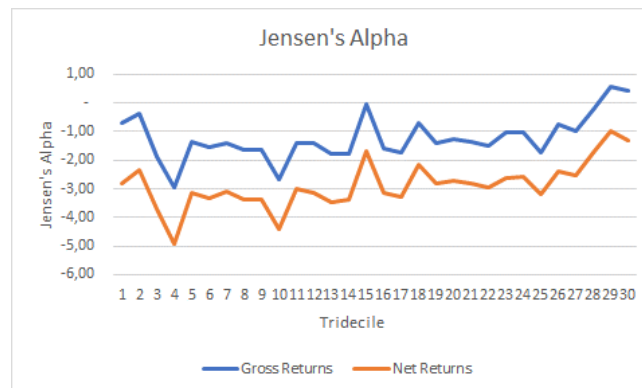


Figure 6: Jensen's Alpha by tridecile

iv) The Fama French Three-Factor Model

The Fama French three-factor alphas vary across trideciles, but are persistently negative for all of the trideciles. This suggests that all size funds at all trideciles deliver both gross and net of fee returns that underperform the market on a risk-adjusted basis. The highest alphas of -0.16% per month gross of fees and -0.29% per month net of fees, were achieved by the largest tridecile.

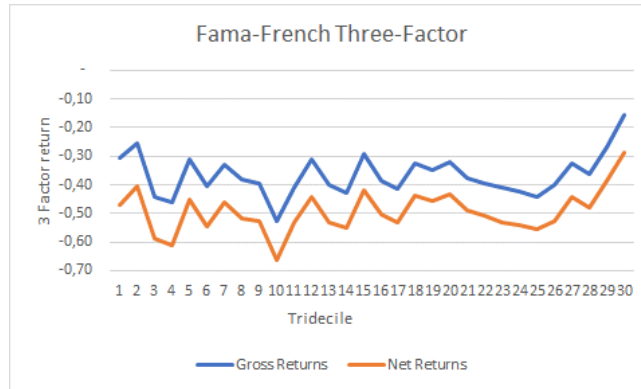


Figure 7: Fama-French three-factor by tridecile

v) The Carhart Four-Factor Model

The four-factor alpha' are negative for all trideciles for both gross and net returns. The highest monthly alphas of -0.17% gross of fees and -0.30% were again achieved by the largest tridecile.

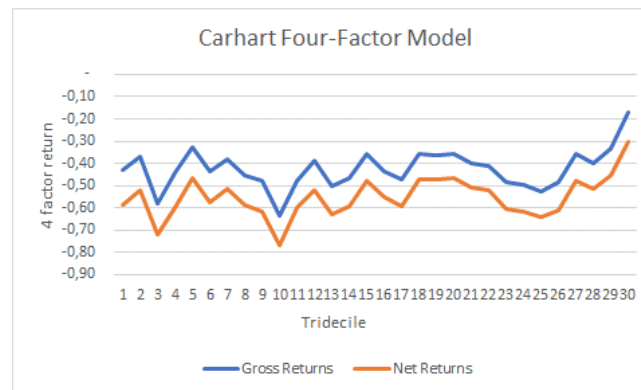


Figure 8: Carhat 4 factor by tridecile

vi) The Fama French Five-Factor Model

Like the Fama French three factor model, the alphas for the five factor model vary for all the trideciles and are negative for all the trideciles. However, the alphas from the five factor model are higher than those achieved from both the three factor and four factor model. The highest alpha - 0.09 (Gross) and -0.22 (Net) was achieved by the largest tridecile.

