ACTIVE MANAGEMENT AND THE COST OF ACTIVE MANAGEMENT OF SOUTH AFRICAN GENERAL EQUITY UNIT TRUSTS

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Date:

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DECLARATION

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R. Coetzee March 2017

ABSTRACT

Investors have various investment options available to provide future wealth. One of the options is to invest in unit trusts. On 31 December 2015 there was a total of R 1 656 448 million invested in South African unit trusts, making this a large investment vehicle. The objectives and constraints of investors should determine in which type of unit trust they invest. This study examines general equity unit trusts in South Africa.

Many investors do not know how actively their active unit trusts are managed, what portion of the management cost is attributable to the active component of the unit trust and how much is attributable to the passive component of the unit trust. The focus of this study was to determine how active general equity unit trusts in South Africa are managed, whether the active management delivers enhanced risk-adjusted returns, and how much investors are paying for active management.

The study was conducted over eight years, from 1 January 2008 to 31 December 2015. The primary objective consisted of two sections. Firstly, the study set out to classify general equity unit trusts in South Africa according to how actively they are managed. This is done through calculating the active share and tracking error for the unit trusts. The results indicated that most (71%) of the analysed general equity unit trusts had an active share lower than 50% and a tracking error lower than 8%. These active funds invested more than 50% of their assets similar to the index.

Secondly it was determined how the classifications of unit trusts performed on a risk-adjusted basis. This is calculated through means of five risk-adjusted performance measures. The study found that the amount of active management does not influence risk-adjusted returns in a statistically significant manner.

The secondary objective investigated the cost of investing in general equity unit trusts. The unit trusts were divided into an active and a passive component based on active share and tracking error. The total expense ratio (TER) of the unit trusts was compared to the active and passive components of the unit trusts to determine how much of the TER is attributed to active management. The average fund TER was 1.55%, with the average cost on the active component being 3.85%. The average alpha for the active

component was -1.54%. This means that investors are paying a substantial amount more for the active component of the unit trust than for the passive component, without receiving the benefit of a higher return.

OPSOMMING

Beleggers het verskeie beleggingsmoontlikhede beskikbaar om toekomstige welvaart te verskaf. Een van hierdie beleggingsmoontlikhede is effektetrusts. Op 31 Desember 2015 was daar R 1 656 448 miljoen belê in Suid-Afrikaanse effektetrusts, wat dit ’n groot beleggingsinstrument maak. Die doelwitte en beperkings van beleggers bepaal in watter tipe effektetrust hulle sal belê. Hierdie studie ondersoek algemene ekwiteit effektetrusts in Suid-Afrika.

Baie beleggers weet nie hoe aktief hulle aktiewe effektetrusts bestuur word nie, asook nie watter gedeelte van die bestuurskostes toeskryfbaar is tot die aktiewe komponent van die effektetrust en watter gedeelte van die bestuurskostes toeskryfbaar is tot die passiewe komponent van die effektetrust nie. Die studie se fokus is om te bepaal hoe aktief algemene ekwiteit effektetrusts in Suid-Afrika bestuur word, of die aktiewe bestuur ’n verbeterde risiko-aangepaste opbrengs lewer, en hoeveel beleggers betaal vir aktiewe bestuur.

Die studie het oor ’n tydperk van agt jaar gestrek, vanaf 1 Januarie 2008 tot 31 Desember 2015. Die primêre doelwit bestaan uit twee gedeeltes. Eerstens het die studie algemene ekwiteit effektetrusts geklassifiseer volgens hoe aktief hulle bestuur word. Dit is gedoen deur die aktiewe aandeel (active share) en navolgingsfout (tracking error) vir die effektetrusts te bereken. Die resultate dui daarop dat meeste (71%) van die geanaliseerde algemene ekwiteit effektetrusts ’n aktiewe aandeel het van laer as 50% en ’n navolgingsfout het van laer as 8%. Hierdie aktiewe fondse belê meer as 50% van hul bates soortgelyk aan die indeks.

Tweedens word bepaal hoe die klassifikasies van effektetrusts presteer op ’n risiko-aangepaste basis. Dit is bereken deur middel van vyf risiko-aangepaste prestasiemaatstawwe. Die studie vind dat die hoeveelheid aktiewe bestuur nie die risiko-aangepaste opbrengs op ’n statistiese beduidende manier beïnvloed nie.

Die sekondêre doelwit het die kostes verbonde aan algemene ekwiteit effektetrusts ondersoek. Die effektetrusts was verdeel in ’n aktiewe en passiewe komponent, gebaseer op die aktiewe aandeel en die navolgingsfout. Die totale onkosteverhouding (total

expense ratio) van die effektetrusts was vergelyk met die aktiewe komponent en die passiewe komponent van die effektetrust, om te bepaal hoeveel aktiewe bestuur bydra tot die totale onkosteverhouding. Die gemiddelde fonds se totale onkosteverhouding was 1.55%, met ’n gemiddelde koste toegeskryf aan die aktiewe komponent van 3.85%. Die gemiddelde alpha van die aktiewe komponent was -1.54%. Dit beteken dat beleggers ’n geruime hoeveelheid meer betaal vir die aktiewe komponent van die effektetrust as vir die passiewe komponent, sonder om die voordeel van ’n hoër opbrengs te ontvang.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of variance
ASISA	Association for Saving and Investment South Africa
CAPM	Capital asset pricing model
CISCA	Collective Investment Schemes Control Act
EMH	Efficient market hypothesis
ETF	Exchange traded funds
FTSE 350	Financial Times Stock Exchange 350 Index
HPR	Holding period return
JSE	Johannesburg Stock Exchange
JSE ALSI	Johannesburg Stock Exchange All Share Index
JSE ALSI TOP 40	Johannesburg Stock Exchange All Share Index Top 40
JSE CAPPED	Johannesburg Stock Exchange Capped All Share Index
JSE CAPPED 40	Johannesburg Stock Exchange Capped Top 40 Index
JSE SWIX	Johannesburg Stock Exchange Shareholder Weighted Index
JSE SWIX 40	Johannesburg Stock Exchange Shareholder Weighted Top 40 Index
NAV	Net asset value
NCD	Negotiable certificate of deposit
OLS	Ordinary least squares

PPU	Price per unit
S&P 500	Standard & Poor's 500 Index
TER	Total expense ratio
UK	United Kingdom
US	United States

CHAPTER 1

INTRODUCTION TO THE STUDY

1.1 INTRODUCTION

Unit trusts are among the main investment vehicles in South Africa, and play a role in the investment strategies and retirement plans of various citizens (Meyer-Pretorius & Wolmans, 2006:50). It is important that the risk of investing in a unit trust and the expected returns should reflect the objectives and the constraints of the investors. A factor that contributes to the classification of this risk is the active positions taken by the fund manager.

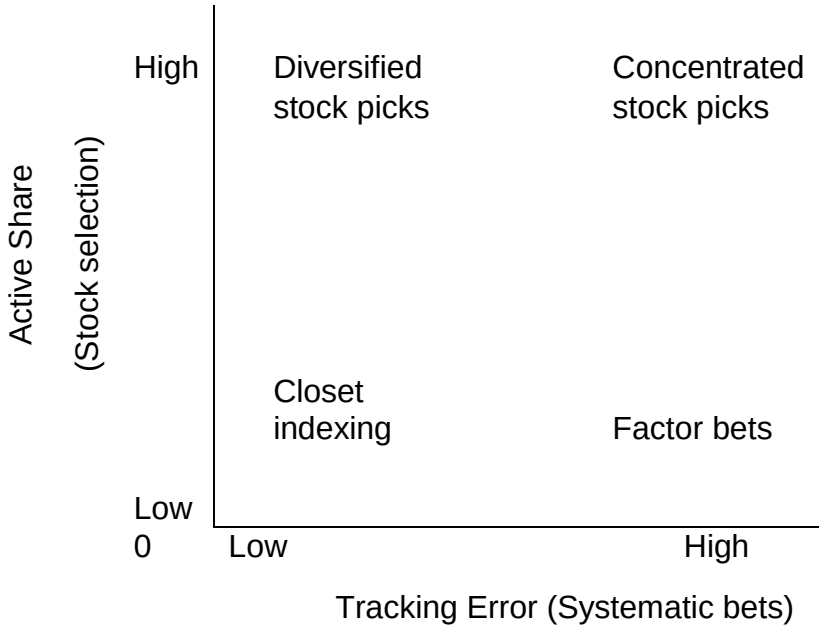
An active position taken by an equity unit trust is any bet that deviates from the benchmark implemented by the fund (Maginn, Tuttle, Pinto & McLeavey, 2007:429). The fund manager can take active positions in two ways. It is done by overweighting shares that are expected to outperform and underweighting shares that are expected to underperform, in order to realize a return in excess of the benchmark. Active positions can also be taken by investing some assets in cash or bonds until the fund manager finds a suitable investment. This second approach focuses on market timing (Bodie, Kane & Marcus, 2010:11). These active positions should cause a deviation from the benchmark in terms of the generated returns.

The traditional measure to indicate the extent of active management is tracking error. Tracking error measures the variability that fund returns exhibit from the benchmark returns (Maginn *et al.,* 2007:339). Cremers and Petajisto (2009:3329) proposed a new measure of active management, known as active share, to indicate the variation of the fund holdings from the benchmark holdings. Active share indicates how the actual stocks held, and the weightings of these stocks, differ from the benchmark.

Since the study on active share by Cremers and Petajisto (2009), the acceptance of this measure of the extent of active management is growing worldwide (Assette, 2014). The active share measure indicates whether unit trusts are emphasizing stock selection (thus focusing on diversified stock picking) or closet indexing (where portfolio managers aim to

achieve similar returns to the benchmark index without exactly replicating the index). Tracking error identifies bets focused on systematic risk, thus identifying concentrated stock pickers and funds that make factor bets (Cremers & Petajisto, 2009:3336), as depicted in Figure 1.1. However, stock selection and market timing strategies have similar qualities, and these strategies only become apparent once active share and tracking error are assessed (Hirschel & Krige, 2010:54).

Figure 1.1 Active Management Style



Source: Adapted from Cremers and Petajisto (2009:3372).

Although it is an arbitrary decision as to what constitutes a high- or low- active share measure, or what constitutes a high- or low- tracking error, Figure 1.1 allows the classification of unit trusts according to their activeness. Figure 1.1 is summarised as follows:

- Unit trusts with a low active share and low tracking error are closet indexers. Closet indexers mimic the benchmark or index it is assigned to outperform, and thus will have a low tracking error and active share.
- Unit trusts with a high active share and low tracking error are classified as diversified stock pickers. Diversified stock pickers make bets on shares that differ

from the benchmark, causing high active share, but their portfolio is diversified across enough companies and sectors, to lower exposure to non-systematic risk, and thus lower tracking error.

- Unit trusts with a low active share and high tracking error make factor bets. Factor bets imply that the fund manager emphasizes exposure to the benchmark or certain sectors. These funds invest in a sector as a whole and not in individual stocks within a sector.
- Unit trusts with a high active share and high tracking error make concentrated stock picks. This is because large bets that differ from the benchmark on a small number of stocks lead to high active share as well as high tracking error.

Through studying Figure 1.1 it becomes apparent that the active share measure together with tracking error is an essential way of determining the extent of active management of unit trusts. An important consideration is that active bets incur costs that decrease returns. According to Jensen (1968) and Malkiel (1995) actively managed unit trusts have on average been found to underperform in comparison to index funds on a risk-adjusted basis, gross of fees. Investment management fees charged by unit trust companies are major contributors to this underperformance. The management fees charged by unit trusts are mostly expressed as a standard fee based on assets under management that is adjusted by a small margin based on fund performance (Miller, 2010:5). This means that the investment management fees charged by unit trusts are mostly related to the amount of assets managed, rather than to the performance of the fund. Performance fees comprise a small part of the total management fees.

Because of the fund managing fees (the standard fee, as well as the performance fee) charged by actively managed unit trusts, actively managed investments are expensive, due to the time and other resources the fund managers put into the investment decisions. Passively managed investments are cheaper, as the fund manager attempts to replicate the index (Discovery Invest, 2012; Sharpe 1991:7).

A unit trust consists of an active component (the outperformance or underperformance of the index fund) and a passive component (an index fund). When separating a fund into

an active and a passive component most of the management costs apply to the active part of the fund. When attributing the cost to each component of a unit trust, an index would represent the passive component. Thus, the passive component is attributed the cost of investing in the index. The active component is attributed the remainder of the reported cost (this is known as the active expense ratio). The calculation of management fees, as implemented by unit trusts, contain the cost of the active and passive component of the unit trusts and can cause the reported cost to be much lower when expressed in terms of TER, than the cost attributable to the active component.

Miller (2010) indicated that in the United States over a three year period ending on 31 December 2009, a sample of 731 actively managed funds reported an expense ratio of 1.20%. However, the active expense ratio proved to be 6.44%. According to Miller (2010:1), the active expense ratio tends to be much higher than the reported average expense ratio, as index funds are cheap to invest in compared to active funds, which are usually much more expensive. Even with these high expense ratios, most active fund managers are only able to outperform the benchmark by a small percentage, if at all, over the long term.

Even though the reported expense ratios are accurate when compared to the total assets under management of the fund, the active expense ratio is larger when separating the fund into an active and a passive component. Miller (2010) found that the cost of active management (active expense ratio) is high. The excess returns achieved through active management often does not warrant the high active cost. Therefore, Miller (2010:14) argues that better long-term performance may be obtained by pure index funds with lower fees.

This chapter will continue with a background study on active share, as well as the cost of actively managed unit trusts. A problem statement and the objectives of the research follow. After the objectives of the study have been defined, the research methods and applicable data analysis techniques will be discussed. Lastly, an orientation regarding the study is provided.

1.2 BACKGROUND

Active share, as introduced by Cremers and Petajisto (2009), aims to quantify the active positions taken by an active fund manager. Active share indicates the proportion of holdings in a unit trust that differs from the composition of the appropriate benchmark. Even though active share is a relatively new concept, it has gained acceptance from fund managers and investment companies worldwide (Assette, 2014). Thus, active share can be a valuable tool to compare various active managers.

Studies have found conflicting results when drawing conclusions on how active management is employed by unit trusts. Muller and Ward (2011:26) concluded that there was no relationship between active share and unit trust performance on the South African market. However, Cremers and Petajisto (2009) found that in the United States, mutual funds with high active share outperformed the benchmark.

Active management in a unit trusts leads to another important aspect for investors, namely investment management cost. When a manager underweights or overweights certain stocks in the fund, in comparison to the benchmark, transaction costs as well as fund managing costs can have a significant impact on net returns. Miller (2010:1) investigated the impact of management fees for US mutual funds. He concluded that the active expense ratios were much higher than the reported expense ratios and that the reported fees were poor predictors of fund performance. Miller (2010:1) further states that mutual funds perform worse than index funds on a risk-adjusted basis, gross of fees and that investment costs is a large contributor.

The next section provides a brief overview on previous studies dealing with the active management of unit trusts and the cost of unit trusts.

1.2.1 The active management of unit trusts

Active management can be represented through two measures, namely, tracking error, and active share. Tracking error indicates to what extent the unit trust returns differ from the benchmark returns. Active share indicates to what extent the unit trust holdings differ from the benchmark holdings.

As mentioned in Section 1.1, active share was first introduced by Cremers and Petajisto (2009). They studied 2 647 mutual funds in the United states from 1980 to 2003. They found persistence with regard to active share positions (meaning that if a fund had high active share the one year, it is probable to have a high active share the following year, and if a fund had low active share the initial year, it would have low active share the following year). The study found that active management as represented by active share is directly related to the performance of the mutual funds. Cremers and Petajisto (2009:3356), further indicated that active management, represented by tracking error, had no significant relationship to higher returns.

On the South African market Hirschel and Krige (2010), studied large cap and general equity unit trusts from 2003 to 2007. They concluded that unit trusts with the highest active share had a statistically significant outperformance of the benchmark. This is similar to the findings of Cremers and Petajisto (2009).

However, other studies reported conflicting results based on active share. In contrast to the conclusions of Cremers and Petajisto (2009), Schlanger, Phillips and LaBarge (2012) found that in the US market, long-only domestic equity mutual funds with high levels of active share had no predictive power in terms of performance. Muller and Ward (2011) found that in the South African market, there is no significant relationship between active share and the return of unit trusts.

1.2.2 The cost of unit trusts

The active management of unit trusts exposes the investor to investment management fees, which could reduce the returns in excess of index fund returns. Miller (2010:1) stated that active mutual funds in the US underperform on a risk-adjusted basis, gross of fees, in comparison to similar index funds. Management fees were a large contributor to this underperformance. The study asserts that mutual funds can be viewed as a combination of an index fund (beta), and a pure hedge fund (alpha). Miller (2010:10-12) proposed that the size of these components could be estimated, by studying the tracking error of the mutual funds in relation to their benchmarks. This would indicate the active return the fund manager is able to realise.

Further, Miller (2010) proposed that the active fund management fees, above the fees applicable to a similar index fund, be compared to the active return. He concluded that on average, for 731 actively managed mutual funds in the US, the active management costs were more than 400% larger than the reported average expense ratios of these funds. Miller (2010) found this, by separating the alpha and beta of the funds, and attributing fund costs to each component, based on the fees of the closest tracking index fund. The active management costs indicate the percentage of alpha foregone by the investor when paying the management fees.

In a study on the South African market, research by Waldeck (2011), covering the period from 31 December 2000 to 31 March 2011, indicates that higher expense ratios for unit trusts in South Africa had no correlation with excess returns after the performance of the funds were divided into a passive and an active component. These findings indicated that the higher management fees of unit trusts, did not necessarily contribute to a higher return for investors. The higher expense ratios of unit trusts lead to the active expense ratio being much larger than the reported average expense ratio.

The problem statement of this study is now proposed, so as to provide a precise description of the issues to address. From the problem statement, the objectives of the study has been determined.

1.3 PROBLEM STATEMENT

Institutional and individual investors are constantly pursuing investment vehicles for future wealth creation. Many individual investors do not have an extensive knowledge regarding various investment vehicles and wealth creation. South African unit trusts prove to be a relatively large investment sector, with about R1 656 448 million in assets under management on 31 December 2015, and consisting of 1 110 funds (ASISA, 2016). Thus, there are a large number of funds available for investors to choose from. Investors will search for fund managers that are able to add value in excess of the return on market indices.

A number of studies have been done on the active share of mutual funds on stock exchanges around the world, including Cremers and Petajisto (2009), Petajisto (2013),

Caquineau, Möttölä and Schumacher (2016), Hirschel and Krige (2010) Siddle (2014) and Schlanger *et al*. (2012), Allen (2015), Frazzini, Friedman and Pomorski (2016) and Muller and Ward (2011). Studies analysing mutual funds in the US found conflicting results on the predictive power of active share. Similarly, studies on the South African market also found conflicting results. However, it has been suggested that there may be a relationship between active share and the performance of a unit trust. The primary objective of this study is to determine the nature of active management for South African unit trusts, and whether active management outperforms the index.

Active management gives rise to costs that are higher than the cost associated with passive management. These costs can reduce the returns generated through active management. The secondary objective determines whether actively managed unit trusts are able to compensate investors for their higher costs.

1.4 OBJECTIVES AND HYPOTHESES

Formal objectives were derived from the problem statement. From the stated objectives, formal statistical hypotheses were formulated.

1.4.1 Primary objective

The primary objective consisted of two components. The first component set out to classify South African general equity unit trusts according to their investment approaches. For this purpose, tracking error and active share were calculated. From the results, the funds were classified as diversified stock pickers, concentrated stock pickers, closet indexers or making factor bets.

The second component of the primary objective aimed to determine whether active fund managers were able to add value through their investment approaches, according to how active the funds were managed.

Hypotheses were formulated in order to determine whether active management had any predictive relationship with the performance of the general equity unit trusts. The following null-hypotheses were to be tested, to determine these conclusions.

$H_{0(1)}$ = The unit trust investment approach does not affect fund performance

$H_{A(1)}$ = The unit trust investment approach does affect fund performance.

These hypotheses indicated whether any of the classifications of unit trusts were able to deliver returns that was significantly different from the other classifications of unit trusts, by comparing the risk-adjusted return measures of each classification with each other classification.

Secondly, hypotheses were stated to determine whether active share or tracking error had any predictive relationship with the performance of the general equity unit trusts. The following null-hypotheses were to be tested to determine these conclusions.

$H_{0(2)}$ = Tracking error does not affect fund performance.

$H_{A(2)}$ = Tracking error does affect fund performance.

$H_{0(3)}$ = Active share does not affect fund performance.

$H_{A(3)}$ = Active share does affect fund performance.

These hypotheses tested active share and tracking error for the entire sample of unit trusts to their risk-adjusted performance measures.

1.4.2 Secondary objective

The secondary objective was to assess whether there is a relationship between investment management fees and the amount of active management by unit trusts and whether the fees charged by unit trusts were justified by their performance. Firstly, it was determined whether tracking error or active share had any relationship with the total expense ratio (TER) of the unit trusts. The following null-hypotheses were tested.

$H_{0(4)}$ = Tracking error does not affect the fund TER.

$H_{A(4)}$ = Tracking error does affect the fund TER.

$H_{0(5)}$ = Active share does not affect the fund TER.

$H_{A(5)}$ = Active share does affect the fund TER.

Following this the researcher determined how much of the TER can be attributed to the active component of the unit trust, and how much of the TER can be attributed to the

passive component of a unit trust. Based on the alpha of the unit trust, and the difference between the TER (total expense ratio) of the actively managed unit trust and the TER of the index fund, the researcher determined the percentage of expenses that went toward generating the alpha. In other words, this would provide an indication of the percentage alpha foregone to pay the unit trust fees.

1.5 RESEARCH DESIGN

To reach the outcomes of the study, the researcher implemented secondary research, as will be described in this section.

1.5.1 Secondary research

Secondary research was done to obtain a greater understanding on the subject of active management, as well as the costs associated with investing in unit trusts. The studies of Cremers and Petajisto (2009) and Hirschel and Krige (2010) served as a guideline for greater understanding on active share, while the study of Miller (2010) served as guideline on the cost associated with actively managed unit trusts.

The primary objective required the holdings, return and net asset value (NAV) data for all general equity unit trusts over the period of the study (1 January 2008 – 31 December 2015). The holdings data and return data of the investable index funds were required as well. The required data on the following index funds were gathered: JSE All Share Index (JSE ALSI), JSE All Share Index Top 40 (JSE ALSI TOP40), JSE Shareholder Weighted Index (JSE SWIX), JSE Shareholder Weighted Top 40 Index (JSE SWIX 40), JSE Capped All Share Index (JSE CAPPED) and JSE Capped All Share Index Top 40 (JSE CAPPED 40). Furthermore, the TER of the general equity unit trusts and the index funds were required for the secondary objective.

To perform risk-adjusted return calculations, a risk free rate was required. Correia and Uliana (2004:71), Theart (2014:58) and Theart and Krige (2014) proposed that the negotiable certificate of deposit (NCD) rate was a valid proxy of the South African risk free rate. They claimed it to be applicable, because of government regulations on pricing and the liquidity of government securities. Thus, this study employed the NCD 3-month rate as a proxy for the risk free rate.

The following sections deal with the data, research methods, as well as the data analysis techniques used in this study.

1.6 DATA

The target statistical population relevant to the study consisted of the group of objects relevant to the specific research undertaken. In accordance to the stated definition, the target population of this research paper consisted of all South African equity unit trusts. A list of all general equity unit trusts in South Africa was obtained from ASISA (Association for Savings and Investment South Africa), to serve as the population of the study. As on 31 December 2007, 99 funds were classified as domestic general equity funds. On 31 December 2015, ASISA classified 248 funds as domestic general equity unit trusts. This indicates a dramatic increase in the number of available unit trusts to investors over the study period.

The data required for the study was retrieved from Bloomberg (2016). For a unit trust to be included in the research sample, the asset holding data, net asset value (NAV) per unit, and quarterly return had to be available for at least one year. Funds with gaps in these data sequences (periods for which data were not reported on Bloomberg) were excluded from the research sample. This left a research sample of 114 general equity unit trusts. Further, the holdings data and return data for the indices were obtained from Bloomberg (2016). For the calculation of the cost of active management, the TER of the unit trusts and the TER for the index proxies were obtained from Bloomberg (2016).