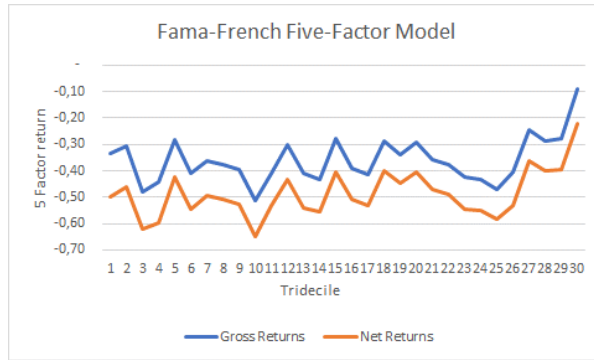


Figure 9: Fama-French 5 factor by tridecile

4.2 Regression Diagnostics

The Q-Q plots are shown below for the different performance measures. For most of the performance measures the Q-Q plots are normal to light tailed. In the light tailed Q-Q plots there are outliers. However, they do not interfere much as most of the of the sample distribution fits with the theoretical line.

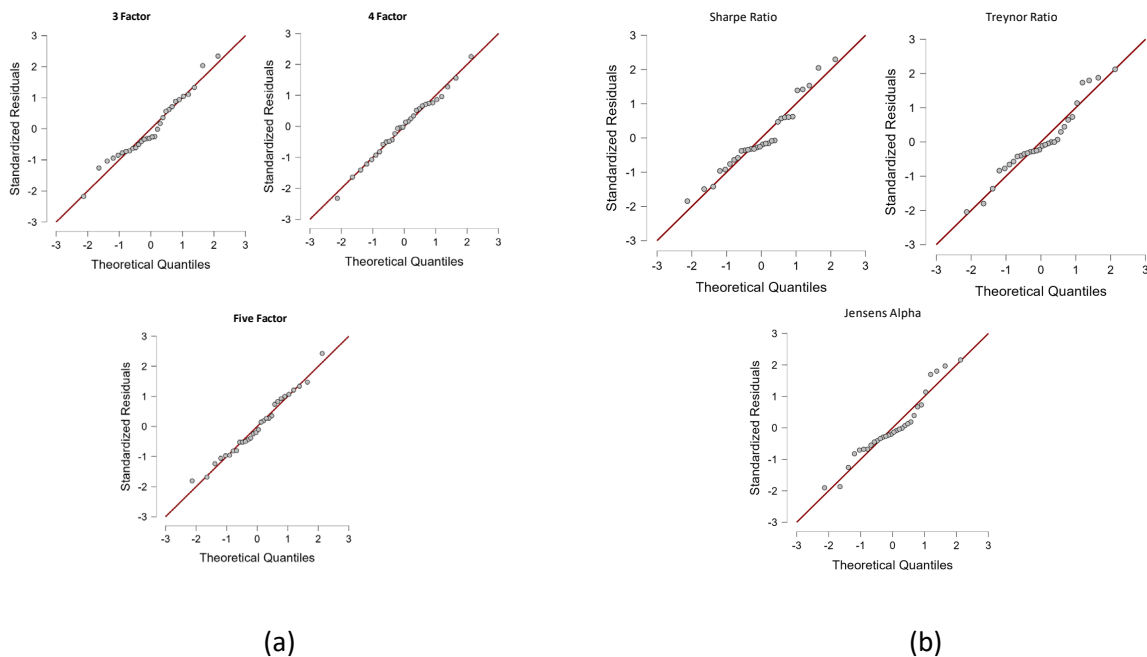


Figure 10 – Q-Q Plots linear regressions: (a) gross of fees and (b) net of fees

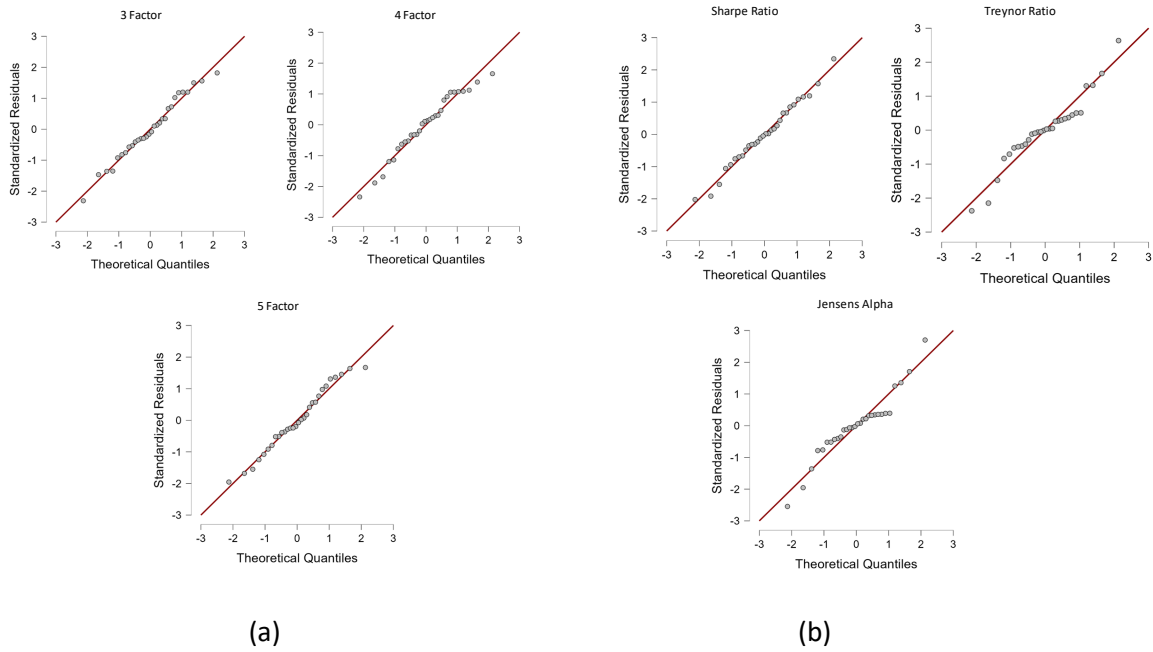


Figure 11 – Q-Q Plots quadratic regressions: (a) gross of fees and (b) net of fees

The Durbin-Watson statistics were calculated for each of the performance measures, both gross and net of fees to test for autocorrelation. The generally accepted bounds for the Durbin-Watson statistic is between 1.5 and 2.5. The results from the performance measures reveal that there is no significant autocorrelation within the data.

Table 4.3: Durbin-Watson statistics for six performance measure data

	Ratios			Factor Models		
	Sharpe	Treynor	Jensen's Alpha	3-Factor	4-Factor	5-Factor
Linear gross of fees	1,348	1,490	1,458	1,376	1,317	1,436
Linear net of fees	1,496	1,626	1,633	1,454	1,362	1,480
Quadratic gross of fees	1,922	2,190	2,207	1,933	1,524	1,806
Quadratic net of fees	1,873	2,012	2,075	1,826	1,485	1,722

4.3 Linear Regression Results

The linear regression results for both gross and net returns are shown in Tables 4 and 5. The gross fees linear regression results indicate a slightly positive linear correlation relationship for the risk-adjusted returns while the factor regressions do not indicate any strong evidence of a linear relationship between South African mutual fund performance and mutual fund assets under management. Unlike the results of Bodson, Cavenaile and Sougne, (2011) in the US market, who find differences in the direction of the performance measures, there is no difference in the direction of the performance measures, which in this case are all positive. However, the results are in line with the base regression results of Ding, Zheng and Zhu, (2015) who also observe a positive but non-significant linear relationship between mutual fund size and performance. Both Ding, Zheng and Zhu (2015) and this study focused on developing markets which could explain the similarities in results and also the dissimilarity with Bodson, Cavenaile and Sougne (2011) which focused on mutual funds in an advanced economy.

When looking at prior South African studies though the results are not in line with what has been found previously. Both Hibbert (2003) and Kopke (2015) found no relationship between South African mutual fund performance and size. The size of the coefficient for Jensen's Alpha is the largest of the performance measures for both the gross and net of fee investigations. Furthermore, the results are mostly statistically significant at the 5% level of significance as, with the exception of the Three-Factor Model gross of fees, the p-values for all the risk-adjusted performance measures are below the 5% p-value threshold. The coefficient of determination adjusted R^2 s of all the performance measures reveal that the response variable can somewhat be explained by the predictor variable, with the highest R^2 s being observed on the Jensen's alpha performance measure at 0.22 and 0.37 for gross and net of cost results respectively. Among the performance measures Jensen's alpha is the best measure to explain variation.

Table 4.4: Linear regression results – gross of fees

	Ratios			Factor Models		
	Sharpe	Treynor	Jensen's Alpha	3-Factor	4-Factor	5-Factor
Log AUM	0,131	0,329	0,434	0,020	0,035	0,039
Standard Error	0,053	0,114	0,144	0,015	0,017	0,017
R²	0,179	0,229	0,246	0,059	0,130	0,167
Adjusted R²	0,150	0,202	0,219	0,025	0,099	0,138
p-value	0,020	0,007	0,005	0,196	0,050	0,025

Table 4.5: Linear regression results – net of fees

	Ratios			Factor Models		
	Sharpe	Treynor	Jensen's Alpha	3-Factor	4-Factor	5-Factor
Log AUM	0,175	0,429	0,575	0,031	0,046	0,051
Standard Error	0,047	0,110	0,136	0,014	0,017	0,016
R²	0,328	0,350	0,388	0,145	0,210	0,262
Adjusted R²	0,304	0,327	0,366	0,115	0,181	0,236
p-value	< .001	< .001	< .001	0,038	0,011	0,004

4.4 Quadratic Regression Results

The use of a quadratic function regression allows for testing for the existence of non-linearities in the relationship between mutual fund performance and mutual fund assets under management.

The results of the quadratic regressions are shown in Tables 6 and 7 for gross and net of fee returns, respectively. As was the case for the linear regressions, it is observed once again for both gross and net results that the direction of the performance measures are all the same, namely negative for all the first orders and positive for all the second orders. The results obtained from the regressions imply

that the relationship between South African mutual fund risk-adjusted performance and mutual fund assets under management could be quadratic instead of linear. For both gross and net performance measures the coefficient on the quadratic term is consistently positive. This direction implies that the relationship between mutual fund performance and mutual fund size is probably convex, meaning that risk-adjusted performance initially decreases with size, but at a specific point starts to increase again with mutual fund size. To further strengthen the case of there being a quadratic relationship between mutual fund performance and mutual fund size, these results are statistically significant with p-values in all cases below a 5% level of significance. Furthermore, there is an improvement in the adjusted coefficient of determination (adjusted R^2) for all the performance measures when comparing the quadratic regressions' results to those of the linear regressions. This result is in line with Malaquias, De Sarvas and Oliveria, (2016) who also found a U-shaped relationship in Brazilian multimarket funds when testing for a non-linearities. Interestingly both studies focused on a developing country (South Africa and Brazil) and both used similar types of mutual funds (MA High Equity and Multimarket) in their respective studies which may explain the similarities in results.

Table 4.6: Quadratic regression results – gross of fees

	Ratios			Factor Models		
	Sharpe	Treynor	Jensen's Alpha	3-Factor	4-Factor	5-Factor
Log AUM	-2,245	-4,707	-6,124	-0,651	-0,534	-0,636
Standard Error	0,667	1,452	1,800	0,191	0,240	0,218
Log AUM²	0,136	0,289	0,377	0,039	0,033	0,039
Standard Error	0,038	0,083	0,103	0,011	0,014	0,012
R²	0,442	0,468	0,495	0,356	0,281	0,387
Adjusted R²	0,401	0,428	0,458	0,308	0,228	0,341
p-value	0,001	0,002	0,001	0,002	0,025	0,004