The data gathered allowed the researcher to analyse more general equity unit trusts in South Africa than previous studies performed on the South African market. Hirschel and Krige (2010) analysed 67 unit trusts, Siddle (2014) analysed 23 unit trusts and Muller and Ward analysed 90 unit trusts.

The research also required the NCD 3-month rate as a proxy for the risk free rate of return. It was obtained from the Bureau for Economic Research (BER) (2016) of Stellenbosch University.

1.7 RESEARCH METHODS

This section sets out the methodological framework that was used in the study. This study focuses on the active share measure in the South African general equity unit trust market. It aims to determine whether fund manager behaviour in the South African market is similar or different to that in the United States (US). This study tested whether active positions measured through active share and tracking error had an effect on the returns of the unit trusts. The research period for this study extended from 1 January 2008 to 31 December 2015, which was a timeframe of 8 years.

To complete this study, all relevant South African general equity unit trusts for which reliable and consistent data could be found, were selected. A total of 114 funds were studied. The selection of a bigger sample of unit trust funds will deliver a more accurate representation of the entire unit trust industry, while analysing the individual stocks held by the unit trusts will further increase this accuracy. This study should thus bridge the gap between previous studies on active share that were performed on the South African market. Hirschel and Krige (2010) studied 67 South African general equity and large cap unit trusts covering a period of five years (2003 - 2007), and analysed active share through considering the fund's investment in the stocks of individual companies. Muller and Ward (2011) studied 90 domestic general equity funds, starting June 2006 until September 2010. Their study grouped the companies into various industries, and compared the percentage of the unit trust funds in each industry to the industry composition of the index fund.

To quantify how active the active fund managers in South Africa are, the active share and tracking error was calculated for the funds. This approach made it possible to classify funds as diversified stock pickers, closet indexers, concentrated stock pickers, or as funds making factor bets, as indicated in Figure 1.1. This was done by implementing the methodology proposed by Cremers and Petajisto (2009), to determine the active share measure.

Secondly, this study investigates whether any of the classifications of the unit trusts were able to outperform any of the other classifications. Risk-adjusted performance measures

were calculated for the unit trusts over the eight-year study period. This allowed the researcher to perform statistical tests to determine any significant association between the classifications of unit trusts and the performance measures. This approach was similar to the approach employed by Hirschel and Krige (2010).

Following this is an investigation into a possible relationship between active share, tracking error and fund performance. This was done by comparing the active management measures to the risk-adjusted returns of the unit trusts. This indicated whether South African unit trust managers were able to add value, which exceeded the index, by taking active positions for their funds.

Lastly, this study focused on the cost associated with actively managed unit trusts. Miller (2010) indicated that in the US, actively managed funds had relatively high expense ratios in comparison to index funds. Thus, the secondary objective determined to what extent the active management fees affected the returns generated by the active fund managers.

This was chosen as the secondary objective to indicate whether the investment management costs incurred by general equity unit trusts in South Africa are justified by the value that is added through active management, or whether index funds with low costs are a better option for investors considering investing in these funds. This was done through evaluating fund returns, active weight, active expense ratio and active alpha as proposed by Miller (2010).

The results obtained for the primary objective will contribute to the currently limited understanding concerning active share and active management as employed by South African general equity unit trusts. The results of the secondary objective will indicate to investors whether they are paying too much for the active positions taken by general equity unit trusts in South Africa.

This study is of value to researchers and academics in the field of unit trusts. Furthermore, it will educate current as well as future investors on their choices when deciding on an investment instrument for wealth creation. Lastly, it is of value to practitioners, by providing a metric for evidence of adding active value. This means that fund managers

will be able to compare their performance to similar funds in South Africa, and determine whether they are adding value for their investors.

1.8 DATA ANALYSIS

Data analysis sets out to generate meaning from raw data collected for the study (Coldwell & Herbst, 2004:92). This study implemented descriptive statistics to summarise large sets of quantitative data (Zikmund, 2003:473), as well as inferential statistics to draw conclusions on the characteristics of the data (Keller, 2005:3).

The data relevant to the study were analysed in four phases. Firstly, quarterly returns, and active measures (active share and tracking error) were calculated for the applicable unit trusts as well as the index funds. Secondly, absolute and risk-adjusted performance measures were calculated for both the unit trusts and the index. Thirdly, the hypotheses of the primary objective were tested. Finally, for the purpose of the secondary objective, the expense ratios of the unit trusts and indices were obtained, and the active alpha and active expense ratios were calculated.

1.9 ORIENTATION OF THE STUDY

This section presents an outline of the study:

Chapter 1 Introduction to the study

This chapter presents the background applicable to the study. Furthermore, research problems and objectives are formulated. The research method that was utilised in the study as well as the data analysis techniques is presented.

Chapter 2 Literature review

The literature review of this study consists of two main sections. The first section provides an in-depth discussion of active share in unit trusts and traditional measures of active management. The second section consists of a detailed discussion on the cost of an actively managed portfolio. Both of the aforementioned sections will be discussed on foreign equity markets, as well as the South African Equity market.

Chapter 3 Research methods

This chapter sets out to the reader how the data applicable to the study has been collected and analysed. The first section discusses the research process as applied in the study. Furthermore, relevant formulae and statistical models will be introduced to provide meaningful data that is needed to obtain the research results.

Chapter 4 Research results

The data obtained from Chapter 3, the research methods, is utilised to attain the relevant results of the study. The results state whether the hypotheses of the study were satisfied. The results from the primary objective will indicate the extent of active management in South African unit trusts. For the secondary objective the results on the cost of active management in South African unit trusts will be presented.

Chapter 5 Conclusions and recommendations

This chapter summarises the results found in the study, as presented by the research results in Chapter 4. The research will be compared to previous research on the relevant subjects. The chapter concludes with recommendations for future studies, as well as areas for further research.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

Unit trusts are a major investment vehicle in South Africa, with more than R 1 656 448 million invested on 31 December 2015 (ASISA, 2016). Unit trusts provide the opportunity for investors to invest their money without having to decide on what stocks to invest in, as the funds from many investors are pooled and invested by professional fund managers (Reilly & Brown: 2012: 58). It is important that the investor chooses a unit trust that meets his or her objectives and constraints. There are many unit trusts to invest in and choosing the right type of unit trust could become a difficult task.

It has long been debated whether active or passive fund management is a better option. Active fund management provide the opportunity to outperform the market by a substantial amount, but are subject to high fund management fees. Passive fund management aim to replicate an index and charge lower fees than active management (Sorensen, Miller & Samak, 1998: 19-20).

As this study deals with the active and passive management of South African general equity unit trusts, this chapter starts off with a discussion on the advantages and disadvantages of unit trusts. After knowing what the advantages and disadvantages of unit trusts are, it is important to know what type of unit trusts there are and how unit trusts perform.

Following this, the chapter focuses on the active management of unit trusts through the active share and tracking error measures, and the possible effect of efficient markets on fund returns. Finally, when considering active and passive management, it is important to consider the cost involved with these strategies. The chapter lastly investigates how the costs of active management decreases the returns that the funds deliver.

2.2 INTRODUCTION TO UNIT TRUSTS AND THE PERFORMANCE OF UNIT TRUSTS

A unit trust is described as a pool of money provided by different investors, and is managed by a fund manager to reach the stated investment objective (Sharenet, 2015; Reilly & Brown: 2012: 58). A unit trust is a kind of trust where the investors buy units in the trust. When buying into a unit trust, the value of a single unit is based on the value of the underlying assets. The price per unit (PPU) is thus calculated as the net asset value (NAV) divided by the number of units, providing the net asset value per unit (Morningstar, 2012). When investing in a unit trust, it is important for an investor to understand the advantages and disadvantages associated with this type of investment.

2.2.1 The advantages and disadvantages of investing in unit trusts

A unit trust provides several advantages as well as disadvantages. The advantages and disadvantages of unit trusts are discussed below.

Choong, Thim, Fie and Ng (2012) state four advantages to unit trusts. Firstly, unit trusts provide the investor with wider diversification, meaning that the investment risk could be reduced. This is because if one asset performs poorly, the large number of other assets invested in could offset it. Unit trusts also provide liquidity to the investors at a reasonable cost. Investors are able to sell all or part of their units quickly, as the management company repurchases the units. Furthermore, it provides the investor with more investment opportunities, as some investments require a very large minimum investment that could be out of reach for some individual investors. Lastly, Choong *et al.* (2012) state that unit trusts provide access to professional and qualified fund managers that make investment decisions on your behalf. According to JE Financial Consulting (2015) the unit trust industry in South Africa is regulated through the Collective Investment Schemes Control Act (CISCA), providing protection and transparency for the investors.

The disadvantages associated with investing in unit trusts include that they are generally best suited for investors looking to invest for a medium to long term, which could make them unsuitable for short-term investors. Investors redeeming their investments in the short term will not take full advantage of the advantages provided by unit trusts (JE

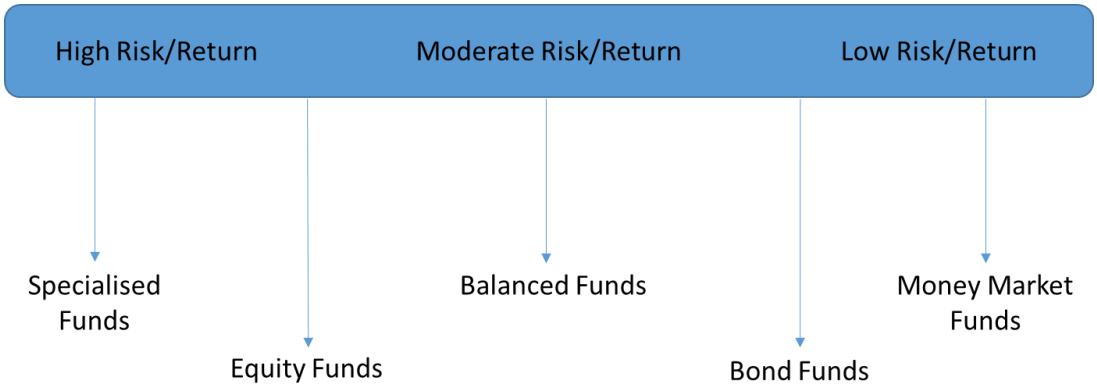
Financial consulting, 2015). A unit trust can be expensive to invest in as the investments can be subject to trust fees, management fees, redemption fees, as well as other fees (U.S. Securities and Exchange Commission, 2016). As with any investment there are also risks involved with investing in unit trusts (Monetary Authority of Singapore, 2014). Further, the investor does not have any control over the individual investments that the fund manager make (Reilly & Brown, 2012: 951). The investor does however have the ability to choose a type of unit trust that best fits their investment profile, and thus it is important to understand the types of unit trusts that exist.

2.2.2 The types of unit trusts

When investing in a unit trust, the investor needs to consider the risk profile, investment objective, investment strategy, foreign exchange risks, time horizon, as well as the specific fund manager (Monetary Authority of Singapore, 2014). These factors will have a large impact on the amount of active bets taken by the fund manager, and thus influence how much the bets taken by the fund manager differ from the benchmark implemented by the unit trust. The benchmark is chosen as a performance measure against which the return of the unit trust is measured. The active bets that differ from the benchmark will give rise to active share, tracking error, and transaction costs.

Investors have various types of unit trusts to choose from when investing. Unit trusts can vary based on the type of assets that they invest in. These assets will define the risk/return profile of the unit trust. Figure 2.1 presents the types of unit trusts that investors can choose from, as described by Jordan and Miller (2008) and Monetary Authority of Singapore (2014).

Figure 2.1 Types of unit trusts



Source: Adapted from Monetary Authority of Singapore (2014).

The types of unit trusts as illustrated in Figure 2.1 are:

- Specialised funds invest in a specific section or sector of the exchange. They carry high risk, because of the lack of diversification from specialization. They have a chance to provide high returns for their investors should the sector or specific stocks invested in be successful.
- Equity funds invest in any equity listed on the stock exchange. They will invest in companies from different sectors, according to the investment objective and investment strategy of the unit trust. These unit trusts are more diversified than specialised funds, but could still pose the investor with a high risk/return profile.
- Balanced funds provide their investors with wide diversification by investing in a mixture of bonds, equities and money market instruments. The equities provide upside potential as well as risk, while the bonds and money market instruments provide a more stable income flow.
- Bond funds invest specifically in bonds. These can be government bonds or corporate bonds. These provide a stable income source to their investors, but have a small chance of defaulting. The risk/return profile on bonds are higher than the risk/return profile on money market instruments.
- Money market funds carry the lowest risk/return profile to investors. These generate income by providing money to parties that need it, and receives interest

on the money provided. The risk/return profile is low as these are usually safe investments.

According to Yu (2012) these categories can be divided into growth and income funds. The income funds, money market funds and bond funds, provide regular distributions through interest (money market funds) and coupon payments (bond funds) to their investors. Balanced funds can be seen as a mixture of a growth and an income fund. Growth funds (equity funds and specialised funds) provide capital protection. These funds pay out dividends which usually gets reinvested in the unit trust. Growth funds can be managed according to different investment styles. Yu (2012) describes these styles as:

- Active and passive: A fund that is actively managed deviates from the implemented benchmark. A passive fund aims to perform similarly to the implemented benchmark (Yu, 2012).
- Growth and value: Value investors invest in stocks with a high book to market (B/M) ratio, a high cash flow to price (C/P) ratio and high earnings to price (E/P) ratio. Growth stocks have low B/M, C/P and E/P ratios (Fama & French, 1998:1975).
- Technical and fundamental: Technical analysis looks at market behavior without attempting to explain it. Fundamental analysis identify factors that influence the prices of shares (Roy, 2015).
- Small-cap and Large-cap: Small-cap stocks have a high potential for growth, while large cap stocks can be less volatile and provide growth (Yu, 2012).

This shows that there are many options in terms of fund type and management style for investors in unit trusts. As this study determines how actively general equity unit trusts in South Africa are managed, the literature review will focus on the active and passive management of equity funds.

2.2.3 The active and passive management of unit trusts and the performance of unit trusts

Globally investors are shifting from actively managed funds to passively managed funds as investors accept the idea that active and passive investments complement each other,

rather than being contrasting investments. In South Africa, however, a large part of long-term investments are placed in actively managed funds (Wessels & Krige, 2005b).

According to Discovery Invest (2012) and Maginn *et al*. (2007), a passively managed fund is one where the fund manager tries to replicate the performance of the benchmark index. With an actively managed fund, the fund manager makes bets that differ from the benchmark in order to try and outperform the allocated benchmark.

Passive investors believe that markets are efficient, which means that the price of a share fully reflects information that is available about it. They believe it is highly unlikely to achieve excess returns by buying individual shares, and thus usually buy either the entire market or a particular segment of the market. Active investors believe that the market is not entirely efficient, and that research can discover information that is not reflected in the current share price. Thus, active managers attempt to find mispriced shares in order to outperform the market (Pollock, 2014 and Maginn *et al*. 2007).

Active and passive approaches to investing both have their advantages and disadvantages. It is important for an investor to understand the advantages and disadvantages when deciding what the better option is.

Passive funds normally have low management fees that investors need to pay (Sharpe, 1991:7). These funds are transparent and regulated, providing reliability for the investor. Passive funds that track the index are also usually well diversified (Monetary Authority of Singapore 2014). There are some disadvantages to investing in these funds. These funds attempt to imitate the benchmark, not to outperform it. Thus, if there are inefficiencies in the market, the fund manager does not necessarily seek to take advantage of these inefficiencies (Discovery Invest 2012).

Active funds have the potential to outperform their respective benchmarks if they are able to take advantage of market inefficiencies (Discovery Invest 2012). These funds are managed according to an investment approach, and may better suit the objectives of the investor. The disadvantages are that active funds have higher management fees, and that the fund can underperform the benchmark if active bets perform differently than expected (Sharpe, 1991:7).

From these advantages and disadvantages it is clear that passive management could be better in certain circumstances, and active management could be a more viable option in other circumstances, depending on the constraints and objectives of the investor. Studies have been performed on whether active or passive unit trusts deliver superior performance in terms of absolute returns.

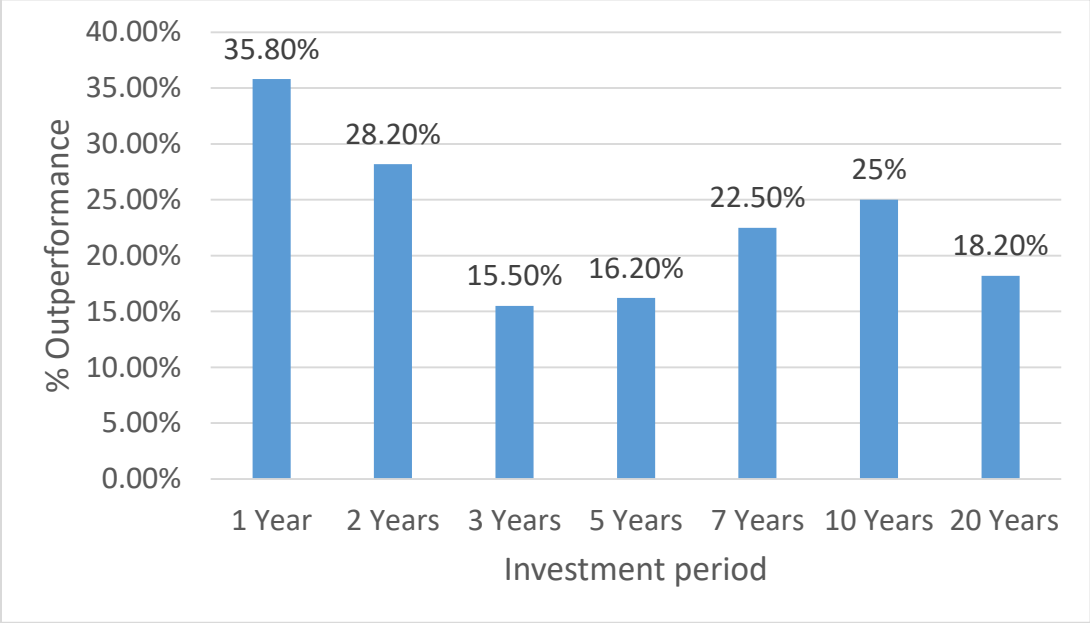
Fortin and Michelson (2002) tested the performance of 9329 actively managed mutual funds in the US from 1976 to 2000 on a total return basis. The actively managed funds were divided into eight categories depending on the index funds that were the closest to them in investment objective. The mean return of all the funds for a certain category was compared to the assigned index fund. Out of the eight categories, six categories of mutual funds were outperformed by their indices in a statistical significant manner on a total return and after-tax total return basis.

The article of Malkiel (2003) presented a case in favour of passive investment strategies for US markets, UK markets as well as international markets. He stated that markets appear to be efficient, as they incorporate and adjust to new information quickly, and that there is no technical or fundamental trading rule that would enable an active investor to beat a passive investor. He further maintained that even in the case of inefficient markets, a passive strategy would be a better option than an active strategy, as investing is a zero sum game (this means that for one party to be able to achieve an excess return, another party needs to perform worse than the market). The results of the study agree with Fortin and Michelson (2002), as he calculated that the average actively managed US mutual fund as at 31 December 2001 had a return that was 175 basis points lower than their respective indices, over periods of 10, 15 and 20 years. In the European market, 69% of actively managed funds were outperformed by the Morgan Stanley Capital International Europe Index for the same period.

On the South African market, Brown (2014) indicated the number of funds that managed to outperform the market over an extended period of time, as illustrated in Figure 2.2. The figure shows that only 18.2% of active fund managers were able to outperform the JSE ALSI on an absolute return basis over a 20 year period. This means that over this period,

investors would have a 81,8% chance of underperforming the JSE ALSI when randomly selecting an actively invested fund.

Figure 2.2 Percentage of Actively Managed General Equity Unit Trusts that Outperformed the JSE All Share Index



Source: Adapted from Brown (2014)

However, when investing it is also important to not only consider the absolute returns, but also the risk-adjusted returns. Some of the best known risk-adjusted measures are those of Treynor (1965), Sharpe (1966) and Jensen (1968). The following studies found that active management did not significantly outperform passive management on a risk adjusted basis.

Jensen (1968) investigated the performance of 115 US mutual funds from 1945 to 1964. He claimed that performance has two dimensions, namely the ability of a fund manager to deliver increased returns through stock selection and the ability to minimize risk. The study used Jensen's alpha to measure the risk-adjusted performance of the funds. This indicates the performance of a portfolio in comparison to the predicted performance by the capital asset pricing model (CAPM). The study found that the average fund delivered an alpha of -1.1% per year after fees and -0.4% before fees. Of the 115 mutual funds, 76

earned an alpha of less than 0%. He concluded that the funds were not able to predict share prices well enough to cover their expenses.

Using a similar method as Jensen (1968), Malkiel (1995) examined the returns of 239 equity mutual funds on the US market over a 21 year period from 1971 to 1991. As with Jensen (1968), Jensen's alpha was used to calculate the excess returns. The average alpha over the study period was -0.06 percent, which was not considered a statistically significant underperformance in terms of the benchmark. Furthermore, he established that fund performance had strong persistence in terms of returns from period to period. Lastly, he found that an investment strategy could not be designed and implemented to exploit the persistence in fund returns.

Gallo and Swanson (1996) analysed 37 international mutual funds, based in the US. The study lasted from January 1985 to December 1993. The funds were analysed according to the methods proposed by Sharpe (1966) and Jensen (1968). The average Sharpe ratio was 0.212 and the average Jensen's alpha was 0.096%. Even though the funds managed to deliver positive risk-adjusted returns, the funds were unable to deliver a statistical significant outperformance over the MSCI World Index. They could not find evidence of market timing ability.

Rompotis (2009) studied active and passive Exchange traded funds (ETF's) that were listed on the US market. The study analysed three passive ETF's and three active ETF's. For all three active ETF's, the return was lower than the stated benchmark. The Sharpe ratio, Treynor ratio, as well as the Jensen's alpha were lower as well. Rompotis (2009:9) concluded that the active funds underperformed the market, and also underperformed passive funds. Furthermore, neither the passive funds nor the active funds provided any statistically significant benefit in terms of risk-adjusted return when compared to their benchmark indices.

Quigley and Sinquefield (2000) investigated the performance of 752 UK unit trusts that invested more than 80% of their assets in European equities from January 1978 to December 1997. Over this period, the UK market achieved a return of 18.33% per year. The average return of the funds before fees were 16.89% and 15.54% after fees. This

amounted to an alpha net of fees of -0.13% using the CAPM model and -0.18% using the Fama and French three-factor model. As in Malkiel (2003), they find that after fees, the unit trusts reliably underperform against the market, and that smaller unit trusts performed worse than bigger unit trusts. They further found persistence in bad performance, but not in good performance. The worst performers underperformed significantly at the 5% level, while the best funds did not outperform significantly at the 5% level.

On the South African market, several studies have also been done on the risk-adjusted performance of unit trusts. Oldfield and Page (1997) analysed eight general equity funds and nine specialist equity funds from September 1987 to September 1994. The study indicated that none of the funds were able to deliver a statistical significant outperformance of the market in terms of Jensen's alpha (this is consistent with the studies done in the US). They indicate that in South Africa there is no statistical proof that fund managers were able to time the market to deliver excess performance, or select stocks in order to achieve excess performance.

Brink (2004) investigated the performance of South African unit trusts over 20 years from 1 January 1984 to 31 December 2003. The study examined whether active fund managers were able to outperform their respective benchmark indices. Over the 20 year study period, the JSE ALSI delivered an absolute return of 16,62%, while the average fund delivered an absolute return of 16,87%. Over this period 40% of active funds underperformed relative to the JSE ALSI. Risk-adjusted returns were calculated using the Sharpe ratio as proposed in Sharpe (1966). The study provided evidence that the JSE ALSI provided a better risk-adjusted return over the study period than active funds.