Table 7: Quadratic regression results – net of fees

	Ratios			Factor Models		
	Sharpe	Treynor	Jensen's Alpha	3-Factor	4-Factor	5-Factor
Log AUM	-1,539	-3,272	-4,226	-0,510	-0,406	-0,507
Standard Error	0,644	1,533	1,859	0,194	0,245	0,225
Log AUM²	0,098	0,213	0,276	0,031	0,026	0,032
Standard Error	0,037	0,088	0,107	0,011	0,014	0,013
R²	0,468	0,466	0,510	0,337	0,298	0,400
Adjusted R²	0,429	0,426	0,473	0,288	0,246	0,355
p-value	0,013	0,023	0,015	0,009	0,076	0,019

In a U-shaped or convex relationship there is not a single optimal amount of assets under management that maximises mutual fund performance – thus either very small or very large funds are performance maximisers (Ding, Zheng & Zhu, 2015). Although not tested, liquidity may be a factor in the type of relationship that was found. It is plausible that in a U-shaped relationship there is scope that mutual funds (when small) initially perform well because of the flexibility to take more active equity positions as well as be nimble in execution with less market impact. As a fund moves on the size continuum to being large it will then first experience diseconomies of scale and enter an intermediate fund size zone where performance will be lower than before. After a while if a fund continues to move on the fund size continuum to being large it will then experience economies of scale (when large enough) which will benefit its performance. Therefore, there is an intermediate mutual fund size range where there is a trade-off which may result in lower than average-risk adjusted fund performance.

In the next chapter the study is concluded and areas of further research are highlighted.

CHAPTER FIVE: CONCLUSION

The objective of this study was to investigate a potential relationship between South African mutual fund size, measured in terms of assets under management and mutual fund risk-adjusted performance, using as sample actively managed equity-focussed funds and MA High Equity funds. Mutual fund risk-adjusted performance was determined in terms of the Sharpe ratio (Sharpe, 1966), the Treynor Ratio (Treynor, 1968), and Jensen's Alpha (Jensen, 1965), as well as the alphas calculated using three well-known factor-based asset pricing models, namely the Fama and French Three-Factor Model (Fama and French, 1993), Carhart's Four Factor Model (Carhart, 1997), and the Fama and French Five-Factor model (Fama and French 2015). There is plethora of academic literature on the relationship between mutual fund size and mutual fund performance, but there is, however, no agreement in the literature on the nature of this relationship. Depending on the context and market, existing literature report five different results for the relationship between mutual fund performance and mutual fund size, namely no relationship, a positive relationship, a negative relationship, a concave (U-shaped) relationship, or a convex (inverted U-shaped) relationship.

Sampling two hundred and fifty funds that are classified by ASISA either in its South African Equity General category or in its Multi-Asset High Equity category, this study not only tests for linear size-return relationships, but also perhaps for the first time in the South African market investigates the possibility go a quadratic relationship. Thus, both linear and non-linear possibilities were investigated using the portfolio method approach as well as factor model returns, and the inclusion of a quadratic term in the regression specification. This was done both gross and net of investment fees. All four of these elements of the study are perhaps novel in an emerging market context, and more specifically so in investigations of the South African mutual fund industry.

The results of the linear regression analysis for both the gross and net of fee samples found strong evidence of a statistically significant positive correlation between South African mutual fund assets under managements and mutual fund risk-adjusted performance across all six measures used to assess the latter. This result is consistent with those of Ding, Zheng and Zhu, (2015) and Bodson, Cavenaile and Sougne (2011), whose studies address emerging Asia mutual funds (2003 to 2009) and U.S mutual funds (2000 to 2010), respectively. Within South African academic literature, the linear regression results are not in line with those of Kopke (2015) and Hibbert (2003), whose research found no statistically significant correlation between South African mutual fund assets under management and risk-adjusted mutual fund performance. The difference in results may arise from the different time periods that were used by the studies Hibbert (2003) covered the period 1990 to 1999, Kopke

(2015) covered the period 2005 to 2014 and this study covered the period 2011 to 2020. Furthermore, a major difference between this study and prior studies is that the composition of the samples are different, as this study included multi-asset high equity while the others only focused on equity funds. Most importantly, the methodologies used differed substantially from the mentioned studies. Specifically, this study was the only South African one to use a portfolio approach, and was also the first South African study to incorporate more sophisticated asset pricing models such as the two Fama French (1993 and 2015) and Carhart (1997) Models as basis for performance measurement.

The quadratic regression analysis, however, found evidence of a statistically significant quadratic relationship between South African mutual fund assets under management and mutual fund risk-adjusted and factor-adjusted performance measures. Furthermore, the results suggest that the quadratic relationship is convex, as the quadratic term is positive for all the performance measures. This means that performance initially reduces with size up to an inflection point (between approximately R43 million and R2.6 billion), whereafter mutual fund performance increases again with mutual fund size. The result was consistent with results found in international academic research that tests for non-linearities in the relationship between mutual fund size and mutual fund performance (Indro et al, 1999; Tang, Wang & Xu, 2012; Bodson, Cavenaile & Sougne, 2011). The results confirm that the relationship between mutual fund performance and size is more quadratic or non-linear than linear as research.

This study concludes that there is a statistically significant positive correlation between South African mutual fund asset under management and mutual fund size. Furthermore, there is evidence that a quadratic relationship between South African mutual fund assets under management size and risk adjusted as well as factor adjusted mutual fund performance. Additionally, this relationship is predominantly a convex quadratic relationship. This suggests that there is no optimal South African mutual fund size which maximises mutual fund performance. Either small or large funds can be performance maximisers (Ding, Zheng & Zhu, 2015). This has major implications for investors and for fund managers that manage mutual funds. For investors the choice of which mutual fund to invest in becomes clear. They can either invest in a small mutual fund or a large mutual fund to maximise returns but need to avoid “in-between” mutual funds that do not perform as well. Furthermore, fund size is a relatively simple factor that investors can remember before investing. For fund managers the U-shaped relationship creates a level of complexity on how to manage a mutual fund. The complexity comes about from whether or not a fund manager should remain small and limit the flows to the fund in order for it not to grow and continue experiencing positive performance however positive

performance may see the fund continue to grow and enter the “in-between” zone. Alternatively, should a fund manager forgo being small and hope that they will enter and exit the “in-between” zone and become a large mutual fund where economies of scale may be experienced, and positive performance will be experienced again.

The following suggestions for further research are made:

Liquidity: The impact of liquidity was not reviewed in this study. Liquidity has been found to be an important variable in the nature of the relationship between mutual fund performance and mutual fund size (see, for example, Tang, Wang & Xu, 2012). Further research on this variable in the South African context can be done to ascertain whether liquidity constraints impact its findings or not.

Costs/TER: Although this study considered gross and net returns, the impact of costs can be seen between the differences in the gross and net performance measures. This observation suggests that costs/TER is a variable of interest in the South African context. Isolating the specific impact of costs/TER on the relationship between mutual fund performance and mutual fund size was excluded because it was outside the scope of the study.

Sample – ASISA Categories: This study was restricted to only two ASISA categories, namely the Multi-Asset High Equity and General Equity categories. By including all the ASISA categories future research may find a different type of relationship between mutual fund performance and mutual fund size in South Africa for mutual funds investing in other asset classes. Current academic literature reveals no clear consensus on which type/category of mutual fund to investigate, with some studies only using a single category of mutual funds while others use multiple mutual fund categories.

Sample – Minimum Fund size: This study did not include a restriction of minimum fund size to the sample. Although prior studies have done this on the basis that there is upward performance bias in small mutual funds, no evidence of this could be found for South African mutual funds and was therefore excluded.

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