Tan (2015) analysed the performance of ten equity unit trust funds in South Africa from 9 January 2009 to 31 October 2014. The funds were analysed using the Sharpe ratio, Treynor ratio and Jensen's alpha. The Sharpe ratio for the funds was between 0.04016 and 0.12015. The Treynor ratios were between 0.00093 and 0.00302. The Jensen's alpha measures ranged from -0.00061 to 0.00108. The results showed that overall, fund managers were unable to deliver statistically significant risk-adjusted returns. As with Oldfield and Page (1997) it was concluded that South African fund managers did not perform well in terms of security selection skills or market timing ability.

In contrast to the South African studies that found no evidence that active management outperformed passive management, Gilbertson and Vermaak (1982) concluded that on a risk-adjusted basis, unit trusts generally outperformed indices. The study analysed the performance of eleven unit trusts in South Africa from 1974 to 1981. The absolute annual returns of the funds were between 15.9% and 22.5%, which was lower than the absolute returns of the indices. However, after adjusting the returns for risk, through the Sharpe ratio, Treynor ratio and Jensen's measure, the unit trusts generally outperformed the indices.

These studies indicate that in the US, UK and South Africa, most mutual funds and unit trusts find it difficult to outperform the market on a risk-adjusted basis. The studies that found that funds did not outperform the market significantly were: Fortin and Michelson (2002), Malkiel (2003), Jensen (1968), Malkiel (1995), Gallo and Swanson (1996), Rompotis (2009), Quigley and Sinquefield (2000), Oldfield and Page (1997), Brink (2004), and Tan (2015). Gilbertson and Vermaak (1982) was the only considered study that found that unit trusts outperformed the market.

The performance of unit trusts, as calculated in these studies can stem from multiple factors. Huij (2007) set out to determine to what extent mutual funds served the investors needs through offering them the benefits that came with diversification and professional investment management. According to Huij (2007:16) there are several studies that acknowledge the fact that mutual funds provide the advantage of diversification. The study states that the literature does not clearly indicate whether professional investment managers are able to increase the returns of the funds above that of the benchmark, but in fact there is evidence that most fund managers are not able to add value after accounting for fees. More than 6400 US mutual funds were studied from 1963 to 2003. The study found that 82% of all returns were accounted for by systematic risk factors. The study further concluded that past performance of mutual funds had predictive power for future performance, and that there was persistence in performance for mutual funds.

On the South African market, Fox and Krige (2013) investigated the sources of performance for general equity unit trusts from 2002 to 2011. They determined whether the performance was from sector allocation or stock selection. For the study, 14 general

equity unit trusts were analysed. The study found that sector allocation provided the funds with a positive alpha, but the positive alpha was offset by the negative alpha caused by stock selection. Their findings are consistent with Oldfield and Page (1997), as only the top fund managers were able to obtain excess performance from sector allocation as well as stock selection.

As can be seen, unit trusts are a widely studied subject. These studies indicate that actively managed funds find it difficult to outperform the benchmark on an absolute and a risk-adjusted basis. An attributor to this is the efficiency in which markets operates. Markets that are more efficient provide fewer opportunities for active funds to outperform the index.

2.2.4 Active and passive management and the efficiency of markets

The efficiency of markets play a major role in the analysis of active and passive management. In an efficient market, the prices of shares rapidly adjust as soon as new information becomes available, meaning that the market prices of shares fully reflect all relevant information (Reilly & Brown 2012:239). In inefficient markets, there is a lag between the time when new information becomes available and the time when the share price adjust to the information.

Fama (1970) proposed a formal theory on the efficiency of markets. Fama (1970:384) stated that share prices should reflect all available information, meaning that the return earned on an investment should be consistent with the risk associated with the investment. The efficient market hypothesis (EMH) asserts that information is represented quickly in share prices, meaning that shares should neither be over-priced nor under-priced (Bodie *et al*., 2010:10-11). The EMH consists of three sub hypotheses, the weak form EMH, semi-strong form EMH and the strong form EMH.

The weak form EMH states that share prices only reflect historical prices and information. It asserts that an investor will not be able to generate an excess return by using trading rules based on past market data. The semi-strong form EMH asserts that share prices adapt rapidly to new public information as well as historical data, meaning that investors are not able to achieve excess risk-adjusted returns on any information that is announced

to the public (Parks & Zivot, 2006:15). The strong form EMH states that share prices reflect all private as well as public information, meaning that investors should not be able to realise above average risk-adjusted returns consistently (Dimson & Mussavian, 2000:4-5).

Various studies have been done on the EMH. Fama (1970:414) asserts that there is support for semi-strong form efficiency in the United States market. Smith and Ryoo (2003) studied the efficiency of European emerging stock markets, including Greece, Hungary, Poland, Portugal and Turkey from April 1991 to August 1998. They find that all the markets, except for Turkey are inefficient at a 95% confidence level. They claim that the size and the liquidity is a large attributor to the efficiency of the market. Of the markets they studied, Turkey was the largest and most liquid.

Several studies on the efficiency of African markets and the South African market have been done. Magnusson and Wydick (2002) studied weak form efficiency in eight African countries, including South Africa. The efficiency of these markets were compared to emerging stock markets in nine other developing countries. They found that from 1989 to 1998, on the South African market, past prices and information cannot be used to determine future prices. And that future volatility cannot be predicted by past volatility. They found that the South African market had weak form efficiency at a 95% level of confidence.

Smith, Jeffers and Ryoo (2002) studied the efficiency of eight African markets. The study lasted from January 1990 to August 1998. They found that of the eight African markets that were studied, the South African market was the only market to follow a random walk at a 95% confidence level. This means that future prices could not be determined by studying past prices, meaning that the South African market is weak-form efficient. They state that the size of the JSE and the turnover levels is what causes this distinction form other African markets. This conclusion agrees with that of Smith and Ryoo (2003)

However, a later study by Gräter and Struweg (2015) from October 1998 to April 2014 found that the JSE is weak form inefficient. They found that the returns of the JSE were normally distributed over this period. They further stated that at the 95% and 90%

confidence level, a shock did not influence future share prices to significantly draw away from their average value in future periods, meaning that the JSE is weak form inefficient.

These studies indicate that markets differ in terms of how efficiently they operate. The efficiency in which a market operates was influenced by the size and the liquidity of the market. Markets that were larger and more liquid were found to be more efficient. The occurrence of efficient markets has implications for unit trusts and their performance. If markets were perfectly efficient, active fund managers would not be able to outperform the market consistently without accepting more systematic risk. This would mean that active managers would not be able to outperform the benchmark on a risk-adjusted basis, meaning that active share and tracking error should have no relationship to the performance of unit trusts. The following section deals with active share and tracking error for unit trusts, indicating whether the degree of active management influences fund performance.

2.2.5 The characterisation of active management according to active share and tracking error

In order to classify how actively a fund is managed, measures of active management are needed. The traditional measure for active management is tracking error. Tracking error indicates to what extent the fund returns generated by the fund manager varies from the benchmark index. Active share measures to what extent the fund holdings differ from the holdings of the benchmark. Several studies have been done globally on the active management of unit trusts, which includes studying their active share as well as tracking error.

Cremers and Petajisto (2009) categorised unit trusts into four categories according to how actively they are managed. These categories were defined based on the tracking error and active share of the unit trusts. The four categories proposed by Cremers and Petajisto (2009) were closet indexers, diversified stock pickers, factor bets and concentrated stock pickers.

- Closet indexers try to mimic their respective benchmarks or indices and will thus have a low active share and tracking error. The active share and tracking error

arise from a lag in adapting the unit trust to replicate the benchmark, the transaction cost applicable to investing in new shares and fund management costs.

- Diversified stock pickers place bets on shares in a manner that differs from the benchmark. This causes the fund to have a high active share. The bets are placed in such a way that they are diversified enough to lower non-systematic risk, and the fund will thus have a low tracking error.
- Funds making factor bets emphasize exposure to the benchmark index or certain sectors. These funds place bets on systematic risk factors. These funds do not choose individual stocks within these portfolios. Funds making factor bets have a low active share and high tracking error.
- Concentrated stock pickers make large bets that differ from the index or benchmark. The shares invested in are not well diversified, and the fund is exposed to a large amount of non-systematic risk. This usually causes the fund to have a large active share as well as tracking error.

The current study categorised unit trusts according to these four categories. Classifying the unit trusts into these four categories allowed the researcher to determine which category was most successful at adding value to their funds, and whether active share or tracking error had any relation to fund performance. Many studies have been done on the degree of active management, and whether this influences fund performance. The following studies found that active management leads to increased fund performance.

Cremers and Petajisto (2009) introduced the active share measure as a measure of active management. They computed active share for general equity unit trusts in the US from 1980 to 2003. Monthly data on 2647 unit trusts were compared to 19 indices for the active share and tracking error calculations. The lowest active share index fund was chosen as a funds benchmark. In 1980, 1.5% of the funds analysed had an active share of less than 60%, in 2003, 44.8% of funds had an active share of less than 60%. Cremers and Petajisto (2009) found that the difference in the benchmark-adjusted returns between the lowest active share and highest active share funds were 2.55%, indicating that a higher active share leads to a statistically significant increase in performance. Further, the study

indicated a positive correlation between active share and tracking error, and that smaller funds tend to have a higher active share than larger funds.

Petajisto (2013), following the same procedure as Cremers and Petajisto (2009), analysed 2740 US mutual funds from January 1980 to December 2009. The study indicated that the average fund beat the benchmark by 0.96% gross of fees, and underperformed the benchmark by -0.41% nett of fees. Mutual funds with the highest active share outperformed their benchmark indices more often, after accounting for fees. Closet indexers were found to underperform relative to their benchmark. The study concluded that for the period the average actively managed fund underperformed in terms of the benchmark. However, similar to Cremers and Petajisto (2009), he found that the most active stock pickers outperformed their benchmarks by 1.26% per annum after accounting for investment fees. The results were consistent during the 2008-2009 financial crisis. Furthermore, he stated that mutual fund investors should invest either in the most active stock pickers or in the mutual funds with the lowest active share.

Caquineau, Möttölä and Schumacher (2016) performed a study on active share on European funds that invest in local equities. Their study analysed 860 funds from 1 January 2005 to end-June 2015. They found that the number of funds classified as closet indexers declined in the recent years. They further found that funds with high active share had larger performance fees. When price was measured per unit of active share, the study found that low active share funds are relatively more expensive. They concluded that funds with higher active share on average performed better than funds with low active share, which is consistent with Cremers and Petajisto (2009) and Petajisto (2013). They advised that active share should be used with caution when making investment decisions, as a higher active share increased the dispersion in risk and return levels.

Amihud and Goyenko (2013) studied how active management, using the R^2 measure is related to fund performance. R^2 is the portion of the funds returns that can be explained by the returns of the benchmark, and is the inverse of tracking error. They studied 2460 funds in the US from 1988 to 2010. The study divided the funds into twenty-five portfolios based on their alpha and tracking error. They find that funds with a lower R^2 (meaning a higher tracking error) have higher risk-adjusted performance. Funds with a Low R^2

delivered an alpha that was 2.052% higher than funds with a high R^2 before fees, and an alpha 2.352% higher after fees. They concluded that funds with the lowest R^2 delivered the highest alpha, gross and net of fees, in a statistical significant manner.

On the South African market studies have been done to determine whether active share leads to better fund performance. Hirschel and Krige (2010) investigated the relationship between tracking error, active share and the performance of South African general equity unit trusts in a similar way as Cremers and Petajisto (2009). The study ranged from 2003 to 2007 and analysed 67 unit trusts. The active share was calculated according to quarterly holdings data of the unit trusts in comparison to the lowest active share index fund and in comparison to the JSE ALSI. The data displayed a positive relationship between active share and tracking error. Active share was compared to performance in terms of Jensen's Alpha and the Omega ratio. They concluded that higher active share leads to a statistically significant higher benchmark-adjusted performance.

Siddle (2014) investigated a sample of 23 unit trusts in South Africa from 30 June 2007 to 30 June 2013. Even though the sample is relatively small, it represented about 58.2% of all assets under management by local general equity funds. The average active share decreased from 60.85% to 55.65% over the study period. Quarterly data was used to calculate tracking error, active share, and to divide funds into terciles based on these measures. Siddle (2014) found that under different market conditions funds with the highest active share and tracking error generated a significantly higher alpha than funds with a lower active share and tracking error, which is consistent with Hirschel and Krige (2010). Further, during the financial crisis of 2007/2008 and the bull market thereafter, the concentrated stock pickers generated a significantly higher alpha than closet indexers. Lastly, when only comparing active share to fund performance, it also proved a valuable measure of fund performance, as active share had a positive correlation to fund performance.

There are however, studies that found that active management does not improve fund performance.

In the US, Schlanger *et al*. (2012) investigated a fund sample of long-only domestic equity mutual funds from the Morningstar database. The sample consisted of only surviving funds, as the database did not report the necessary holdings data of closed funds. The final sample consisted of 903 funds that were analysed from 1 January 2001 to 31 December 2011. Active share was calculated relative to a Russell Benchmark corresponding to the Morningstar style box. In contrast to the previous studies on active share, the study concluded that higher levels of active share did not lead to outperformance of the benchmark. Furthermore, they found that high active share funds did not significantly outperform low active share funds, but the higher active share funds exhibited a larger dispersion of excess returns.

Allen (2015), expanded on the research of Cremers and Petajisto (2009) by focusing on the active share of product pairs. In this research product pairs consisted of portfolios managed by the same manager, using the same philosophy, managed against the same benchmark and is supported by the same research platform. The degree of concentration was the fundamental difference between the portfolios in each product pair. Their sample consisted of 148 US portfolios, which translated to 74 product pairs. These product pairs were analysed from 31 December 1989 to 31 December 2013. An appropriate Russell style index was implemented to calculate the active share for each portfolio. Allen (2015) concluded that active share is only one of many factors that have an influence on the direction as well as magnitude of excess return for any given investment strategy.

A follow up study on Cremers and Petajisto (2009) and Petajisto (2013) was done by Frazzini, Friedman and Pomorski (2016). The sample consisted of all US actively managed domestic mutual funds from 1990 to 2009. They found that large-cap funds have the lowest average active share, and small-cap funds have the highest average active share. This means that when investors select funds with a high active share, they will tilt towards small-cap managers, and when investors invest in funds with low active share, they will tilt towards large-cap funds. Further, they found that large-cap indices, which tend to be the indices associated with low-active share funds, outperformed small-cap indices, which tend to be the indices associated with high active share funds. The focus of this study was on benchmark-adjusted returns, and not on the fund returns

themselves, as benchmark-adjusted returns emphasise the skill of the manager better. They found no statistically significant difference between the returns of low active share and high active share funds, and thus concluded that active share does not predict performance.

However, Petajisto (2016) responded to this article and the three main results that Frazzini *et al*. (2016) found.

1) Petajisto stated that it is a well-known result that small-cap funds have higher active share than large-cap funds, as mentioned in Petajisto (2013) and Stahl, Thomas and Simons (2011), as well as many presentations delivered by Petajisto. Petajisto (2016) agreed that large-cap funds must be compared to large-cap funds.

2) Further Frazzini *et al.* (2016:1) stated that active share had no predictive power in terms of fund returns. Petajisto (2016) stated that tests were done individually for different market-cap fund groups. Frazzini *et al.* (2016:7) indicate that active share is negatively related to returns for some benchmark indices, and positively related to returns for others, arguing that active share has no significant effect on returns. Petajisto (2016) argued that active share is positively related to the indices that are used as benchmarks by most funds. Further, he argued that the benchmarks that were underperformed, only formed a small part of the universe of mutual funds.

3) Over the study period of Frazzini *et al.* (2016), the small-cap benchmark indices had larger negative four-factor alphas than the large-cap indices. Petajisto (2016) had an issue that four-factor alphas assign unsuitable large non-zero alphas to both the large-cap and small-cap segments. Cremers, Petajisto, and Zitzewitz (2013:47) suggested that the four-factor alpha model should be modified to deal with this result.

On the South African market, Muller and Ward (2011) investigated active share on 90 domestic general equity unit trusts on the JSE. The study investigated active share from June 2006 to September 2010. Consistent with the previous studies, they found a decline in active share. Over the study period active share declined from around 50% to 15%, which indicated that active fund managers were unwilling or unable to take active positions. The study was performed on industry level active share, and not on the

individual shares held by each unit trust. Contrary to Hirschel and Krige (2009) and Siddle (2014), Muller and Ward (2011) could not find a statistical significant relationship between active share and unit trust returns.

These studies indicate that the active management of unit trusts in terms of tracking error and active share is a widely studied subject. The studies conclude that active share tends to decline worldwide, and that indexing is becoming more popular. There is however conflicting results on whether active management significantly improves fund performance. Five of the studies that were considered found that a higher active share improves fund performance, these were Cremers and Petajisto (2009), Petajisto (2013), Caquineau *et al*. (2016), Hirschel and Krige (2010) and Siddle (2014). Four studies namely, Schlanger *et al*. (2012), Allen (2015), Frazzini *et al*. (2016) and Muller and Ward (2011) found no statistical significant increase in performance that could be associated with a high active share. The following section indicates factors that drives the performance of funds with a high active share.

2.2.6 Factors that drive the performance of high active share funds

As investing is a zero sum game, it means that the average fund should perform equal to the market before the deduction of fees (Fama and French, 2010:915). This gives rise to the question of why studies have found that active share leads to higher fund returns, and what drives this performance. The following studies dealt with this topic.

Cremers and Pareek (2016) studied active share and the frequency of trades from 1990 to 2013 on the US market. They state that the performance of the average active fund manager is similar or slightly below the benchmark performance after accounting for fees. On the basis that high active share funds outperform their benchmarks after fees, as found in Cremers and Petajisto (2009), they attempt to find a source for the outperformance by looking at how frequently the funds traded. The frequency of trades were measured in three ways. Firstly based on the weighted average time that a fund held its investments. Secondly, based on the changes in quarterly holdings. Thirdly, based on the ratio of all sales and buys of shares. They found that the highest active share funds, with holdings durations over two years, performed up to 2% better than the

average fund. On average, all other funds underperformed, including funds with high active share that traded frequently. They concluded by saying active managers that pick stocks that other investors find less attractive, with a low beta, high value and high quality and that stick with these shares outperform.

Cremers (2016) studied active share, management skill, conviction and opportunity for US mutual funds from 1990 – 2015. The sample consisted of 3100 actively managed mutual funds. Any funds with an active share of lower than 20% was excluded from the sample. Over the study period low active share funds on average underperformed their benchmarks by 1.37% per year, which was statistically significant. High active share funds outperformed their benchmarks by 0.71% on average, which was deemed statistically insignificant. Further they found that only active funds with long-term investments were successful (1.88% outperformance), while active funds with short-term investments underperformed (-0.23% underperformance). Finally they found that small-cap funds with high active share and holding duration delivered a statistically significant outperformance of 1.94%, and that high active share small-cap funds with a short holding duration underperformed insignificantly by -1.15%. Large-cap funds with a short holdings duration and low active share underperformed significantly with -1.40%.

Cremers, Ferreira, Matos and Starks (2016) studied indexing and active management worldwide. They investigated exchange-traded and open-end equity mutual funds from 2002 to 2010. The sample consisted of 24 492 funds across 32 countries. Over the study period, explicit indexing and closet indexing on average increased slightly. Of the total equity mutual funds worldwide, as of December 2010, 22% were explicitly indexed, 20% were closet indexers and 58% were active (had an active share of 60% and above). Explicit indexing funds had a TER of 0.35%, closet indexers had a TER of 1.64% and active funds had a TER of 1.66%.

As with Cremers and Petajisto (2009) and Petajisto (2013), the study found that active share positively affects fund performance, while tracking error is negatively related to fund performance on a benchmark-adjusted basis in a statistically significant manner. Further, Cremers, *et al*. (2016) found that when active funds compete with many low-cost indexing funds, they tend to be more active and charge lower fees. Further they found that in

countries with more closet indexing, the alpha was lower than in countries with more explicit indexing. They conclude that markets with more competition from explicit indexing drive fund managers to assume a higher active share, leading to better performance. Markets with less options for cheap index-investing have many closet indexers that have high fees and underperforms.

These studies indicate that it is the high active share funds, with a long holding duration that outperforms. Further it is found that the competition from low cost index funds could drive active funds to assume higher levels of active share at a lower cost. This indicates that the price of active management could have a large effect on the performance of a unit trust after fees have been deducted. Considering this, it is important for unit trust investors to consider how much it is going to cost them to invest in an active or passively managed unit trust, as the costs could deteriorate the returns they receive.

2.2.7 The cost of investing in unit trusts

A large attributor to the debate between active funds and passive funds is the cost of investing in these funds. Generally, actively managed funds have very high costs in comparison to passively managed funds (Wessels and Krige, 2005a:4 and Sharpe, 1991:7). As stated earlier, active funds are more expensive because of the amount of research done, as well as transaction costs, taxes and the spread between the bid and ask prices (Malkiel, 2003 and Sharpe, 1991:8). Even with the high costs, active fund management does provide the ability to outperform the market substantially (Wermers, 2000:1655).

Several studies have indicated that funds that are actively managed charge much higher fees than passively managed funds. Sharpe (1992) indicated that 97.3% of the variance in returns of Fidelity's Magellan fund was attributable to passive choices, and only 2.7% was due to active choices. At the end of 2004, Morningstar reported that 99% of this fund's return variance could be attributed to the benchmark index (Standard & Poor's 500 composite Stock Price Index). At this time the expense ratio of the Magellan fund was 0.7%. The expense ratio of the S&P 500 was 18 basis points at this time. An expense ratio 52 basis points higher than the S&P 500 expense ratio is thus large when related to

the amount of variance in return due to active management. This indicates that the fund managers attributed high fees to the small, active component of the fund.

Wermers (2000) looked at 1788 US equity mutual funds between January 1975 and December 1997. He found that mutual funds outperformed the market index by 1.3% per year, before accounting for fees. However, net of fees, the study found that the mutual funds on average underperformed by 1%. Wermers (2000) stated that 0.7% of this difference in return is due to mutual funds holding positions that are not shares. The remaining 1.6% difference in performance is due to the transaction costs and expense ratios of the funds. Further, he concluded that managers of active mutual funds have the ability to pick stocks, but this is offset by the costs due to the active management.

Malkiel (2003) studied active and passive management in the United States. He stated that in the US, active funds had an average expense ratio of over 140 basis points, while index funds were available at 10 to 20 basis points. Because of this difference in costs, and active investing being a zero sum game, he stated that most active investors must underperform the market. This statement is consistent with the results of Wermers (2000). This was confirmed by the data, indicating that between 1 January 1992 and 31 December 2001, 29% of active funds managed to outperform the S&P 500 index.

On the US market, French (2008) compared the costs of active investing to an estimate of how much people would pay if everyone invested passively. He investigated active management from 1980 to 2007. This was done by measuring four components: the cost of investing in mutual funds, institutional investment costs, the fees hedge funds charge and trading costs paid by investors. Each of the costs were standardised according to their market capitalisation. French (2008) found that on average, 0.79% of the total US equity value is spent in costs each year. Next the cost for investing passively was considered under certain assumptions. These assumptions were that mutual fund investors move to passive mutual funds, institutional investors move to a passive market portfolio, there are no fees for direct holdings in companies, and lastly that hedge fund investments are distributed among mutual funds, institutional investments and direct holdings. Passive investing amounted to an average cost of 0.12% per year.

This means that active investors in the US spend 0.67% of the total US market capitalisation in search of superior returns. French (2008) concluded that if the average investor switched to a passive market portfolio, the investor's annual return would be 0.67% higher.

The studies of Wermers (2000), Malkiel (2003) and French (2008) indicate that active management is relatively expensive relative to passive management, and that the performance of the funds does not necessarily justify these costs. This is consistent with the overall result of the studies in Section 2.2.3. Attempts have been made to determine whether there is a relationship between the fees paid for active management, and the return generated by these funds.

Gil-Bazo and Ruiz-Verdú (2009) investigated whether the fees of mutual funds has any relationship with the value added to investors. They studied US mutual funds from December 1961 to December 2005. Carhart's (1997) four-factor model was used to estimate risk-adjusted returns net of fees. They used OLS regression and non-parametric regression to indicate the relationship between the risk-adjusted returns net of fees and expense ratios of the unit trusts. They found that at a 5% statistical significance level, mutual fund performance before fees was inversely related to the expense ratios charged by the mutual funds. They argued that funds that expect to perform well, charge lower fees to attract performance-sensitive investors.

In South Africa, a similar patter can be seen. A summary of unit trust fees was given by Brown (2011). He stated that high costs of unit trusts would not guarantee better performance. As seen in Table 2.1 the most expensive funds had a return that was significantly lower than the least expensive funds. Further, the cheapest funds had a significantly higher return than the average return of all equity funds in South Africa over the study period. Lastly, he found that multi manager funds (broker funds and fund of funds) had a higher TER and lower return than single manager funds.

Table 2.1 Equity funds TER (2007-2009)

Funds	Average TER	Total Return
5 Most expensive	2.97	10.88%
10 Most Expensive	2.65	15.67%
Overall Average	1.59	14.89%
10 Cheapest	0.92	19.19%
5 Cheapest	0.72	21.35%

Source: Adapted from Brown (2011).

These studies indicate that active fund management is expensive in comparison to passive fund management and that the most expensive funds perform worse than cheaper funds. This was done by comparing the total costs of the active funds to the total cost of the passive funds. Miller (2007) proposed a new way to calculate the cost of active management, by attributing a segment of the total fund TER to the active component of a unit trust and a segment of the total fund TER to the passive component of a unit trust.

Miller (2007) examined 4 752 funds, over a 36 month period from January 2002 to December 2004, from a total of 17 411 funds from the Morningstar database. This study asserts that a fund should be viewed as two parts, an active component (alpha created by the fund manager) and an index component (beta). He found that the mean active expense ratio was 5.20%, while the mean reported expense ratio was 1.26%. Further, the mean alpha for these funds were –0.59%, while the mean active alpha was -3.19%. These figures indicate that the management fees paid for active management is relatively large in comparison to the reported expense ratio, and that investors are thus paying a large amount of money for little value added to the funds.

A following study of Miller (2010) followed the same procedure as Miller (2007). He stated that active funds underperform in comparison to index funds, because of the high management fees charged by actively managed funds. This study compared the costs of investing in the index fund with the costs of investing in active funds, by dividing the total management costs into two components and attributing the costs applicable to the index

as well as the active component. The study was performed on the US market and included 731 actively managed funds. He found that the average reported expense ratio was 1.20%, while the average active expense ratio was 6.44%. Miller (2010) concluded that the cost associated with the active component of the mutual fund were much larger than the cost associated with the index component of the mutual fund.

On the South African market, Waldeck (2011) investigated the costs and performance of actively managed unit trusts, in a similar way as proposed by Miller (2007). The study determined whether active fund management could lead to greater fund performance. Further, Waldeck (2011) determined whether active alpha and active weight could predict fund performance. Furthermore, he set out to determine the cost of active fund management through the active expense ratio. The study investigated the performance of funds from 2002 to 2011. The most expensive funds delivered an average benchmark-adjusted return of 0.16%, which was lower than the funds with a lower active expense ratio. This is consistent with the findings of Gil-Bazo and Ruiz-Verdú (2009). He found a negative correlation between active alpha and fund performance in South Africa. The study also determined that there is a positive correlation between active alpha and the active expense ratio. He concluded that active unit trusts in South Africa should increase their performance to remain competitive on a global scale.

The studies performed according to the method as proposed by Miller (2007) indicate that the cost applicable to the active component of a unit trust is much higher than the cost of passive investing. Further it is shown that active funds tend to underperform against passive funds, and that the fees is a large attributor. Studies have attempted to explain why investors invest in these high cost funds when they underperform.

Cremers, Ferreira, Matos and Starks (2011) investigated the causes and consequences of indexing by active managed equity mutual funds. The study examined mutual funds worldwide in 32 countries, including countries in North America, Europe, Asia as well as other regions around the world, over the period 2002 to 2010. The sample amounted to a total of 24 492 funds with a total of $9,8 trillion assets under management, with the US sample representing $5,7 trillion in assets under management. This sample represented

about 93.33% of all assets under management worldwide as reported by the Investment Management Institute.

They concluded that in many countries investors do not have the opportunity of paying lower management fees for passive management. Further they established that there is little explicit indexing in many of the countries, and that many of the active funds are closet indexers. This means that investors pay high fees to obtain a fund that uses closet indexing, instead of being able to benefit from truly active managed funds.

In South Africa, Haldane (2014) studied the methods for calculating the performance fee structures. He found that only 25% of funds, totalling 34% of total assets under management implemented a performance fee structure. General equity unit trusts were among the categories with the largest performance fees. He stated that the performance fee structure for unit trusts are not always transparent to investors. Further, he stated that an unsophisticated investor will not always be able to use, or understand the information provided about the performance fee structure of their unit trust.

These studies indicate that the cost of active management is higher than the cost of passive management. It also indicates that a higher expense ratio is not necessarily associated with a higher return on the investments. Further, the studies concluded that if a fund is divided into an active and a passive component, the fees applicable to the active component is relatively large in comparison to the fees applicable to the passive component.

2.3 CONCLUSION

This chapter discussed the relevant literature to this study. It commenced with a discussion on the types of unit trusts, as well as the advantages and disadvantages of investing in unit trusts. Following this was a discussion on the active management, passive management and the performance of unit trusts. The overall consensus was that active managers struggle to outperform the market.

This was followed by looking at the effect of the efficiency of markets on the investment style implemented by the fund manager. The research showed that the more efficient

markets become, the fewer opportunities there are for active managers to outperform the market.

After understanding how unit trusts function, and how the market is able to influence them, research on the objectives of the study could commence. It started with a discussion on the classification of unit trusts as closet indexers, diversified stock pickers, funds making factor bets and concentrated stock pickers. Following this, a discussion on active share and tracking error was provided, taking into account studies from around the world, as well as studies performed on the South African market. The studies concluded that active share has decreased worldwide. Contradicting results was found with regard to the predictive power of active management in comparison to fund returns.

Finally, the chapter focused on the cost of investing in unit trusts. Studies found that passive management is relatively cheaper than active management. Further, the studies indicated that the cost of actively managed unit trusts tend to be high, considering that passive management can be obtained cheaply. A very limited amount of research on this topic on the South African market could be found.

CHAPTER 3
RESEARCH METHODS

3.1 INTRODUCTION

Chapter 2 discussed the functioning of unit trusts as well as the various types of unit trusts and their benefits to investors. The chapter further explored whether fund managers were able to deliver a positive return in an efficient market. This was followed by an explanation of the active management of unit trusts, specifically focusing on active share and tracking error. Lastly, the costs associated with investing in various unit trusts were examined and the extent to which these costs affect the returns these unit trusts were able to deliver.

Chapter 3 discusses the research process that the researcher has followed in this study. The research undertaken will be explained and the chapter discusses the procedure followed to classify South African general equity unit trusts, to indicate how active they truly are, whether this active management of general equity unit trusts are able to add value to these funds, and how the costs associated with active management reduced the returns.

3.2 THE RESEARCH PROCESS

Scientific research attempts to answer a question through deriving hypothesis from a theory that claims to answer a question, collecting and analysing data to test the hypothesis and relating the results back to the theory from which the question was produced (Lynch, 2013). This study generally followed the business research process as proposed by Zikmund, Babin, Carr and Griffin (2010).

3.3 DETERMINING THE RESEARCH OBJECTIVES

General equity unit trusts are major investment vehicles in South Africa with R 1 656 448 million invested in them as on 31 December 2015. These unit trusts have various investment strategies and offer different benefits to their investors.

This study set out to answer two research questions, namely, how active are general equity unit trusts managed, and how much investors pay for active management. The primary objective consists of two parts. Firstly, the study classified funds as closet

indexers, diversified stock pickers, factor bets or concentrated stock pickers according to their active share and tracking error. Following this, the study determined whether active fund managers were able to add value to their funds through active management, by analyzing various risk-adjusted measures of return. The secondary objective determined how expensive the actively managed part of a unit trust was and how these costs affected the return that fund managers were able to realise.

3.4 UNDERSTANDING THE BACKGROUND TO THE PROBLEM

Before performing the study, the researcher had to become familiar with the topic of unit trusts, active management, active share, tracking error, as well as costs associated with investing. This entailed that background data on these subjects were collected. Previous research was used to gain insight into the relevant topics. Scientific journals, theses, presentations, websites, as well as articles were studied.

3.5 METRIC OF ANALYSIS

After the topic was properly understood and the objectives of the research were clear, the metrics in which the unit trusts would be analysed were determined. The metrics of analysis for this study were the risk-adjusted return measures (Alpha, Sharpe ratio, Treynor ratio, Sortino ratio and the Information ratio) realised by various active managed unit trusts in South Africa, and to what extent the costs associated with active management affected the returns generated.

3.6 DETERMINING THE VARIABLES RELEVANT TO THE STUDY

After the unit of analysis was determined the variables that were relevant to the study needed to be established. For the primary objective active share and tracking error were the variables analysed to classify the unit trusts in terms of how actively they were managed. To determine how successful active management was, the returns realised by these unit trusts and the various risks associated with these investments were examined. To reach the secondary objective of the study, to determine how much investors pay for active management, the costs associated with investing in unit trusts were analysed.

3.7 DETERMINING THE RESEARCH QUESTIONS AND HYPOTHESES

From chapter 2, the literature review, it is evident that limited research is available on active share in the South African general equity unit trust market. Previous studies on the South African market provide contradictory results. Thus, the primary objective consisted out of two parts. The first part set out to classify general equity unit trusts according to their investment approaches (closet indexers, diversified stock pickers, factor bets or concentrated stock pickers). The second part aimed to determine whether active fund managers were able to add value through employing various investment approaches. The following hypotheses were formulated to determine whether fund managers were able to add value through active management:

$H_{0(1)}$ = The unit trust investment approach does not affect fund performance.
$H_{A(1)}$ = The unit trust investment approach does affect fund performance.

To test this null-hypothesis, the risk-adjusted returns for each of the classifications of unit trusts were tested for statistical significance against the risk-adjusted returns of all the other classifications. If the primary null-hypothesis $H_{(1)}$ is confirmed, it would indicate that the investment approach of a unit trust did not affect fund performance.

$H_{0(2)}$ = Tracking error does not affect fund performance.
$H_{A(2)}$ = Tracking error does affect fund performance.

$H_{0(3)}$ = Active share does not affect fund performance.
$H_{A(3)}$ = Active share does affect fund performance.

These null-hypotheses tested whether tracking error or active share had any relation to general equity unit trust performance. For $H_{(2)}$ the tracking error of all 114 unit trusts were compared to the risk-adjusted returns of the 114 unit trusts. For $H_{(3)}$ the active share of the 114 unit trusts were compared to the risk-adjusted returns of the 114 unit trusts.

The secondary objective firstly determined whether there is a relationship between the measures of active management and the TER of a unit trust. This was done by testing the following hypotheses:

$H_{0(4)}$ = Tracking error does not affect the fund TER.

$H_{A(4)}$ = Tracking error does affect the fund TER.

$H_{0(5)}$ = Active share does not affect the fund TER.

$H_{A(5)}$ = Active share does affect the fund TER.

Following this, the study determined whether there is an association between the costs of active management and the value added to these unit trusts. This was done by finding the alpha of a unit trust in comparison to the lowest active share index fund. This indicates the alpha generated through active management. The alpha and TER of the active fund and TER of the index fund allowed the researcher to determine what percentage of expenses are attributable to generating the alpha. This also provided an indication of the percentage of the alpha generated that goes toward unit trust fees.

3.8 DATA

The population for the study included all South-African general equity unit trusts listed during the period of 1 January 2008 to 31 December 2015. As at 31 December 2015, there were 248 South African general equity unit trusts. These funds were obtained from the ASISA database. In South Africa general equity unit trusts are required to have 75% of their funds invested in equities. In this study, the entire population served as the sample, for which the researcher was able to obtain reliable and consistent data that meet the requirements set out.

Funds were required to have at least a year of data available for performing the active management and return calculations. Funds with gaps in their data were excluded, as this could not be considered as consistent data. The researcher was able to include some of the funds that were not listed until the end of the study period in order to minimise survivorship bias.

The limitations on the data availability for the calculation of active share reduced the sample size. Even though there were limitations on acquiring reliable data, the researcher was able to analyse more general equity unit trusts than previous studies. Siddle (2014:45) analysed 23 unit trusts and Hirschel and Krige (2010) analysed 67 unit trusts. This study analysed 114 South-African general equity unit trusts.

3.8.1 The active management of unit trusts

To determine whether active management improves fund performance, the researcher obtained a list of all general equity unit trusts in South Africa (namely the sample frame). The list started with 99 funds on 1 January 2008 and increased to 248 funds on 31 December 2015. The researcher retrieved this from the ASISA (2016) database. Following this the quarterly holdings data for each unit trust as well as the return distributions were obtained from Bloomberg (2016). Index funds were required to measure the active share of the funds.

3.8.1.1 Index selection

Active share describes how much the unit trust holdings deviate from the index. To calculate active share, the unit trust holdings were compared to six indices and the comparison that delivered the lowest active share was selected. The chosen indices are some of the better-known investible indices, for which the necessary data could be obtained. The six indices were the JSE ALSI, ALSI TOP 40, JSE SWIX, JSE SWIX 40, JSE CAPPED and JSE CAPPED 40. A short description on the index funds are now provided.

JSE ALSI: This index represents the top 99% of the total pre-float market capitalisation for all the equities listed on the JSE Main Board. The JSE ALSI index is market-capitalisation weighted. The JSE ALSI index has been live since 24 June 2002 (JSE, 2016a).

JSE ALSI TOP 40: The ALSI TOP 40 index consists of the forty companies that are the largest constituents of the JSE ALSI index. This index has been live since 24 June 2002. The total constituents of the index can exceed 40 companies, as some companies issue more than one equity instrument (JSE, 2016a).

JSE SWIX: The Shareholder Weighted All share index construction follow the construction of the JSE ALSI index. The free float for the JSE SWIX constituents is calculated from the segment of listed share capital on the Strate register. The Index has been live since 1 July 2003 (JSE, 2016b).

JSE SWIX 40: The JSE SWIX Top 40 index construction follow that of the Top 40 index. The free float for constituents are calculated through their portion of the listed share capital on the Strate register. The index went live on 1 July 2003 (JSE, 2016b).

JSE CAPPED: The JSE CAPPED All Share consists of the same shares as the JSE ALSI. The difference between these indices are that constituents with a weighting larger than 10% in the JSE ALSI index are capped at a level of 10% each quarter. The index went live on 1 July 2003 (JSE, 2016c).

JSE CAPPED 40: This index consists of the same shares as the JSE ALSI 40. In the JSE CAPPED 40 index, the constituents that have a weight larger than 10% are capped to 10% on a quarterly basis. The index went live on 01 July 2003 (JSE, 2016c).

3.8.1.2 Calculation of activeness

Firstly, to calculate active share for the unit trusts, the lowest active share index fund was found. This index delivered the lowest amount of active share in comparison to the unit trust. Active share for all the unit trusts were also calculated in comparison to the JSE ALSI, to indicate the possible effect of the selection of the benchmark. The holdings data and return distributions for each of the index funds considered were obtained from Bloomberg (2016).

The study set forth to calculate tracking error as well as the active share for all the unit trusts. The active share and tracking error was used to classify the unit trusts as closet indexers, diversified stock pickers, factor bets or concentrated stock pickers. The return distributions were used to determine a relationship between active management and fund return. This was done through comparing the active share and the tracking error of the general equity unit trusts to various risk-adjusted return measures (as described in section 3.9.1 and 3.9.2). For the calculation of the risk-adjusted return measures, a risk free rate had to be used, as described next.

3.8.1.3 Risk free rate

A risk-free rate is the highest rate of return which an investor can achieve without being susceptible to any kind of risk (Hull, 2012:813). Thus, if the investor faces no risk, he should receive the principal amount and any accrued interest over the investment period.

The risk-free rate is uncorrelated with other investments, as it is said to bear no risk (Damodaran, 2008:2-6). Correia and Uliana (2004:71) and Theart (2014) recommended that the negotiable certificate of deposit (NCD) rate in South Africa is a valid representation of the risk free rate. Correia and Uliana (2004:71) state that the NCD rate is applicable because of past government regulations on the pricing as well as the liquidity of government securities. The researcher obtained the NCD 3-month rate, from the Bureau for Economic Research (BER) of Stellenbosch University (2016), and represented the risk-free rate used in this study.

3.8.2 The cost of active management

To determine how much active management costs, the researcher used the same unit trusts as for the primary objective. The researcher required the expense ratios of the unit trusts as well as the R-squared statistic (which explains which percentage of a funds movement is due to movement in the index) in relation to the lowest active share index fund from Bloomberg (2016).

3.9 PROCESSING THE DATA

After the collection of the data for the primary and secondary objective, the data needed to be processed into a format that is suitable for analysis.

3.9.1 Classifying the unit trusts

The study first set out to classify unit trusts according to how actively they are managed. The classifications were closet indexers (AS < 60%; TE < 8%), diversified stock pickers (AS > 60%; TE < 8%), factor bets (AS < 60%; TE > 8%) or concentrated stock pickers (AS > 60%; TE > 8%).

The active share boundary was 60% as other studies including Cremers and Petajisto (2009) chose an active share cut-off as 60%. The tracking error boundary was chosen as 8% to be consistent with Cremers and Petajisto (2009). To indicate the possible effect the selection of the boundaries had on the performance of the classifications of unit trusts, other boundaries were considered as well. A threshold of 50% active share and 8% tracking error was selected, as Cremers, *et al*. (2016:541) stated that an active manager

should have a minimum active share of 50%. Petajisto (2013) stated that an active share of 50% is theoretically the lowest active share that a pure active manager can have.

Lastly, the active share threshold was chosen so that half of the funds were above the active share threshold and half of the funds below the active share threshold. The tracking error threshold was chosen that half of the funds were above the tracking error threshold, and half of the funds below the tracking error threshold.

The collection of the holdings data and return data allowed the calculation of quarterly active share and tracking error, which in turn allowed the classification of the general equity unit trusts.

Active share describes the variability of the unit trust holdings in comparison to the benchmark index. The active share was calculated as follows (Cremers & Petajisto, 2009:6):

$$Active\ Share = \frac{1}{2}\sum_{i=1}^{N}\left|W_{fund,i} - W_{index,i}\right|$$

Where: $W_{fund,i}$ = Weight of share i in the unit trust.

$W_{index,i}$ = Weight of share i in the benchmark index.

The calculation of active share was done in comparison to the lowest active share index fund and the JSE ALSI. To find the lowest active share index fund, the active share for each unit trust was calculated in comparison to each of the six applicable index funds of the study (JSE ALSI, JSE ALSI TOP 40, JSE SWIX, JSE SWIX40, JSE CAPPED and JSE CAPPED 40), and selecting the index that delivered the lowest active share for each applicable unit trust. Thus, the active share benchmark selected for the unit trusts may differ from the benchmark employed by the fund itself. The study refers to this benchmark as the active benchmark.

To determine how well each fund tracked their active benchmark and the JSE ALSI, the tracking error was calculated for each fund. The tracking error describes the degree in variability of returns to the benchmark index (see appendix B for standard deviation calculations). As with the active share calculation, the tracking error calculation was

performed using the active benchmark and the JSE ALSI. Tracking error was calculated as follows (Cremers & Petajisto, 2009:6):

$$Tracking\ Error = \sigma[\varepsilon_{fund,t}]$$

With:

$$R_{fund,t} - R_{f,t} = \alpha_{fund} + \beta_{fund}(R_{index,t} - R_{f,t}) + \varepsilon_{fund,t}$$

Where: $\sigma[\varepsilon_{fund,t}]$ = The standard deviation of [$\varepsilon_{fund,t}$].

$R_{fund,t} - R_{f,t}$ = Excess return of the unit trust above the risk free rate.

$R_{index,t} - R_{f,t}$ = Excess return of the index above the risk free rate.

α_{fund} = The alpha or performance in excess of the benchmark for the fund.

β_{fund} = Sensitivity to excess benchmark return.

According to the findings of the active share and tracking error calculations, with thresholds of 60% active share and 8% tracking error, the researcher was able to classify the unit trusts. Eighty-nine funds were classified as closet indexers, 4 funds as diversified stock pickers, 17 funds as making factor bets and 4 funds as concentrated stock pickers.

After classifying the unit trusts, the study set out to determine how successful active management is in providing performance to the investors.

3.9.2 Active management and performance

After the classification of the unit trusts, the performance of the unit trusts were measured. Only looking at the absolute returns is not adequate when investigating from an investor's perspective. Different investments are exposed to different risks, and their return must be adjusted for the underlying risk.

The holding period returns needed to be calculated for all the unit trusts as well as the indices. The returns data collected was on a quarterly basis. From this quarterly holding period, returns were calculated. This was followed by a calculation of the geometric mean

rate of return for each of the unit trusts and indices over the full research period (see Appendix A).

Finally, the researcher calculated risk-adjusted return measures (see Appendix C) for the unit trusts in comparison to their lowest active share index fund, and the JSE ALSI. These were:

- Sharpe ratio: Indicates the excess return per unit of standard deviation. For this ratio, the standard deviation of the unit trust returns were calculated (see Appendix B).
- Treynor ratio: Indicates the excess return achieved for each unit of systematic risk. The beta of the unit trusts was obtained from Bloomberg (2016).
- Sortino ratio: This is an adaption to the Sharpe ratio and distinguishes between general volatility and harmful volatility. The downside deviation (below a return of zero) was calculated.
- Information ratio: This indicates the excess return in comparison to the volatility of the returns. The tracking error as calculated in section 3.9.1 was used.

These calculations allowed the researcher to indicate how well the unit trusts performed by comparing them through the classification of the unit trusts as well as active share and tracking error individually.

3.9.3 The cost of active management

The secondary objective set out to determine how expensive active fund management is, and to what extent the price paid for active management influences the return generated from the active management. Firstly, the researcher determined whether there is a relationship between tracking error and unit trust TER and active share and unit trust TER. This was done by plotting the TER for the funds against the active share and tracking error for the various funds. From this, the line of best fit for the data points were determined. The researcher determined the line of best fit through ordinary least squares (OLS) regression (Gujarati, 2004:58).

Following this, the researcher needed to calculate the active expense ratio and active alpha for the funds as described by Miller (2010). The method assumes that the funds

consist of an active and a passive component. For this, the R^2 statistic was obtained from Bloomberg (2016). The R^2 statistic delivers a percentage that indicates the amount of return generated due to movement in the index (which was calculated as the lowest active share index fund), and indicates the passive component of the unit trust.

The passive percentage of the fund that can then be replicated by investing in the lowest active share index (as calculated with the active share measure) should carry the TER of the index fund, while the remainder of the TER is explained by the active component (alpha) of the unit trust, called the active expense ratio. The active expense ratio (C_A) was calculated using the following equation (Miller, 2007:36):

$$C_A = C_p + \frac{R(C_p - C_1)}{\sqrt{(1 - R^2)}}$$

Where: C_p = Unit trust expense ratio.

C_1 = Expense ratio of the lowest active share benchmark.

R^2 = R^2 statistic of unit trust relative to the lowest active share benchmark.

Similarly, the active alpha (α_A) was calculated according to the following formula (Miller, 2007:36):

$$\alpha_A = \alpha_p + \frac{R(\alpha_p - C_1)}{\sqrt{(1 - R^2)}}$$

Where: α_p = Unit trust alpha.

C_1 = Expense ratio of the lowest active share benchmark.

R^2 = R^2 statistic of unit trust relative to the lowest active share benchmark.

Comparing the active expense ratio of the unit trust to the active alpha of the unit trust will indicate the percentage of active alpha foregone by paying unit trust management fees. Because index-tracking funds usually have a low TER relative to general equity unit

trusts, the active expense ratio should be higher than the reported TER. These calculations compare the expense ratio of the fund to only one component of active management, namely tracking error.

3.10 STATISTICAL SIGNIFICANCE ANALYSIS

Once the risk-adjusted return measures for the unit trusts were calculated, statistical tests were performed to determine if there was any statistical significance in the values that were found. The classifications of unit trusts (the nominal variables) were compared to the risk-adjusted returns (the continuous variables). To calculate whether the data had any statistical significance, ANOVA (analysis of variance) analysis methods were used through means of STATISTICA (Dell Inc., 2016). ANOVA is used if the independent variable has three or more categories. Where the ANOVA tests found homogeneous variances, Bonferroni post hoc analysis was used. Where the variances was not homogenous, Games-Howell post hoc analysis was used. This delivered a p-value that indicates whether the mean risk-adjusted returns of the classifications was statistically different or not. A p-value smaller than 0.05 means that the data is statistically significant, while a p-value larger than 0.05 means the data is not statistically significant for a confidence level of 95% (Dunn and Clarke, 1987).

For the data that was not normally distributed, bootstrapping was used (Efron & Tibshirani, 1993). This method uses re-sampling procedures based on the current sample. The statistic that summarises the data (sample statistic) will differ from sample to sample. A large number of repeated samples, 10 000 in this study, with the same size were drawn. From this, the sampling distribution was obtained to indicate the extent of differences in the sample statistic. A summary was then calculated based on the samples delivered through bootstrapping. The specific tests used for each comparison is indicated in Appendix J Table 1 and Appendix J Table 2.

To calculate whether active share or tracking error (without the use of classifications) had any relationship with the risk-adjusted returns or TER of the unit trusts, regression and correlation analysis were used. This tested whether the independent variable (active share or tracking error) had a significant impact over the dependent variable (risk-

adjusted return or TER). Spearman's correlation coefficient was used, as this does not assume that the data is normally distributed (Nel, 2016). Further it assesses the relationship between the data, whether it is a linear relationship or not. It delivered a correlation coefficient between the data points, and then a p-value to indicate the statistical significance.

3.11 CONCLUSION

Chapter 3 dealt with the research methods used in this study. The steps to reach the objectives of the study were discussed. Further, hypotheses were stated for which the researcher had to analyse secondary data to reach conclusions.

All South African general equity unit trusts were analysed for which reliable data could be found. The researcher used descriptive statistics (measures of central tendency, and measures of dispersion) to specify the nature of the data. After the nature of the data was determined, the risk-adjusted performance were determined for the general equity unit trusts. Following this, a discussion on the calculation of the cost of active management were given. The chapter ended with a discussion on the statistical significance measures employed to determine the significance of the research findings.

Chapter 4 discusses the research findings.

CHAPTER 4
RESEARCH RESULTS

4.1 INTRODUCTION

Chapter 3 discussed the research process that was used to achieve the research results. This study has two main objectives. The primary objective was to determine how actively general equity unit trusts are managed in South Africa. For this, the active share and tracking errors were calculated, which allowed the classification of these unit trusts as diversified stock pickers, concentrated stock pickers, closet indexers or as making factor bets. This was followed by an investigation into whether these measures of active management had any significant association with fund performance.

The secondary objective of the study assessed to what extent the investment management fees reduced the return earned by investors of the unit trusts. An alpha for a unit trusts was determined as the excess return a unit trust delivered over the benchmark index. Next, the difference in the TER of the unit trust and the TER of the index was calculated, to indicate the costs applicable to the active component of the unit trust. Comparing the alpha and the costs of the active component of the unit trusts, indicates how much value active management added to the unit trust.

This chapter presents the results. It first shows how the unit trusts were classified according to different investment approaches. It then determines whether active investment leads to better performance. It finally investigates the cost of active management, and whether superior returns are obtained to compensate for this cost.

4.2 DATA PROCESSING

The data needed for the primary as well as secondary objectives of this study were obtained from ASISA (2016), Bloomberg (2016) and the Bureau for Economic Research (BER) (2016) of Stellenbosch University.

4.2.1 Active share calculations

In order to determine how active the general equity unit trusts in South Africa were, the active share and tracking error for 114 general equity unit trusts were determined from

1 January 2008 – 31 December 2015. The quarterly holdings data for the general equity unit trusts as well as the relevant index funds were obtained. Comparing the quarterly holdings of the general equity unit trusts to each of the quarterly holdings of the index funds (JSE ALSI, JSE ALSI TOP 40, JSE SWIX, JSE SWIX 40, JSE CAPPED and JSE CAPPED 40) enabled the researcher to determine the lowest active share index fund. This index fund delivered the lowest active share for each unit trust. These calculations followed the procedure employed by Cremers and Petajisto (2009) and Hirschel and Krige (2010).

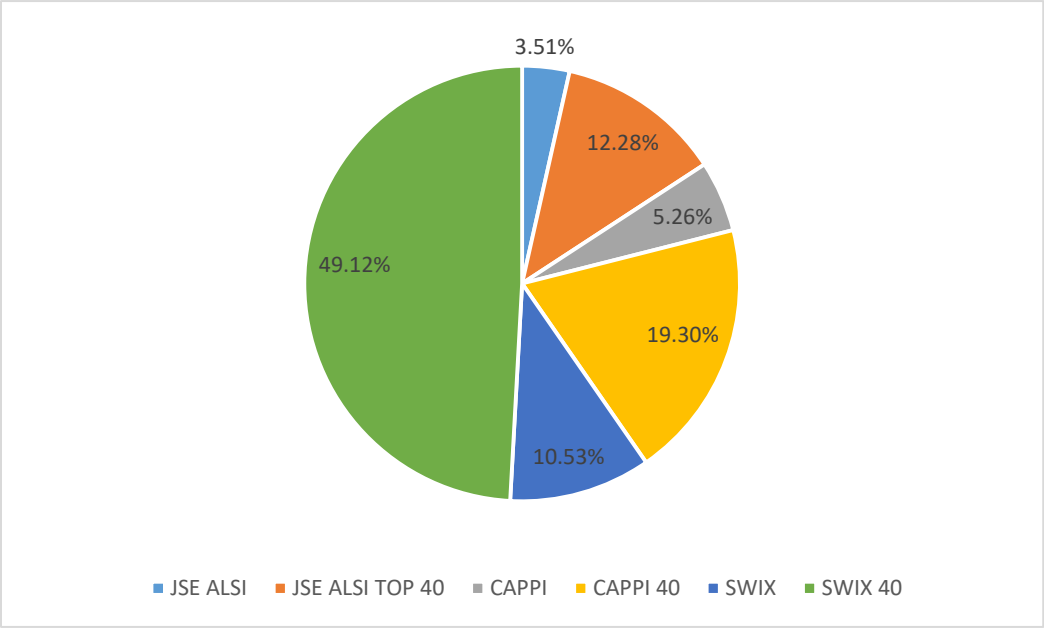
Table 4.1 indicates how many funds had a certain index fund as its lowest active share index fund (see Appendix D). The JSE ALSI had the lowest number of lowest active share unit trusts (four unit trusts), followed by the JSE CAPPED (six unit trusts), JSE SWIX (twelve unit trusts), JSE ALSI TOP 40 (fourteen unit trusts), JSE CAPPED 40 (twenty two unit trusts). The index fund that turned out to be the lowest active share index fund for the largest number of funds is the JSE SWIX 40 with 56 lowest active share unit trusts.

Table 4.1 Number of funds for each lowest active share index fund

Index	Number of unit trusts
JSE ALSI	4
JSE ALSI TOP 40	14
JSE CAPPED	6
JSE CAPPED 40	22
JSE SWIX	12
JSE SWIX 40	56

Figure 4.1 indicates the percentage values of Table 4.1. As can be seen, nearly 50% of the unit trusts had the JSE SWIX 40 index fund as their lowest active share index fund. The JSE ALSI was the index fund with the lowest amount of lowest active share unit trusts with just over 3.5%.

Figure 4.1 Percentage of lowest active share general equity unit trusts for each index



Next, to provide an idea of the dispersion in active share between the unit trusts (against their lowest active share index fund), the number of funds for each 10 percentage point range of active share was calculated and shown in Table 4.2 and Figure 4.2. A range of 10 percentage points was chosen as in Cremers and Petajisto (2009:35).

Table 4.2 Frequency table of unit trusts per active share range

Active share range	Number of unit trusts
90% - 100%	0
80% - 90%	0
70% - 80%	2
60% - 70%	6
50% - 60%	11
40% - 50%	22
30% - 40%	41
20% - 30%	25
10% - 20%	4
0% - 10%	3

As indicated in Figure 4.2 and Table 4.2, the majority (106 unit trusts) had an active share of lower than 60% whereas only 8 unit trusts had an active share higher than 60% (see Appendix D for more details). As can be seen from Figure 4.2 and Table 4.2, the mode interval is within the 30%-40% range.

Figure 4.2 Number of unit trusts per active share range

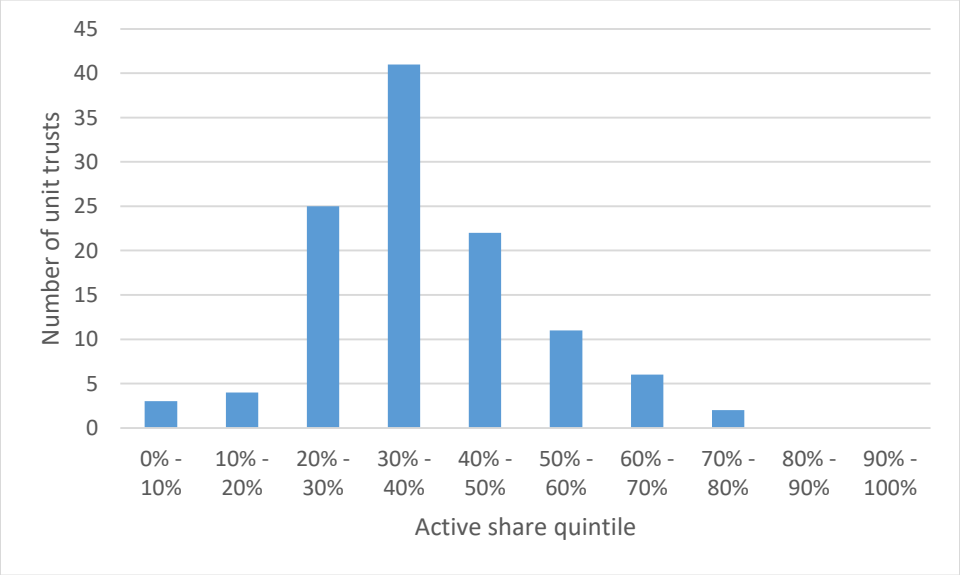


Table 4.3 indicates the minimum active share, maximum active share, mean active share and median active share for the unit trusts between 1 January 2008 and 31 December 2015.

Table 4.3 Summary of maximum -, minimum -, mean - and median active share

Maximum active share	77.68%
Minimum active share	4.25%
Mean active share	37.93%
Median active share	37.11%

Table 4.3 indicates that there was a wide dispersion in the active share for the various unit trusts. The range for active share was 73.43%. The median and the mean of the active share for the unit trusts was relatively close to each other, with the median active share being slightly lower than the mean active share. This means that the data was relatively evenly distributed around the mean, being slightly skewed to the right.

4.2.2 Tracking error calculations

The calculation of the active share for each general equity unit trust enabled the researcher to determine the appropriate fund for calculating the tracking error of the unit trust. The tracking error for each fund was calculated against the index that was closest in holdings as indicated by the active share analysis. All the data required for these calculations were obtained from Bloomberg (2016).

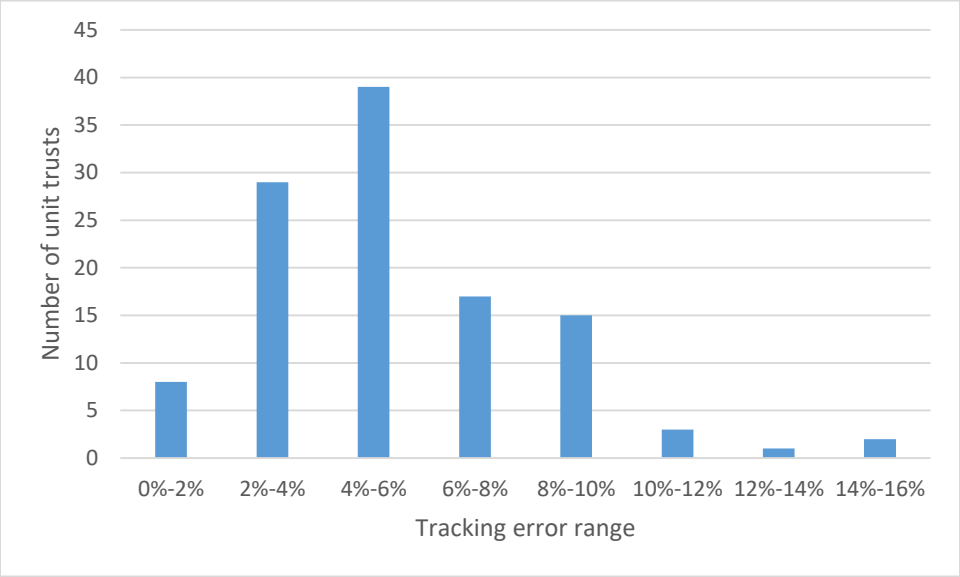
The calculation of tracking error for each of the unit trusts, allowed the researcher to determine how many unit trusts fell within a certain range of tracking error. The results as depicted in Table 4.4 and Figure 4.3 indicate the number of funds that fell within each range of 2% tracking error. A range of 2 percentage points was chosen as in Cremers and Petajisto (2009:35).

Table 4.4 Frequency table of unit trusts per 2% tracking error range

Tracking error range	Number of unit trusts
0%-2%	8
2%-4%	29
4%-6%	39
6%-8%	17
8%-10%	15
10%-12%	3
12%-14%	1
14%-16%	2

As seen in Table 4.4 and Figure 4.3, the mode of this distribution was in the 4% - 6% tracking error range. It can be seen that 68 of the 114 unit trusts fell in a range of 2% tracking error to 6% tracking error. The lower tracking error ranges (0% - 2%) as well as higher tracking error ranges (10% and above) had a considerable lower number of unit trusts that fell within their ranges, than the 2% -10% tracking error range (see Appendix D).

Figure 4.3 Number of unit trusts for each 2% tracking error range



The researcher also obtained the maximum-, minimum-, mean- and median tracking error for the unit trusts between 1 January 2008 and 31 December 2015 as shown in Table 4.5.

Table 4.5: Summary of maximum -, minimum -, mean - and median tracking error

Maximum tracking error	15.73%
Minimum tracking error	0.67%
Mean tracking error	5.55%
Median tracking error	5.04%

As with the results for the active share calculations, there was a relatively wide dispersion in tracking error for the various unit trusts. The range of tracking error was 15.06%. The median active share, being slightly lower than the mean active share indicates that the data is slightly skewed to the right.

After calculating the active share and the tracking error for the various unit trusts, the researcher used these results to classify the unit trusts as diversified stock pickers, concentrated stock pickers, closet indexers or making factor bets. A discussion on the classification will follow.

4.2.3 Cross sectional relationship between active share and tracking error

After calculating the active share and tracking error for the general equity unit trusts, the study aimed to compare active share and tracking error. Figure 4.4 shows the active share and tracking error combinations for each of the 114 unit trusts analysed.

Figure 4.4 Active share vs tracking error for the general equity unit trusts

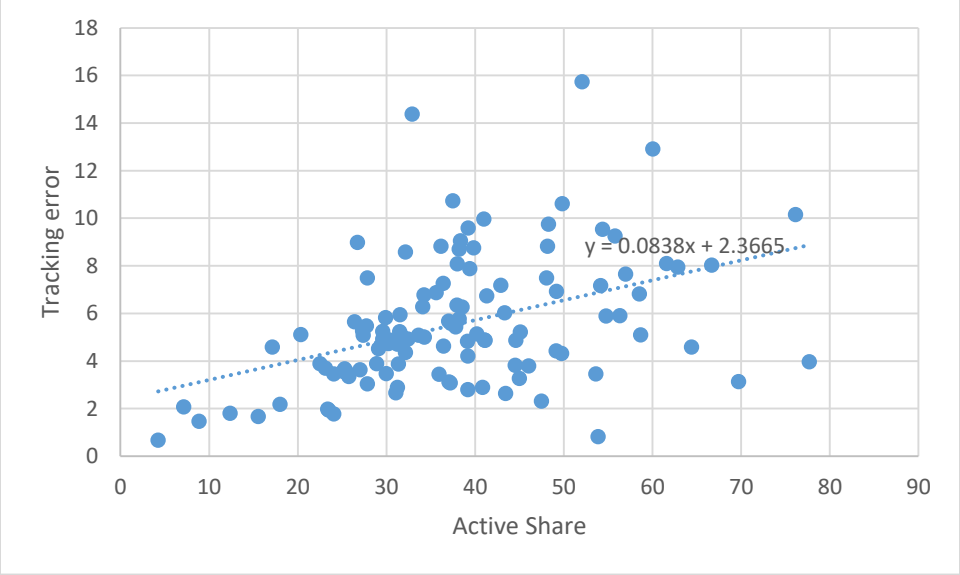


Figure 4.4 shows the active share versus the tracking error for the general equity unit trusts. The line of best fit indicates that there is a generally positive relationship between active share and tracking error. Further it can be seen that most of the funds had a low tracking error and low active share.

Table 4.6 provides a breakdown of the active share and tracking error for the general equity unit trusts for the period of 1 January 2008 to 31 December 2015. As shown in the table, most of the general equity unit trusts, 106, fall beneath an active share of 60%. It can also be seen that the most unit trusts fall below a tracking error of 8%, a total of 93. This indicates that most funds will classify as closet indexers.

Table 4.6 Number of unit trusts for each amount of active share and tracking error

	Tracking error (% per year)								
Active Share (%)	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	All
90-100									0
80-90									0
70-80		1				1			2
60-70		1	1	1	2	0	1		6
50-60	1	1	3	3	2	0		1	11
40-50	0	6	7	5	3	1		0	22
30-40	0	7	18	7	7	1		1	41
20-30	3	11	9	1	1				25
10-20	2	1	1						4
0-10	2	1							3
All	8	29	39	17	15	3	1	2	114

4.3 CLASSIFICATION OF UNIT TRUSTS ACCORDING TO THE LOWEST ACTIVE SHARE INDEX FUND

For this study, the unit trusts were classified according to different thresholds for active share and tracking error. The first test is in line with Cremers and Petajisto (2009) and Hirschel and Krige (2010), where an active share threshold of 60% and a tracking error threshold of 8% was used.

Other thresholds were chosen, so as to test whether the selection of thresholds had a significant impact on the classifications of the funds, and ultimately the performance that was delivered by a classification. The second boundary chosen was an active share of 50% and a tracking error of 8%. The active share of 50% was chosen as Cremers, *et al*. (2016:541) suggest that a manager that attempts to beat the benchmark should have an active share of at least 50%. They found consistent results in their study by using an active share of 60% and an active share of 50%. Petajisto (2013) further states that 50% active share is the theoretical minimum that a pure active manager should have.

The last classification attempted to classify the data in a manner that had 50% of the funds above the active share threshold, and 50% of the funds below the active share threshold, with 50% of the funds above the tracking error threshold and 50% of the funds

below the tracking error threshold. This was done to have a more even distribution of the funds across the classifications.

4.3.1 Classification according to 60% active share and 8% tracking error

Figure 4.4 together with Table 4.7 allowed the researcher to classify the unit trusts as either diversified stock pickers, concentrated stock pickers, closet indexers or making factor bets by sorting the funds according to the two measures of active management, namely active share and tracking error.

Table 4.7 Classification thresholds of the unit trusts

Management style	Active Share	Tracking Error
Closet indexing	<60%	<8%
Diversified stock picks	>60%	<8%
Factor bets	<60%	>8%
Concentrated stock picks	>60%	>8%

Figure 4.5 classifies the unit trusts according to their management styles through comparing active share and tracking error in accordance to the classification thresholds.

Figure 4.5 Classification according to management style

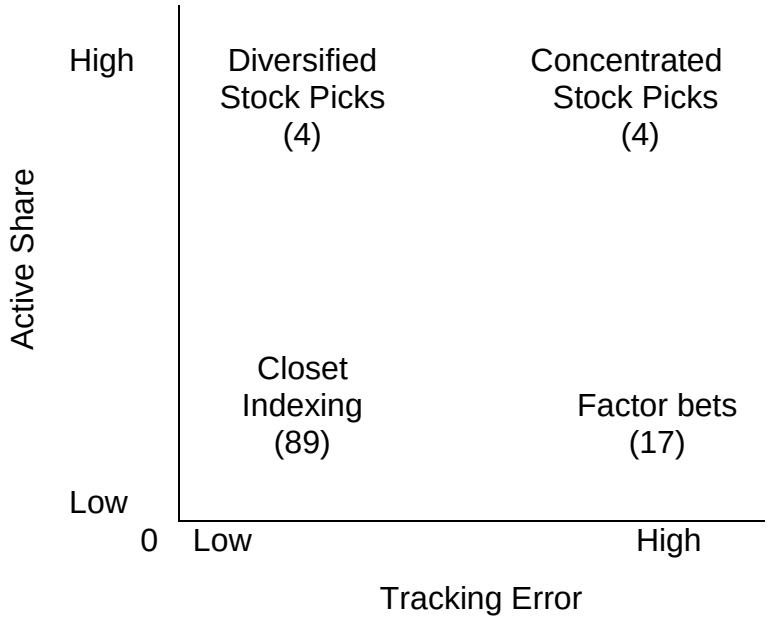


Figure 4.5 is interpreted as follows:

- 89 General equity unit trusts were classified as closet indexing, meaning they had an active share of <60% and a tracking error of <8%.
- 4 General equity unit trusts were classified as diversified stock picks, meaning they had an active share of >60% and a tracking error of <8%.
- 17 General equity unit trusts were classified as making factor bets, meaning they had an active share of <60% and a tracking error of >8%.
- 4 General equity unit trusts were classified as concentrated stock picks, meaning they had an active share of >60% and a tracking error of >8%.

Thus, for the period of the study, 1 January 2008 – 31 December 2015 most (89) of the actively managed general equity unit trusts were classified as closet indexing. Only 4 unit trusts fell within each of the concentrated stock picks and diversified stock picks categories. This shows that the active share and tracking error for general equity unit trusts in South Africa are relatively low.

4.3.1.1 Risk-adjusted performance of the various unit trust classifications

Risk-adjusted performance measures adjust the realised return for an underlying risk of the investments. With the calculations based on quarterly data, Table 4.8 indicates how the four groups of unit trusts (based on active share – tracking error classifications) performed according to the risk-adjusted performance measures.

Table 4.8 Average risk-adjusted performance measures for the classifications of unit trusts and all the unit trusts for the study (1 January 2008 – 31 December 2015)

Classification	Alpha	Treynor ratio	Sharpe ratio	Sortino ratio	Information ratio
Closet indexers	0.1821	1.7491	0.2806	1.1625	-0.0596
Diversified stock picks	0.090	0.3320	0.1321	-0.3336	-0.1097
Factor bets	-0.269	0.7874	0.0691	0.1515	-0.1097
Concentrated stock picks	-0.465	1.9155	0.1578	0.2486	-0.0979
All unit trusts	0.0889	1.5618	0.2395	0.9463	-0.0695

This table provides a summary on the average risk-adjusted returns measures for the four classifications.

- The Alpha of a fund is the excess return that an investment delivered relative to the benchmark (Reilly & Brown 2012:1040). Concentrated stock picks delivered the lowest (negative) alpha, while closet indexers performed the best in terms of alpha.
- The Treynor ratio compares the excess returns to the systematic risk associated with the portfolio (Bodie *et al*., 2010:583-584). Concentrated stock picks delivered the highest Treynor ratio on average, with diversified stock picks delivering the lowest Treynor ratio on average.
- The Sharpe ratio compares excess return in comparison to the total risk of the investment (systematic and non-systematic risk) (Reilly & Brown, 2012:939). Closet indexers delivered the highest Sharpe ratio, with funds making factor bets delivering the lowest Sharpe ratio.

- The Sortino ratio is a measure that compares excess returns to the downside deviation (below a return of zero) of the portfolio (Sortino & Price, 1994:62). The closet indexer category was the only fund type that was able to deliver a Sortino ratio above one.
- The Information ratio compares the excess return over the lowest active share index fund to the volatility of the return, as measured by standard deviation (Maginn, *et al*., 2007:770). None of the classifications could deliver a positive information ratio on average.

4.3.1.2 Statistical significance tests for the risk-adjusted measures of performance

The calculation of the risk-adjusted return measures were not sufficient to draw conclusions and test the hypotheses. Statistical analysis was done (non-parametric ANOVA) to test the statistical significance of the data.

This section sets out to test the following hypothesis:

$H_{0(1)}$ = The unit trust investment approach does not affect fund performance
$H_{A(1)}$ = The unit trust investment approach does affect fund performance.

The classifications of the unit trusts were compared as seen in Table 4.9 to Table 4.13. The non-parametric tests (see Appendix J Table 1) delivered a *p*-value as indicated in these tables. A *p*-value of smaller than 0.05 indicated a statistical significant difference.

Table 4.9 *p*-values for the Alpha statistical significance test

Classification	(1)	(2)	(3)	(4)
(1) Closet indexers		0.758	>0.999	0.978
(2) Factor bets	0.758		0.993	>0.999
(3) Diversified stock Picks	>0.999	0.993		0.993
(4) Concentrated stock picks	0.978	>0.999	0.993	

The values in Table 4.9 represents the *p*-values delivered through comparing the alpha for each classification of general equity unit trust to each other classification. All *p*-values were larger than 0.05 indicating that there is no statistical significant difference in the

alphas generated by the four classifications of the unit trusts. As can be seen, a lot of the p-values were bigger than 0.999. This could arise due to some of the classifications having a small amount of unit trusts. According to Nel (2017) the larger the sample of unit trusts for each group, the easier it would be to find differences between the groups, leading to lower p-values.

Table 4.10 *p*-values for the Treynor ratio statistical significance test

Classification	(1)	(2)	(3)	(4)
(1) Closet indexers		0.878	>0.999	>0.999
(2) Factor bets	0.878		>0.999	>0.999
(3) Diversified stock Picks	>0.999	>0.999		>0.999
(4) Concentrated stock picks	>0.999	>0.999	>0.999	

The *p*-values in Table 4.10, were generated by comparing the Treynor ratios of the classifications of the general equity unit trusts to one another. All *p*-values were larger than 0.05. This shows that there is no statistical significant difference in the Treynor ratios for the unit trusts.

Table 4.11 *p*-values for the Sharpe ratio statistical significance test

Classification	(1)	(2)	(3)	(4)
(1) Closet indexers		0.006*	>0.999	>0.999
(2) Factor bets	0.006*		>0.999	>0.999
(3) Diversified stock Picks	>0.999	>0.999		>0.999
(4) Concentrated stock picks	>0.999	>0.999	>0.999	

The *p*-values in Table 4.11 indicates that for the Sharpe ratio closet indexers had a statistical significant outperformance in comparison to factor bets. This means that closet indexers delivered a statistical significant higher return in terms of standard deviation than factor bets. There is no classification of the general equity unit trusts that consistently outperformed the other classifications in a statistical significant manner.

Table 4.12 *p*-values for the Sortino ratio statistical significance test

Classification	(1)	(2)	(3)	(4)
(1) Closet indexers		>0.999	>0.999	>0.999
(2) Factor bets	>0.999		>0.999	>0.999
(3) Diversified stock Picks	>0.999	>0.999		>0.999
(4) Concentrated stock picks	>0.999	>0.999	>0.999	

Table 4.12 indicates that there was no statistical significant difference when comparing the Sortino ratios for the classifications of unit trusts to the other classifications of general equity unit trusts.

Table 4.13 *p*-values for the Information ratio statistical significance test

Classification	(1)	(2)	(3)	(4)
(1) Closet indexers		0.773	>0.999	0.994
(2) Factor bets	0.773		>0.999	>0.999
(3) Diversified stock Picks	>0.999	>0.999		>0.999
(4) Concentrated stock picks	0.994	>0.999	>0.999	

The *p*-values in Table 4.13 indicates that there is no statistical significant difference in the Information ratios for the general equity unit trusts. The null hypothesis ($H_{0(1)}$) could not be rejected in terms of any risk-adjusted return measures. This indicates that none of the classifications of general equity unit trusts in South Africa had a consistent significant outperformance in comparison to the other classifications, given the categorical boundaries.

4.3.2 Classification according to 50% active share and 8% tracking error

To examine the robustness of the results for the thresholds used in Section 4.3.1, and for the reasons mentioned in Section 4.3 as motivated by Cremers and Petajisto (2009) and Petajisto (2016), the thresholds were now tested as 50% active share and 8% tracking error as indicated in Table 4.14.

Table 4.14 Classification thresholds of the unit trusts

Management style	Active Share	Tracking Error
Closet indexing	<50%	<8%
Diversified stock picks	>50%	<8%
Factor bets	<50%	>8%
Concentrated stock picks	>50%	>8%

Appendix E Figure 1 illustrates the classifications according to these thresholds. Closet indexers consisted of 81 funds, 12 funds were diversified stock picks, 14 funds made factor bets and 7 funds were classified as concentrated stock picks.

4.3.2.1 Risk-adjusted performance of the various unit trust classifications

Risk-adjusted performance measures were calculated for the classifications of unit trusts to adjust the investments for their underlying risk. Appendix E Table 1 indicates how the four groups of unit trusts (based on active share – tracking error classifications) performed according to the risk-adjusted performance measures.

- Concentrated stock picks delivered the lowest (negative) alpha (-0.6310), while diversified stock picks performed the best in terms of alpha (0.8175).
- Closet indexers delivered the highest Treynor ratio on average (1.7714), with funds making factor bets delivering the lowest Treynor ratio on average (0.9767).
- Diversified stock pickers delivered the highest Sharpe ratio (0.2925), with concentrated stock picks delivering the lowest Sharpe ratio (0.0533).
- Closet indexers and diversified stock picks were the only two fund types that were able to deliver Sortino ratios above one (1.1341 and 1.0554).
- Diversifed stock picks were the only type of fund to deliver a positive information ratio on average (0.0739).

4.3.2.2 Statistical significance tests for the risk-adjusted measures of performance

Statistical significance tests were performed to determine whether there is significance in the data according to the thresholds as set out above.

This section sets out to test the following hypothesis:

$H_{0(1)}$ = The unit trust investment approach does not affect fund performance

$H_{A(1)}$ = The unit trust investment approach does affect fund performance.

Appendix E Table 2 indicates the p-values for the comparison of the unit trust classifications. As indicated, the only statistical significant difference in performance was the Sharpe ratio for closet indexers and factor bets. Closet indexers delivered a statistical significant higher return in terms of standard deviation than factor bets. None of the classifications consistently performed better or worse than the other classifications in a statistically significant manner. The null hypothesis ($H_{0(1)}$) could not be rejected in terms of any risk-adjusted return measures given the categorical boundaries. These results are consistent with the thresholds set at 60% active share and 8% tracking error.

4.3.3 Classification with 50% of funds on each side of active share and tracking error

The final classification of unit trusts classified the data that 50% of the funds lie above the active share threshold and 50% of the fund lie below the active share threshold. This was also done for tracking error, so that 50% of the funds lie above the tracking error threshold and 50% of the funds lie below the active share threshold. This made that the funds were more evenly distributed across the classifications. The thresholds are as indicated in Table 4.15.

Table 4.15 Classification thresholds of the unit trusts

Management style	Active Share	Tracking Error
Closet indexing	<37.09%	<5.06%
Diversified stock picks	>37.09%	<5.06%
Factor bets	<37.09%	>5.06%
Concentrated stock picks	>37.09%	>5.06%

Appendix F Figure 1 illustrates the classifications as with the thresholds in Table 4.15. The closet indexing classification consisted of 37 funds, diversified stock picks had 20

funds, funds making factor bets had 20 funds and concentrated stock pickers consisted of 37 funds.

4.3.3.1 Risk-adjusted performance of the various unit trust classifications

The risk-adjusted performance was calculated for the unit trust classifications as indicated in Appendix F Table 1.

- Closet indexers was the only category to deliver a negative alpha on average (-0.1240). Factor bets performed the best, with an alpha of 0.3970.
- Closet indexers delivered the best risk-adjusted return in terms of the Treynor ratio (1.7194), with concentrated stock pickers delivering the lowest Treynor ratio (1.3568).
- Diversified stock picks delivered the highest Sharpe ratio (0.3046), whereas funds making factor bets delivered the lowest Sharpe ratio (0.1582).
- Funds making factor bets performed the worst according to the Sortino ratio (0.3888). Diversified stock picks delivered the highest Sortino ratio on average (2.2338).
- Diversified stock picks was the only category that managed to deliver a positive information ratio (0.0092).

4.3.3.2 Statistical significance tests for the risk-adjusted measures of performance

After calculating the risk-adjusted returns for the unit trusts, statistical significance tests were performed to determine whether there is significance in the data according to the thresholds in Table 4.15.

This section sets out to test the following hypothesis:

$H_{0(1)}$ = The unit trust investment approach does not affect fund performance
$H_{A(1)}$ = The unit trust investment approach does affect fund performance.

Appendix F Table 2 shows p-values for the comparison of the risk adjusted returns for the unit trusts. As with the previous two classifications (60% active share and 8% tracking error threshold and 50% active share and 8% tracking error threshold) there was only a statistical significant difference between the Sharpe ratios for closet indexers and funds

making factor bets. Closet indexers outperformed funds making factor bets significantly based on the Sharpe ratio. As with the previous tests, none of the classifications outperformed consistently. The null hypothesis ($H_{0(1)}$) is not rejected based on the risk-adjusted returns that were calculated. These results agree with the results for the previous thresholds.

4.4 CLASSIFICATION OF UNIT TRUSTS WITH THE JSE ALSI AS BENCHMARK

To test whether the index fund chosen as the benchmark index had an effect on the results, the funds were compared to the JSE ALSI instead of to their closest tracking index fund as in Cremers and Petajisto (2009).

The data was classified with the same thresholds for active share and tracking error as in Section 4.3. Firstly, the data was tested with a threshold of 60% active share and 8% tracking error for the classifications. Secondly the data was classified according to a 50% active share and 8% tracking error threshold. Thirdly the data was classified so that half (57) of the funds lie on either side of the active share threshold and half (57) of the funds lie on either side of the tracking error threshold.

4.4.1 Classification according to 60% active share and 8% tracking error

As in Section 4.3.1, the unit trusts were classified according to 60% active share and 8% tracking error threshold. Appendix G Figure 1 shows that 86 funds were classified as closet indexers, 11 funds as diversified stock picks, 11 funds as making factor bets and 6 funds as concentrated stock picks with the given thresholds in comparison to the JSE ALSI.

4.4.1.1 Risk-adjusted performance of the various unit trust classifications

The risk adjusted performance measures were calculated for each of the unit trusts. Appendix G Table 1 shows how the four groups compared in terms of their risk adjusted returns.

- Diversified stick picks delivered the highest alpha (0.5940), and funds making factor bets was the only negative alpha (-0.3017).
- Closet indexers had the highest average Treynor ratio (1.6861), with funds that make factor bets having the lowest Treynor ratio (0.6073).

- Closet indexers had the highest Sharpe ratio (0.2753) and funds making factor bets had the lowest Sharpe ratio (0.0530).
- Closet indexers performed the best in terms of the Sortino ratio (1.1140), and was the only classification to deliver a Sortino ratio above one.
- Closet indexers delivered the only positive information ratio (0.0346) on average.

4.4.1.2 Statistical significance tests for the risk-adjusted measures of performance

The risk-adjusted returns for the unit trusts in comparison to the JSE ALSI with a threshold of 60% active share and 8% tracking error were tested for statistical significance. The following hypothesis was tested:

$H_{0(1)}$ = The unit trust investment approach does not affect fund performance
$H_{A(1)}$ = The unit trust investment approach does affect fund performance.

Apendix G Table 2 indicates the p-values by comparing the average risk adjusted-return for each classification of unit trusts with the risk-adjusted return for each other classification of unit trust. Closet indexers outperformed funds making factor bets in terms of the Sharpe ratio to deliver the only statistically significant difference. No other statistical significant difference in the data could be found. The null-hypothesis could not be rejected for any of the unit trust classifications, as with the previous tests done.

4.4.2 Classification according to 50% active share and 8% tracking error

As in section 4.3.2, the unit trusts were classified according to a threshold of 50% tracking error and 8% active share. The JSE ASLI was used as the benchmark index. Appendix H Figure 1 indicates that 74 funds were classified as closet indexers, 23 funds as diversified stock pickers, 7 funds as making factor bets and 10 funds as concentrated stock picks.

4.4.2.1 Risk-adjusted performance of the various unit trust classifications

The risk-adjusted performance measures calculated for the classifications is indicated in Appendix H Table 1.

- Diversified stock picks delivered the highest alpha (0.668) on average, with funds making factor bets performing the worst, with an alpha of -0.2611.

- Closet indexers delivered the highest Treynor ratio (1.6745) while funds making factor bets had the lowest Treynor ratio (0.4923).
- Diversified stock picks had the highest Sharpe ratio of 0.2924, while funds making factor bets had the lowest Sharpe ratio (0.0357).
- The highest average Sortino ratio was achieved by diversified stock picks (2.2873).
- Diversified stock picks was the only classification to deliver a positive information ratio of 0.2479.

4.4.2.2 Statistical significance tests for the risk-adjusted measures of performance

As with previous tests, the statistical significance of the risk-adjusted performance measures were tested with the following hypothesis:

$H_{0(1)}$ = The unit trust investment approach does not affect fund performance
$H_{A(1)}$ = The unit trust investment approach does affect fund performance.

As indicated in Appendix H Table 2, closet indexers and diversified stock picks outperformed factor bets in a statistically significant manner in terms of the Sharpe ratio. Concentrated stock picks however did not outperform factor bets in a statistically significant manner, but their risk adjusted measures was not significantly different from closet indexers and diversified stock picks. The other risk-adjusted returns delivered no significant difference. The null hypothesis could not be rejected as none of the classifications delivered a consistent out performance or underperformance.

4.4.3 Classification with 50% of funds on each side of active share and tracking error

As in Section 4.3.3 the funds were classified so that 50% of the funds lie on either side of the active share threshold, and that 50% of funds lie on either side of the tracking error threshold. The thresholds for this classification was thus 42.57% active share and 5.48% tracking error, as indicated in Appendix I Table 1. This lead to 34 funds being classified as closet indexers, 23 funds as diversified stock picks, 23 funds as making factor bets and 34 funds as concentrated stock picks (Appendix I Figure 1).

4.4.3.1 Risk-adjusted performance of the various unit trust classifications

The average risk-adjusted performance for each of the classifications is indicated in Appendix I Table 2.

- Funds making factor bets delivered the highest average alpha of 0.9793, with closet indexers delivering the lowest alpha of 0.1009.
- Diversified stock picks had the highest Treynor ratio (1.8322) and funds making factor bets had the lowest Treynor ratio (1.4291).
- Diversified stock picks had the highest Sharpe ratio (0.3597), and concentrated stock picks had the lowest Sharpe ratio on average (0.1784).
- Diversified stock picks had an average Sortino ratio of 2.5012, with closet indexers having the lowest Sortino ratio of 0.5019.
- Diversifeid stock picks was the only classification that managed to deliver a positive Information ratio on average (0.2432).

4.4.3.2 Statistical significance tests for the risk-adjusted measures of performance

The following hypothesis was tested on the risk-adjusted returns calculated for the classifications of unit trusts.

$H_{0(1)}$ = The unit trust investment approach does not affect fund performance
$H_{A(1)}$ = The unit trust investment approach does affect fund performance.

Appendix I Table 3 shows the p-values obtained through statistical analysis. None of the classification delivered a significant risk-adjusted return according to any of the risk-adjusted return measures. The null hypothesis could not be rejected, as none of the classifications consistently performed significantly different from any of the other classifications.

4.5 STATISTICAL SIGNIFICANCE TESTS FOR THE TRACKING ERROR AND RISK ADJUSTED RETURNS

After calculating the *p*-values for the classifications of unit trusts and their risk-adjusted returns, the researcher set out to determine whether there is a statistically significant relationship between tracking error and the risk-adjusted returns. This was done by comparing the unit trusts to the lowest active share index fund and the JSE ALSI.

For this, the following hypothesis was tested:

$H_{0(2)}$ = Tracking error does not affect fund performance.

$H_{A(2)}$ = Tracking error does affect fund performance.

Firstly, the tracking error as found by comparing the unit trusts to the lowest active share index fund was compared to the risk-adjusted returns. Secondly the tracking error as found by comparing the funds to the JSE ALSI was compared to the risk-adjusted returns. Table 4.16 contains the correlation and the *p*-values (as found by Spearman's correlation coefficient) found by comparing tracking error with the risk-adjusted returns.

Table 4.16 *p*-values for tracking error against risk-adjusted return measures

	Benchmark			
	Lowest active share index		JSE ALSI	
Risk-adjusted return measure	Correlation	p-value	Correlation	p-value
Alpha	0.05	0.62	0.00	0.99
Treynor ratio	-0.09	0.32	-0.14	0.14
Sharpe ratio	-0.25	0.01*	-0.30	0.01*
Sortino ratio	-0.12	0.22	-0.13	0.20
Information ratio	-0.03	0.72	-0.13	0.15

A positive correlation in Table 4.16 indicates that as the tracking error increased, the risk-adjusted-returns increased. A negative correlation indicates that as tracking error increased, the risk-adjusted returns decreased. All p-values in Table 4.16 were larger than 0.05 except the *p*-value for the Sharpe ratio for both benchmark indices. There was a negative relationship between the Sharpe ratios and tracking error, meaning that as the tracking error increased the Sharpe ratios decreased. This indicates that the more the returns deviate from the benchmark, the less likely it becomes that the excess return will compensate for total volatility. No other statistically significant data was found.

4.6 STATISTICAL SIGNIFICANCE TESTS FOR THE ACTIVE SHARE AND RISK-ADJUSTED RETURNS

After determining if there is a relationship between tracking error and the risk-adjusted returns, the researcher determined if active share had a relationship in comparison to risk-adjusted returns. For this the following hypothesis was tested:

$H_{0(3)}$ = Active share does not affect fund performance.
$H_{A(3)}$ = Active share does affect fund performance.

The risk-adjusted returns for the unit trusts were compared to the active share, with both the lowest active share index fund and the JSE ALSI as benchmark. Table 4.17 indicates the Spearman's correlation coefficient and the *p*-values found for the active share in comparison to the risk-adjusted returns.

Table 4.17 *p*-values for active share against risk-adjusted return measures

	Benchmark			
	Lowest active share index		JSE ALSI	
Risk-adjusted return measure	Correlation	p-value	Correlation	p-value
Alpha	0.16	0.09	0.12	0.21
Treynor ratio	-0.02	0.86	-0.02	0.82
Sharpe ratio	-0.01	0.93	-0.01	0.88
Sortino ratio	-0.12	0.21	-0.10	0.29
Information ratio	0.14	0.13	0.09	0.36

All *p*-values in Table 4.17 were larger than 0.05. This indicates that there is no statistical significant relationship between the active share of a unit trust and the risk-adjusted return generated. This means that active share does not influence fund performance in a statistically significant manner.

4.7 THE COST OF INVESTING IN UNIT TRUSTS

To calculate the cost of the passive component and the active component of a unit trust, the researcher had to gather the expense ratios for the various unit trusts. The cost of

investing in an index fund is used as a proxy for the cost of the passive component of the unit trust. The researcher found a viable proxy investment to simulate the investment into each index. The expense ratios for investing in each index proxy and the average fund TER for each index was as follows:

Table 4.18 Cost of investing in each index proxy used in this study and the cost of investing in unit trusts with a set index as their lowest active share index fund

Index name	TER	Average fund TER
JSE ALSI	0.3306	1.17
JSE ALSI TOP 40	0.4	1.47
JSE CAPPED	0.4218	2.5717
JSE CAPPED 40	0.89	1.4467
JSE SWIX	0.3306	1.5008
JSE SWIX 40	0.68	1.4639

The proxies used in Table 4.18 are funds from Old Mutual. They were some of the cheapest funds the researcher could find, and tracked the index closely. From Table 4.18 it is clear that the cost of investing in unit trusts are much higher than investing in an index fund. This suggests that fund managers are charging large amounts of money for their investing expertise. The average TER for all the funds relevant to the study was 1.55%.

Firstly, the researcher attempted to determine whether there is a relationship between the degree of active management and the TER of a fund. The tracking error and the active share of the funds were compared to the TER of the funds to test the following hypotheses:

$H_{0(4)}$ = Tracking error does not lead to a higher total expense ratio.
$H_{A(4)}$ = Tracking error does lead to a higher total expense ratio.

$H_{0(5)}$ = Active share does not lead to a higher total expense ratio.
$H_{A(5)}$ = Active share does lead to a higher total expense ratio.

Figure 4.6 and Figure 4.7 indicate the relationship between tracking error and fund TER and active share and fund TER.

Figure 4.6 Unit trust TER vs. Tracking Error

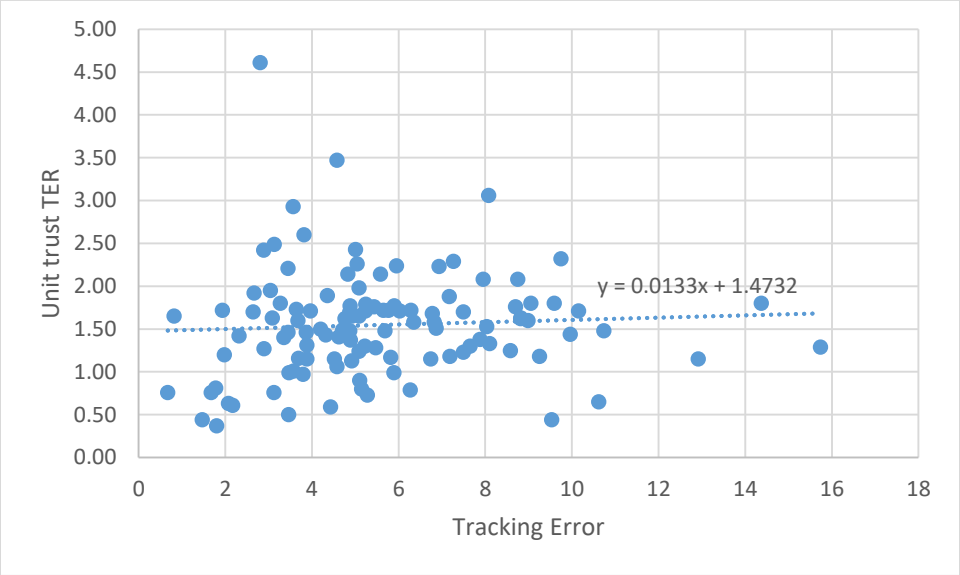


Figure 4.6 shows a generally positive relationship between tracking error and the unit trust TER. The slope of the line of best fit is 0.0133. The relationship between tracking error and the fund TER was insignificant, as it delivered a p-value of 0.16.

Figure 4.7 Unit trust TER vs. Active Share

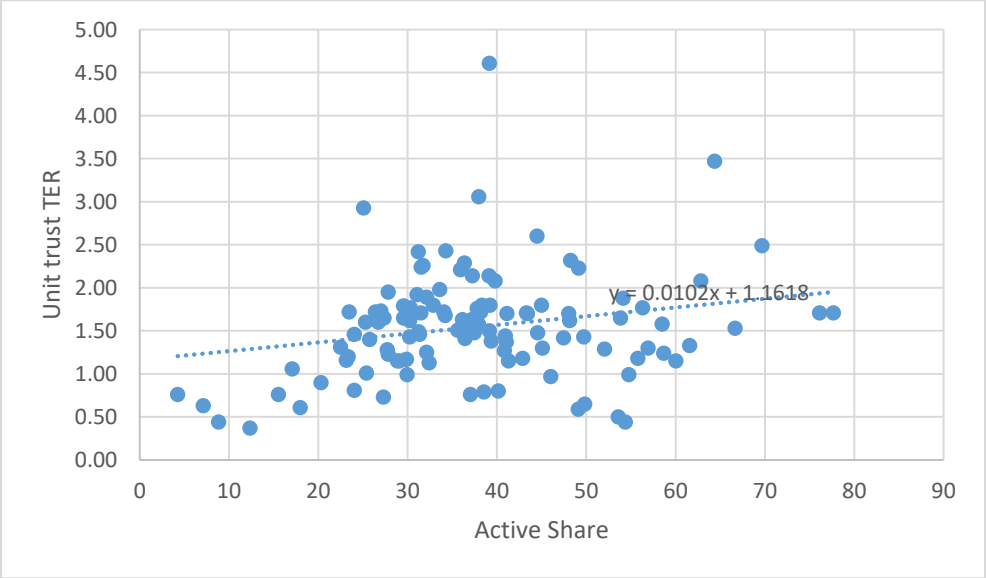
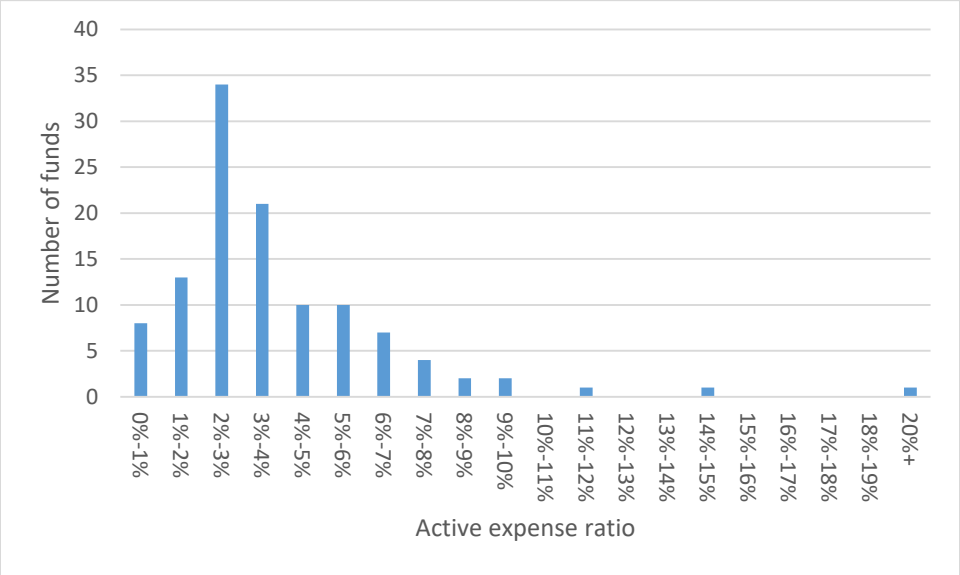


Figure 4.7 compares the unit trust TER to the active share of the unit trust. There was a positive relationship between the unit trust TER and active share, as the slope of the line of best fit is 0.0102. This relationship was found insignificant as it delivered a p-value of 0.32. For both $H_{0(4)}$ and $H_{0(5)}$, the null-hypotheses could not be rejected.

Next, researcher set out to calculate the active expense ratio and active alpha for each of the four classifications of the unit trusts for comparison purposes. Figure 4.8 indicates the distribution of active expense ratios for the funds of this study. Most funds fell in the 2%-3% active expense ratio. There were three funds with an active expense ratio of 10% or higher. The values for the four classifications of unit trusts were found as indicated in Table 4.19.

Figure 4.8 Fund distribution of active expense ratios



As indicated by Table 4.19, the active expense ratio for each category is substantially higher than the reported expense ratio. The average active expense ratio for all funds were 3.85%, while the average reported expense ratio was 1.55%. Concentrated stock pickers and funds making factor bets had the lowest difference between the fund TER and the active expense ratio, with the active expense ratio being about 1.80 times higher than the reported TER for the fund. Closet indexers on average had the highest difference, with the active expense ratio 2.66 times higher active expense ratio than TER.

Diversified stock picks on average had an expense ratio 2.47 times higher than the fund TER.

Table 4.19 The cost of active management for each unit trust classification and all unit trusts for the study

	Sample Mean		
Category	Fund TER	Active Expense ratio	Active alpha
Closet indexers	1.50%	3.99%	-1.50%
Diversified stock picks	2.43%	6.01%	-1.82%
Factor bets	1.60%	2.88%	-1.44%
Concentrated stock picks	1.43%	2.58%	-2.44%
All funds	1.55%	3.85%	-1.54%

The active alpha in Table 4.19 indicates that on average, none of the classifications were able to deliver a positive return on the active part of their investments. Concentrated stock picks performed the worst in terms of generating alpha on the active part of their portfolio, as their active alpha was -2.44%. This indicates that funds on average performed poorly on the actively managed part of the unit trust. These findings are consistent with Miller (2010) and Waldeck (2011).

4.8 CONCLUSION

This chapter classified the unit trusts as closet indexers, diversified stock pickers, making factor bets or concentrated stock pickers. With the classification thresholds at 60% active share and 8% tracking error, the majority of the funds were classified as closet indexers.

The risk-adjusted returns (Alpha, Treynor ratio, Sharpe ratio, Sortino ratio and Information ratio) were calculated for all the unit trusts in the study to determine how the various classifications of unit trusts performed. The active share and tracking error was calculated

in comparison to the lowest active share index fund and the JSE ALSI. The funds were classified according to various thresholds to check the robustness of the results.

Statistical significance tests were performed on the risk-adjusted returns. None of the classifications of general equity unit trusts delivered a consistent statistical significant outperformance or underperformance compared to the other groups. This indicates that there is not a generally superior investment strategy that can be linked to one of the classifications based on active share and tracking error.

Lastly, the cost of active management was calculated by dividing the unit trusts into an active component and a passive component. The study found that active management is relatively expensive in comparison to passive management, and that the delivered returns does not justify the cost of the active component. This agrees with the research done by Miller (2007) and Miller (2010).

CHAPTER 5
CONCLUSION

5.1 INTRODUCTION

Worldwide there has been a substantial amount of research done on the topic of active management and the cost of active management. In South Africa, however, the research that has been done in terms of active share and the cost of the active portion of unit trusts has been limited.

A large amount of research has been done on active share. Cremers and Petajisto (2009) proposed the active share measure, and claimed that on the US market from 1980 to 2003, high active share in mutual funds lead to better performance. Further, they indicated that tracking error does not lead to higher returns. Some studies contradicted these results. Thornburg Investment Management (2016) claimed that a higher active share could lead to an increase in either outperformance or underperformance.

On the South African market Hirschel and Krige (2010:79) studied 67 unit trusts form 2003 to 2007. They found that higher levels of active share lead to a statistically significant outperformance. Muller and Ward (2011) contradicted this by indicating that from June 2006 to September 2010 active share did not lead to significant excess returns.

This chapter will first discuss the results found in chapter 4. Following this is a discussion on the suggestions and recommendations for future studies as well as the limitations this study faced. Finally, the researcher does a reconciliation on the study and draws conclusions.

5.2 SUMMARY OF THE RESEARCH RESULTS

Chapter 4, the research results chapter, described the results found for the primary and secondary objectives. This chapter provides a summary of the results and draws conclusions on these results.

5.2.1 The active management of unit trusts

The primary objective of this study had two stages. First, the unit trusts were classified as either closet indexers, diversified stock pickers, making factor bets or concentrated stock pickers. The researcher did this by calculating the active share and tracking error for the unit trusts in comparison to their lowest active share index fund and in comparison to the JSE ALSI. Following this, he determined whether any of these classifications delivered a significant outperformance or underperformance in comparison to any of the other classifications. These classifications and the comparison of their performance are in line with the study of Cremers and Petajisto (2009) that did these classifications on the US market for unit trusts from 1980 to 2003.

Hirschel and Krige (2010), and Muller and Ward (2011) have done similar studies on the South-African market. Hirschel and Krige (2010:78) found that for period of their study, the active share ranged from 18.3% to 86.1% and the tracking error ranged from 2.2% to 11.3%. Further, they indicated that for December 2007, out of 57 funds, 36 funds had an active share of less than 60%, and 21 funds had an active share of more than 60%.

Muller and Ward (2011:23) calculated for their sample of 90 funds, that 57 funds had an active share below 50% and 33 funds had an active share above 50% over the study period. The average active share for the funds in their study was 45%, and the median active share for their study was 39%.

5.2.1.1 The classification of unit trusts

As indicated in Table 5.1 the range for the tracking error and active share was relatively wide for the unit trusts analysed. The ranges for active share and tracking error as depicted in Table 5.1 is relatively consistent with Hirschel and Krige (2010:70).

In the current study, the mean tracking error of 5.545% and mean active share of 37.9386%, when calculated according to the lowest active share index fund, indicates that most of the funds should be classified as closet indexers, as these are both within the thresholds of an active share of less than 60% and a tracking error of less than 8%. This is consistent with the results when using the JSE ALSI as means to calculate the measures of active management.

Table 5.1 Summary of the active management of unit trusts

Benchmark	Tracking error		Active share	
Lowest active share index fund	Maximum	15.734%	Maximum	77,6802%
	Minimum	0.670%	Minimum	4,2534%
	Mean	5.545%	Mean	37,9386%
	Median	5.036%	Median	37.1173%
JSE ALSI	Maximum	16.020%	Maximum	79.666%
	Minimum	0.556%	Minimum	4.2534%
	Mean	5.776%	Mean	43.965%
	Median	5.477%	Median	42.563%

When calculating active share and tracking error with regards to the lowest active share index fund, of the 114 unit trusts analysed by this study, 106 funds had an active share below 60%, while 8 funds had an active share above 60%. This indicates a decrease in the funds with a high active share when compared to Hirschel and Krige's (2010:70) analysis for December 2007 and Muller and Ward (2011). The current study found that 93 funds had a tracking error of less than 8%, and 21 funds had a tracking error above 8%.

To confirm the results found in Table 5.1 the classification of the unit trusts indicated that most of the general equity unit trusts analysed had an active share below 60% and a tracking error below 8%, and thus fell into the classification of closet indexers.

Table 5.2 Frequency table of unit trusts for each classification

Classification of unit trusts	Amount of unit trusts
Closet indexers	89
Diversified stock picks	4
Factor bets	17
Concentrated stock picks	4

The frequency of unit trusts for each classification according to the various thresholds using the lowest active share index fund and JSE ALSI as benchmark can be seen in Appendix E to Appendix I.

5.2.1.2 The performance of the unit trust classifications

After classifying the unit trusts the researcher determined how well each of the classifications performed in terms of risk-adjusted returns. The Alpha, Treynor ratio, Sharpe ratio, Sortino ratio and Information ratio for each classification of unit trusts was compared to each of these measures for the other classification of unit trusts. The p-values for the comparisons is indicated in Appendix E to Appendix I. The non-parametric ANOVA tests (see Appendix J Table 1 and Appendix J Table 2) indicated that the only significant difference was between the Sharpe ratio for closet indexers and funds making factor bets as a p-value of less than 0.05 is deemed significant. However, there was no classification that managed to deliver a consistent outperformance in comparison to the other classifications.

According to the results found, one of the null hypotheses could be rejected as summarised in Table 5.3.

Table 5.3 Hypotheses testing

	$H_{0(1)}$	$H_{0(2)}$	$H_{0(3)}$
Alpha	Failed to reject	Failed to reject	Failed to reject
Treynor ratio	Failed to reject	Failed to reject	Failed to reject
Sharpe ratio	Failed to reject	Rejected	Failed to reject
Sortino ratio	Failed to reject	Failed to reject	Failed to reject
Information ratio	Failed to reject	Failed to reject	Failed to reject

$H_{0(1)}$ tested whether the unit trust investment approach had any effect in terms of fund performance. The measures of active management and risk-adjusted returns were calculated according to an active share threshold of 60% and a tracking error threshold of 8% in relation to the lowest active share index fund. These results indicated that none of the classifications of general equity unit trusts in South Africa delivered a statistical

significant outperformance or underperformance relative to the benchmark or each other from 1 January 2008 to 31 December 2015. The results for the hypotheses tests ($H_{0(1)}$) for the various classifications can be seen in Appendix K Table 1 and Appendix K Table 2. These tables indicate that $H_{0(1)}$ could not be rejected for any of the classifications of unit trusts, as none of the classifications delivered a consistent underperformance or outperformance in terms of their risk-adjusted returns.

$H_{0(2)}$ tested whether tracking error affected fund performance. $H_{0(2)}$ could be rejected for the Sharpe ratio. This means that the tracking error had a statistically significant effect on risk-adjusted fund returns when measured by the Sharpe ratio. The relationship between the Sharpe ratio and the tracking error was inverse, which meant that a higher tracking error lead to a lower Sharpe ratio. In other words, a higher tracking error lead to lower performance in terms of excess returns per unit of standard deviation.

$H_{0(3)}$ tested whether active share affected fund performance. None of the null-hypotheses could be rejected. This means that for the study period active share did not have a statistically significant effect on the risk-adjusted returns of unit trusts.

The results found in this study differ from Hirschel and Krige (2010). They indicated that the funds with the highest active share delivered statistically significant better returns in terms of Jensen's alpha and the Omega ratio. The difference in the study period, and the risk-adjusted return measures used in this study could have had an influence on the different result.

However, the results found in this study is consistent with Muller and Ward (2011), indicating that for the Sharpe ratio, a higher active share did not lead to increased risk-adjusted returns.

5.2.2 The cost of active management

The secondary objective set out to determine how expensive the active management of unit trusts are in comparison to passive management. The calculation of the cost of active management was done following the methods of Miller (2005), and Miller (2010). These studies divided unit trusts into an active and a passive component. Miller (2010:1) found that the mean active expense ratio, as described in section 3.9.3, in the US for a sample

of 731 funds was 6.44%, while the mean reported expense ratio was 1.2%. Further, Miller (2005) determined that the mean active alpha, as described in section 3.9.3, for this sample of funds was -2.10%, while the reported alpha was -0.51%.

The current study first compared active share and tracking error to the TER of the unit trusts. Spearman's correlation was used to determine whether active share or tracking error had any significant impact on the TER of the funds. No significant relationship could be found. According to the results found, neither $H_{0(4)}$ or $H_{o(5)}$ could be rejected.

Next, the study analysed the active expense ratio and active alpha for the four classifications of unit trusts. The study found that the mean active expense ratio for all classifications of the unit trusts were larger than the mean reported expense ratio. Diversified stock pickers had a mean active expense ratio that was 2.47 times higher than the mean reported expense ratio. This indicates that investors pay a high price for the actively managed part of a unit trust. For the entire sample of funds in this study, the mean active expense ratio was 3.85%, while the mean reported expense ratio was 1.55%. Further, it was indicated that active managers on average have a negative active alpha. This indicates that the returns active funds deliver do not justify the costs associated with investing in them.

5.3 CONTRIBUTION OF THE RESEARCH

The study on the functioning of unit trusts is something investors deal with on a regular basis. Having knowledge on how unit trusts function is valuable for determining whether it is a viable investment option. It is important for investors to know what the advantages and disadvantages to investing in unit trusts are.

Knowing how actively funds are managed provides insight to investors on what they are paying for when investing in a unit trust, and the way in which their returns are achieved. This could also indicate whether an index fund is a more viable option than an actively managed unit trust.

It is also of importance to investors to know what their fund management fees are used for. This study showed how much of the fees go towards the passive component of the unit trust and how much fees go toward the active management.

This thesis expanded on the limited amount of research done on active share and active management for unit trusts in South Africa. This study expanded on current research, by studying the effects of active management on returns for a different period, and including more funds than previous studies done on the South African market. This thesis also expanded on studying measures of risk-adjusted performance, not analysed in previous studies.

Further, this study expanded previous research done on the cost of investing in active funds, and how much the cost of passive investing differ form the cost of active investing.

The results found by this study indicates that investors seeking to invest in unit trusts should consider investing in an index fund. According to the four classifications of actively managed unit trusts in this study, none of the classifications were found to significantly outperform any of the other classifications of unit trusts

5.4 LIMITATIONS THAT THE STUDY FACED AND AREAS OF FUTURE RESEARCH

The greatest limitation of the study was the availability of consistent and reliable data. The database used in this study, Bloomberg (2016), did not allow the researcher to calculate active share for funds before 1 January 2008. This was due to the limited number of funds for which holdings data was available before this date. Further, the holdings data for each of the unit trusts as listed by ASISA was not available to the researcher, which decreased the sample that was researched.

Future research could increase the period of the study and the total number of funds if this data is available elsewhere. This would increase the number of observations, which should provide a more accurate representation on the active management of unit trusts.

The classifications of the unit trusts can be done in various different ways to determine whether there is a threshold for active share and tracking error that produces excess risk-adjusted returns.

5.5 CONCLUSION

This study enlightens investors on how actively general equity unit trusts in South Africa are managed. Further the study indicates how much investors are paying for active management by separating the funds into an active and passive component. By studying the active share and tracking error investors are able to determine which funds are closet indexers. Studying the TER of the funds together with the active management measures indicated that the fund management fees charged by active funds are not always justified.

This study found that the active share for South African general equity unit trusts are relatively low, as most of the funds were classified as closet indexers. According to the active management classifications set out, none of the classifications were able to deliver increased risk-adjusted fund returns in a statistically significant way, and in some cases a higher degree of active management could decrease fund returns. Further, the study found that investors pay high effective fees for the actively managed component of the unit trust in comparison to the passively managed component. According to these results, the researcher suggests that investors should consider investing in an index fund, when considering risk-adjusted returns.

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APPENDIX A

MEASURES OF CENTRAL TENDANCY

This appendix presents the measures of central tendency used in the calculations in this thesis. Section 3.9.2 refers to Appendix A.

- Holding period return

To express the return of the unit trusts and indices over the lifetime of the investments, the holding period return is calculated (Reilly & Brown, 2012:5). In this study the quarterly holding period return for each unit trust and index was calculated over the time horizon of the study using the following formula:

$$HPR_t = \frac{P_t + \frac{DY_t}{4} - P_{t-1}}{P_{t-1}} \times 100$$

Where: HPR_t = holding period return for quarter t;

P_t = PPU at end of quarter t;

P_{t-1} = PPU at end of quarter t-1;

DY_t = annual dividend yield during quarter t.

The holding period return delivered quarterly returns of the unit trusts and indices over the study period. Thus the holding period return indicates the change in the value of the unit trust and indices.

- Geometric mean rate of return

The geometric mean rate of return delivers the return per-period that provides equivalent cumulative performance to the actual realised quarterly returns. The geometric mean rate of return is calculated by compounding actual quarterly returns of the unit trusts and indices, which provide the per-period returns identical to this (Bodie, Kane & Marcus, 2003:133). The geometric mean provides a compound growth rate to set the beginning and end value of the investment equal (Berenson, Levine & Krehbiel, 2006:79). This measure thus does not provide the upward bias that is present when calculating the

arithmetic mean rate of return, and is calculated as follows (Stowe, Robinson, Pinto & McLeavey, 2010: 115):

$$GA_x = \prod (1 + HPR_x)^{\frac{1}{n}} - 1$$

Where: GA_x =quarterly geometric mean rate of return for unit trust x;

$\prod(HPR_x)$ = product of the monthly holding period returns for unit trust x;

n = number of periods of the investment.

The quarterly geometric mean can be annualised using the following equation:

$$GA_{annualised} = (1 + GA_x)^{12} - 1$$

Where: $GA_{annualised}$ = the annual geometric mean of unit trust x; or index x;

GA_x = quarterly geometric mean rate of return for unit trust x; or index x.

APPENDIX B

MEASURES OF DISPERSION

This Appendix presents the measures of dispersion used in the calculations in this thesis. Section 3.9.2 refers to appendix B.

- Variance

The variance indicates the disparity in a data set through describing how the data deviates relative to the mean (Bodie, Kane & Marcus, 2010:114-115). The variance is an indication of the risk involved with an investment and is the squared deviation of the difference in actual returns and the arithmetic mean rate of return of the data. The variance is calculated using the following formula:

$$\sigma^2 = \frac{1}{n-1}\sum(r_t - r_m)^2$$

Where: σ^2 = the variance of the unit trust; or index;

r_t = return of the unit trust; or index for period t;

r_m = arithmetic mean return of the unit trust; or index;

n = number of observations.

Because the researcher did not use the whole universe of general equity unit trusts, and instead a sample to represent the whole, n-1 observations was used in the formula above. To annualise the quarterly variance, it is simply multiplied by 4. Standard deviation is calculated to expresses the deviation in percentage terms.

- Standard deviation

Standard deviation indicates the extent of variation around an expected value. The larger the value for standard deviation, the larger is the risk associated with the investment. Less risk is indicated by a smaller standard deviation. The standard deviation is calculated as follows (as calculated above) (Muljadi, 2003: 1-2):

$$\sigma = \sqrt{\sigma^2}$$

Where: σ = the standard deviation of the unit trust or index;

σ^2 = the variance of the unit trust; or index.

To calculate the annualized standard deviation from the quarterly standard deviation, the value as found in this equation is multiplied by $\sqrt{4}$.

APPENDIX C

RISK-ADJUSTED PERFORMANCE MEASURES

This Appendix presents the risk-adjusted performance measures used in the calculations in this thesis. Section 3.9.2 refers to appendix C.

- The Treynor ratio

The Treynor ratio indicates the amount of excess return (return above the risk free rate) that is achieved per unit of systematic risk (Bodie *et al*., 2010:583-584). The Treynor ratio assumes a diversified portfolio with the systematic risk as the relevant risk measure. This study calculated, quarterly Treynor ratios for the unit trusts. The Treynor ratio is provided using the following formula:

$$T_i = \frac{R_i - RFR}{\beta_i}$$

Where: R_i = mean rate of return for unit trust I;

RFR = mean rate of return on a risk-free asset;

β_i = beta coefficient of the portfolio.

- The Sharpe ratio

The Sharpe ratio provides an indication of the excess return achieved per unit of standard deviation of the portfolio. Standard deviation measures the total risk of the portfolio (Reilly & Brown, 2012:939).

$$S_i = \frac{R_i - RFR}{\sigma_i}$$

Where: R_i = mean rate of return for the unit trust;

RFR = mean rate of return on a risk-free investment;

σ_i = standard deviation of the unit trust.

- The Sortino ratio

The Sortino ratio is a modification to the Sharpe ratio. This ratio differentiates between harmful and general volatility by taking the standard deviation into account of negative asset returns, known as downside deviation (Sortino & Price 1994: 62). The Sortino ratio divides the risk premium by the downside deviation and is calculated as follows:

$$S_i = \frac{R_i - R_f}{O_d}$$

Where: R_i = mean rate of return for the unit trust;

R_f = mean rate of return on a risk-free investment;

O_d = Standard deviation of negative asset returns.

- The Information ratio

The information ratio indicates the ratio of returns above the returns of the benchmark to the volatility of those returns. This ratio measures the ability of the manager to achieve excess returns, and attempts to identify how consistent these returns are (Maginn *et al*., 2007:770). The Information ratio is calculated as follows:

$$I_R = \frac{R_i - R_b}{S_{p-i}}$$

Where: R_i = mean rate of return for the unit trust;

R_b = average rate of return for the benchmark index;

S_{p-i} = Tracking error of the unit trust to the benchmark index.

The Information ratio has an assumption that the portfolio roughly matches the systematic risk of the benchmark. This ratio is thus most useful when the benchmark matches the style of the portfolio Goodwin (1998:35).

APPENDIX D

CALCULATION OF ACTIVE SHARE AND TRACKING ERROR

This Appendix presents the active share and tracking error values for the unit trusts in this thesis. It is referred to in Section 4.2.1 and Section 4.2.2.

FUND NAME	JSE ALSI TOP 40	JSE ALSI	JSE CAPPED 40	JSE CAPPED	JSE SWIX	JSE SWIX40	Tracking Error
3LAWS CLIMATE CHANGE EQUITY PRESCIENT FUND	72.6263	76.7835	71.8839	76.6752	75.9495	**69.6971**	3.130
27FOUR SHARIAH ACTIVE EQUITY PRESCIENT FUND	34.0237	38.7975	33.5789	38.5306	37.4814	**32.1447**	4.358
36ONE MET EQUITY FUND	40.6141	44.1787	40.8614	44.2569	42.7629	**39.8176**	8.749
ABSA SELECT EQUITY FUND	34.6456	38.9656	**34.0748**	38.6826	39.4794	35.1078	6.281
AEON ENHANCED EQUITY PRESCIENT FUND	28.2339	32.1063	27.8605	31.9482	23.8782	**23.3702**	1.976
AFENA EQUITY PRESCIENT FUND	29.2648	35.2648	28.2198	34.8719	31.5721	**25.0832**	3.563
ALLAN GRAY EQUITY FUND	37.7486	42.8821	**36.3832**	42.2234	43.7313	38.1899	7.265
AMPERSAND MOMENTUM EQUITY FUND	47.3551	46.6581	46.6574	46.4110	**43.4355**	45.0662	2.641
ANALYTICS CI MANAGED EQUITY FUND	25.5938	26.8090	25.1956	26.4848	**24.0535**	24.5077	3.449
ANCHOR BCI EQUITY FUND	60.2345	61.1263	59.2822	60.7687	58.6767	**56.9505**	7.651
ASHBURTON MULTI MANAGER EQUITY FUND	27.7784	28.1143	27.8410	27.8213	**27.3637**	28.6250	5.087
ASHBURTON SA EQUITY FUND	35.9399	42.6572	34.3769	42.0153	39.5259	**29.9658**	3.470
AUTUS BCI EQUITY FUND	50.5190	58.5956	50.1515	58.7203	58.7449	**49.7481**	4.315
AYLETT EQUITY PRESCIENT FUND	56.8782	60.0341	57.2566	60.2940	60.3365	**55.7937**	9.255
BCI BEST BLEND SPECIALIST EQUITY FUND	50.8387	52.3828	49.7645	52.0636	46.5570	**46.0321**	3.796
BCI SA EQUITY FUND	56.9780	57.5292	56.7351	57.5071	54.7967	**53.6061**	3.462
CADIZ MASTERMIND FUND	39.8263	45.0732	**38.1977**	44.5633	45.7622	38.5765	8.696
CANNON MET EQUITY FUND	69.3317	69.5961	68.4107	69.1146	67.2225	**66.6900**	8.033
CAPSTONE BCI EQUITY FUND	38.9864	**37.9626**	39.6847	38.1878	38.1908	40.8139	6.352
CLARUS MET OPTIMAL FUND	**31.5252**	34.6103	32.2363	34.8046	34.8375	32.9689	5.950
CLARUS MET VALUE FUND	38.0226	42.2321	**37.9672**	42.1741	42.2915	38.3857	8.080
CLUCASGRAY GENERAL EQUITY FUND	39.1992	43.3995	**39.1330**	43.3866	46.6312	40.9405	4.828
CORONATION EQUITY FUND	29.8603	36.3759	29.4851	36.3943	35.8673	**27.7361**	5.469
CORONATION TOP 20 FUND	32.5749	41.5833	30.7171	40.9546	39.6337	**27.8400**	7.491
COUNTERPOINT MET HIGH YIELD EQUITY FUND	59.3081	63.3478	59.0528	63.2320	62.2336	**58.6782**	5.090
COUNTERPOINT MET VALUE FUND	32.7927	39.0734	31.9544	38.8363	37.1240	**30.3213**	4.880
DISCOVERY DYNAMIC EQUITY FUND	49.3017	54.4466	48.0356	54.0859	50.3639	**45.0003**	3.269
DISCOVERY EQUITY FUND	**32.8900**	40.1447	33.0838	40.2679	40.0601	33.0851	14.373
DYNASTY CI WEALTH ACCUMULATOR FUND OF FUNDS	32.3716	36.8368	31.6215	36.4809	34.5964	**31.0528**	2.666
EFFICIENT BCI GENERAL EQUITY FUND	**31.2439**	34.9317	31.4481	34.8845	36.6647	34.2461	4.708
EFFICIENT EQUITY FUND OF FUNDS	46.3854	44.6800	46.3440	**44.5142**	45.0231	47.9673	3.815
ELEMENT EARTH EQUITY FUND	38.4398	44.6503	**38.3322**	44.5658	47.2110	41.8334	9.052
ELEMENT ISLAMIC EQUITY FUND	63.7558	65.6760	**62.8390**	65.2037	65.5196	63.8755	7.952
EMPEROR IP MOMENTUM EQUITY FUND	78.7675	79.6659	78.1492	79.3886	**76.1377**	76.1870	10.157
FAIRTREE EQUITY PRESCIENT FUND	30.6617	35.1531	30.7408	35.2183	33.5381	**30.2591**	4.762
FG IP MERCURY EQUITY FUND OF FUNDS	41.4142	39.1831	41.5121	39.0611	**37.1823**	42.1977	3.083
FIRST AVENUE SANLAM COLLECTIVE INVESTMENTS EQUITY FUND	43.1737	47.4821	42.7652	47.4567	43.6840	**36.4369**	4.623
FLAGSHIP IP EQUITY FUND	70.5648	61.8144	69.8804	**61.6023**	63.4372	71.4856	8.102

FUND NAME	JSE ALSI TOP 40	JSE ALSI	JSE CAPPED 40	JSE CAPPED	JSE SWIX	JSE SWIX40	Tracking Error
FNB GROWTH FUND	29.7663	33.3473	27.6886	32.1904	29.4669	**25.2898**	3.677
GRINDROD EQUITY INCOME GROWTH FUND	56.0493	64.6991	55.2765	64.5944	63.5930	**54.7699**	5.893
GRINDROD RAFI ENHANCED SA STRATEGY FUND	30.9060	35.6160	29.9622	35.2480	35.8318	**29.9010**	5.816
GRYPHON ALL SHARE TRACKER FUND	**12.3545**	13.7668	13.9057	13.6314	20.0413	22.8270	1.803
HARVARD HOUSE BCI EQUITY FUND	47.6529	50.5868	45.9830	49.9390	45.7710	**41.0593**	4.886
HOLLARD PRIME EQUITY FUND	46.4129	48.5584	**45.1087**	48.1208	53.8894	49.7830	5.220
HUYSAMER EQUITY PRESCIENT FUND	27.7145	35.2682	**25.7637**	34.3195	37.9897	28.5190	3.351
IMARA MET EQUITY FUND	38.6524	43.6469	38.4297	43.4517	43.6511	**37.7873**	5.437
INVESTEC ACTIVE QUANTS FUND	31.5029	37.6034	**31.3509**	37.4611	36.7439	31.4348	3.869
INVESTEC EQUITY FUND	31.0989	35.4398	30.4435	35.1017	34.9018	**29.0896**	4.520
INVESTEC VALUE FUND	53.7182	60.7410	**52.0732**	59.9696	60.8317	53.2657	15.734
IP EQUITY FUND	36.5772	38.7217	36.2055	38.5363	40.0600	**36.1394**	8.822
KAGISO EQUITY ALPHA FUND	40.5945	43.7495	38.8038	42.8844	40.9057	**36.9925**	5.681
LAURIUM FLEXIBLE PRESCIENT FUND	67.3796	64.5421	66.8290	**64.3844**	64.5452	66.2173	4.579
LION OF AFRICA MET EQUITY FUND	34.3594	34.7398	**33.6092**	34.1163	36.2434	36.7826	5.084
LYNX OPPORTUNITIES FUND OF FUNDS	40.0258	39.7158	39.3603	**39.1822**	39.3616	41.5645	2.802
MAESTRO EQUITY PRESCIENT FUND	50.3434	55.8762	**49.1560**	55.3616	56.9699	50.3376	6.930
MARRIOTT DIVIDEND GROWTH FUND	66.1530	74.3439	64.8314	73.7628	69.2704	**60.0510**	12.913
MAZI CAPITAL MET EQUITY FUND	**40.1763**	42.9791	40.5766	42.9829	42.6110	41.5001	5.142
MELVILLE DOUGLAS STANLIB HIGH ALPHA FUND	39.4750	42.9815	39.3915	42.8863	43.3248	**39.1814**	4.203
MERGENCE EQUITY PRESCIENT FUND	28.0304	31.1091	27.0110	30.6067	25.1589	**24.0626**	1.780
MIPLAN IP BETA EQUITY FUND	22.3464	20.6706	22.6553	20.2909	**17.9938**	24.3020	2.172
MITONOPTIMAL IP HIGH CONVICTION EQUITY FUND	40.6189	46.9474	39.8778	47.0110	45.1174	**37.0523**	3.124
MITONOPTIMAL IP SMART EQUITY FUND	**15.5465**	16.7928	15.7029	17.0544	30.6632	27.6862	1.672
MOMENTUM BEST BLEND SPECIALIST EQUITY FUND	**38.1861**	38.9326	38.6643	38.8647	39.0744	40.7920	5.763
MOMENTUM EQUITY FUND	27.5826	31.3010	27.2198	30.9193	28.4043	**25.4107**	3.575
MOMENTUM TOP 25 FUND	32.0857	37.5811	31.6244	37.2863	36.1690	**30.2282**	4.739
MOMENUM VAUE FUND	41.7384	45.8911	39.6955	44.8137	41.6551	**37.4914**	10.738
NEDGROUP INVESTMENTS CORE EQUITY FUND	29.3011	28.5722	29.7760	28.4470	**27.2988**	31.6712	5.277
NEDGROUP INVESTMENTS GROWTH FUND	44.1422	**41.1395**	44.7812	41.2522	43.3500	46.8885	4.874
NEDGROUP INVESTMENTS RAINMAKER FUND	27.4495	31.6948	27.1732	31.5015	30.6262	**27.0237**	3.635
NEDGROUP INVESTMENTS VALUE FUND	50.4719	57.7162	50.7342	57.8625	56.1529	**48.0422**	7.495
NEFG BCI EQUITY FUND	32.0162	34.5179	31.5577	34.2818	31.5289	**29.5742**	4.921
NFB EQUITY FUND	26.9258	37.4257	**26.7252**	37.2513	40.4002	28.5927	8.988
OLD MUTUAL ACTIVE QUANT EQUITY FUND	31.9855	36.6017	30.3630	36.0776	31.3694	**22.5055**	3.882
OLD MUTUAL ALBARAKA EQUITY FUND	**56.3205**	59.0696	56.7575	59.2264	62.8705	60.8611	5.897
OLD MUTUAL GROWTH FUND	32.8108	38.5712	**32.1253**	38.2063	39.0631	32.7728	8.579
OLD MUTUAL HIGH YIELD OPPORTUNITY FUND	44.7999	51.9485	44.1916	51.8239	48.5343	**40.9720**	9.965

FUND NAME	JSE ALSI TOP 40	JSE ALSI	JSE CAPPED 40	JSE CAPPED	JSE SWIX	JSE SWIX40	Tracking Error
OLD MUTUAL INVESTORS FUND	29.7732	35.0532	28.6988	34.5128	30.2372	**23.1325**	3.693
OLD MUTUAL TOP COMPANIES FUND	36.1052	39.9071	33.7487	38.7301	38.0812	**32.4312**	4.917
OLD MUTUAL UMBONO RAFI 40 TRACKER FUND	21.8301	29.5096	**20.3337**	29.2988	36.2843	24.6220	5.104
PERSONAL TRUST HIGH YIELD GROWTH FUND	**39.3856**	44.2935	39.7161	44.4318	47.1404	42.2061	7.879
PERSONAL TRUST SA EQUITY FUND	36.1162	41.6627	**35.6185**	41.4180	44.9166	38.7121	6.866
PORTFOLIOMETRIX BCI EQUITY FUND OF FUNDS	59.2849	57.1346	58.7452	56.9781	**53.8574**	57.2583	0.814
PRESCIENT EQUITY INCOME FUND	51.5834	58.3537	50.5573	58.1900	52.3438	**44.5845**	4.874
PRESCIENT LIVING PLANET FUND	32.9709	31.6381	32.5455	**31.4976**	32.8420	34.7051	5.233
PRUDENTIAL DIVIDEND MAXIMISER FUND	32.7487	34.9520	32.1190	34.5834	33.2950	**31.7555**	5.042
PRUDENTIAL EQUITY FUND	38.0046	39.1066	36.2285	38.1325	35.7853	**34.2807**	5.008
PSG EQUITY FUND	**39.2260**	42.4678	39.5758	42.5406	44.2636	41.3881	9.594
RECM EQUITY FUND	**49.8395**	59.0505	50.5956	59.3808	60.2878	51.0528	10.616
SASFIN MET EQUITY FUND	**48.1666**	56.8666	48.3432	57.0212	58.7319	49.0247	8.816
SATRIX ALSI INDEX FUND	10.4584	**4.2534**	12.5973	4.4326	14.5097	22.4338	0.670
SATRIX DIVIDEND PLUS INDEX FUND	50.1530	61.6485	50.2261	61.6767	59.8691	**49.1429**	4.430
SATRIX MOMENTUM INDEX FUND	40.6843	48.9867	41.2028	49.2111	45.7612	**38.5388**	6.269
SATRIX RAFI INDEX FUND	17.7610	25.9519	**17.1099**	25.7795	27.1487	19.0030	4.579
SEED EQUITY FUND	43.0324	54.2077	**42.9069**	54.1811	54.7808	43.8639	7.182
SIM GENERAL EQUITY FUND	31.0686	32.9008	29.0508	31.8888	30.3082	**28.8978**	3.884
SIM TOP CHOICE EQUITY FUND	40.7373	47.3412	39.9479	47.0916	45.0729	**37.2494**	5.584
SIM VALUE FUND	44.2373	45.7729	**43.3232**	45.2470	46.6460	44.9099	6.025
SPI EQUITY FUND	36.5479	43.8223	**35.9413**	43.7808	46.1283	38.0303	3.447
STANLIB EQUITY FUND	34.3972	39.2565	33.0283	38.6573	34.4515	**29.5674**	5.244
STANLIB GROWTH FUND	42.7089	49.1585	41.5502	48.3634	47.4107	**41.3023**	6.739
STANLIB INDEX FUND	11.7236	**7.1329**	13.8565	7.1514	16.6703	23.6592	2.074
STANLIB MULTI MANAGER ALL STARS EQUITY FUND OF FUND	34.6293	32.8056	34.8118	32.6128	**31.2205**	36.0271	2.886
STANLIB MULTI MANAGER EQUITY FUND	32.1285	30.4424	32.7807	30.4738	**27.8502**	33.3666	3.041
STANLIB SA EQUITY FUND	31.3806	37.7793	30.1382	37.3435	34.2028	**26.3970**	5.645
STANLIB SHARIAH EQUITY FUND	**54.1478**	60.0633	54.3447	60.1581	62.5156	56.4092	7.170
STANLIB VALUE FUND	34.3008	42.6583	34.3398	42.5551	42.4667	**34.2349**	6.781
SYGNIA ACTIVE EQUITY FUND	44.5802	48.8189	43.5191	48.5802	44.3190	**40.8364**	2.892
SYGNIA DIVI INDEX FUND	54.7206	65.2806	**54.3853**	65.1147	64.5535	55.0783	9.531
SYGNIA EQUITY FUND	30.6575	27.4121	30.4328	27.3703	**23.4658**	29.8439	1.933
SYGNIA SWIX INDEX FUND	23.6268	24.9965	22.4784	24.6654	**8.8722**	15.2059	1.466
TOWER CAPITAL EQUITY PRESCIENT FUND	85.1474	77.7910	84.8696	**77.6802**	78.1308	85.7636	3.964
TRILLIAN IP FCF EQUITY FUND	64.7905	64.8347	63.7615	64.5539	60.6863	**58.5176**	6.821
VERSO BCI EQUITY FUND OF FUND	**48.2690**	50.5257	48.5366	50.5964	50.1348	48.9190	9.749
VISIO BCI GENERAL EQUITY FUND	50.2183	53.9522	49.5265	53.8020	50.4141	**47.4758**	2.316

APPENDIX E

Classification according to 50% active share and 8% tracking error with the lowest active share index as benchmark fund

This appendix presents the data obtained from classifying the unit trusts with the thresholds of 50% active share and 8% tracking error.

Appendix E Figure 1 is referred to in Section 4.3.2.

Appendix E Table 1 is referred to in Section 4.3.2.1.

Appendix E Table 2 is referred to in section 4.3.2.2.

Figure 1 Classification according to management style

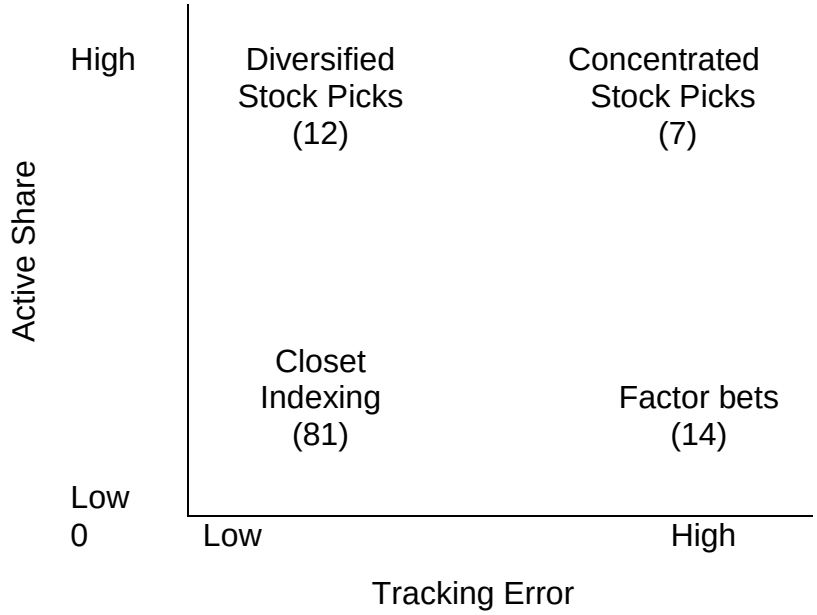

Table 1 Average risk-adjusted performance measures for the classifications of unit trusts (1 January 2008 – 31 December 2015)

Classification	Alpha	Treynor ratio	Sharpe ratio	Sortino ratio	Information ratio
Closet indexers	0.0835	1.7714	0.2714	1.1341	-0.0819
Diversified stock picks	0.8175	1.1259	0.2925	1.0554	0.0739
Factor bets	-0.144	0.9767	0.1024	0.1930	-0.0930
Concentrated stock picks	-0.6310	1.0535	0.0533	0.1032	-0.1259
All unit trusts	0.0889	1.5618	0.2395	0.9463	-0.0695

Table 2 Summary of the p-values between each risk- adjusted measure for each unit trust classification in comparison to other unit trust classifications

	Closet indexers		Factor bets		Diversified stock picks		Concentrated stock picks	
Closet indexers			Alpha	0.726	Alpha	0.837	Alpha	0.911
			Treynor	>0.999	Treynor	>0.999	Treynor	>0.999
			Sharpe	0.015*	Sharpe	>0.999	Sharpe	0.063
			Sortino	0.495	Sortino	>0.999	Sortino	0.729
			Information	>0.999	Information	0.449	Information	>0.999
Factor bets	Alpha	0.726			Alpha	0.569	Alpha	0.995
	Treynor	>0.999			Treynor	>0.999	Treynor	>0.999
	Sharpe	0.015*			Sharpe	0.441	Sharpe	>0.999
	Sortino	0.495			Sortino	0.369	Sortino	>0.999
	Information	>0.999			Information	0.795	Information	>0.999
Diversified stock picks	Alpha	0.837	Alpha	0.569			Alpha	0.748
	Treynor	>0.999	Treynor	>0.999			Treynor	>0.999
	Sharpe	>0.999	Sharpe	0.441			Sharpe	0.495
	Sortino	>0.999	Sortino	0.369			Sortino	0.945
	Information	0.449	Information	0.795			Information	0.817
Concentrated stock picks	Alpha	0.911	Alpha	0.995	Alpha	0.748		
	Treynor	>0.999	Treynor	>0.999	Treynor	>0.999		
	Sharpe	0.063	Sharpe	>0.999	Sharpe	0.495		
	Sortino	0.729	Sortino	>0.999	Sortino	0.945		
	Information	>0.999	Information	>0.999	Information	0.817		

APPENDIX F

Classification so that 50% of funds lie on either side of the tracking active share and tracking error thresholds with the lowest active share index fund as benchmark fund

This appendix presents the data obtained from classifying the unit trusts so that 50% of the funds lie on either side of the active share threshold and 50% of the funds lie on either side of the tracking error threshold, with the lowest active share index fund as benchmark.

Appendix F Figure 1 is referred to in Section 4.3.3.

Appendix F Table 1 is referred to in Section 4.3.3.1.

Appendix F Table 2 is referred to in section 4.3.3.2.

Figure 1 Classification according to management style

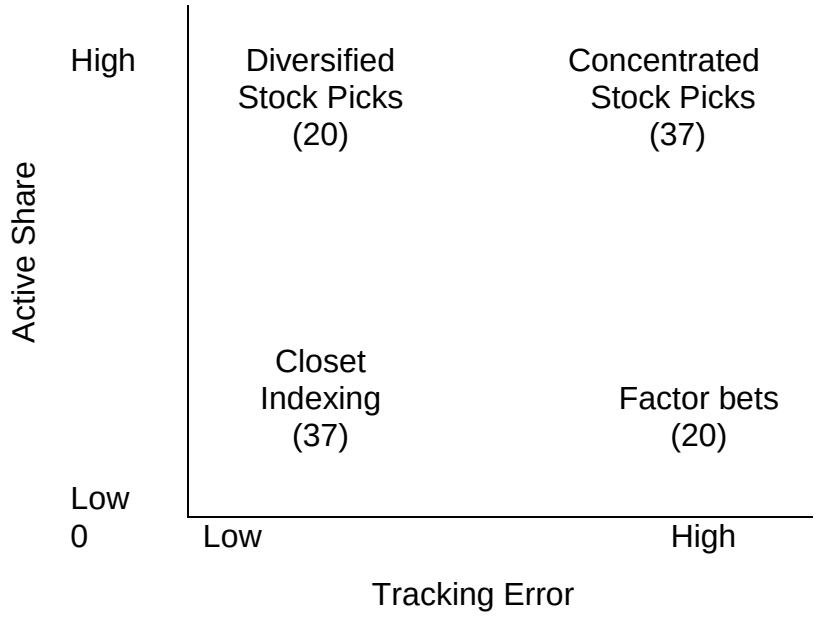

Table 1 Average risk-adjusted performance measures for the classifications of unit trusts (1 January 2008 – 31 December 2015)

Classification	Alpha	Treynor ratio	Sharpe ratio	Sortino ratio	Information ratio
Closet indexers	-0.1240	1.7194	0.2861	0.9227	-0.1075
Diversified stock picks	0.2110	1.5210	0.3046	2.2338	0.0092
Factor bets	0.3970	1.6902	0.1582	0.3888	-0.0595
Concentrated stock picks	0.0695	1.3568	0.2017	0.7319	-0.0796
All unit trusts	0.0889	1.5618	0.2395	0.9463	-0.0695

Table 2 Summary of the p-values between each risk- adjusted measure for each unit trust classification in comparison to other unit trust classification

	Closet indexers		Factor bets		Diversified stock picks		Concentrated stock picks	
			Alpha	>0.999	Alpha	>0.999	Alpha	>0.999
			Treynor	0.967	Treynor	0.777	Treynor	0.536
			Sharpe	0.021*	Sharpe	>0.999	Sharpe	0.357
			Sortino	0.489	Sortino	0.741	Sortino	>0.999
Closet indexers			Information	>0.999	Information	0.609	Information	>0.999
	Alpha	>0.999			Alpha	>0.999	Alpha	>0.999
	Treynor	0.967			Treynor	0.832	Treynor	0.634
	Sharpe	0.021*			Sharpe	0.153	Sharpe	>0.999
	Sortino	0.489			Sortino	0.417	Sortino	>0.999
Factor bets	Information	>0.999			Information	>0.999	Information	>0.999
	Alpha	>0.999	Alpha	>0.999			Alpha	>0.999
	Treynor	0.777	Treynor	0.832			Treynor	0.814
	Sharpe	>0.999	Sharpe	0.153			Sharpe	0.663
	Sortino	0.741	Sortino	0.417			Sortino	0.837
Diversified stock picks	Information	0.609	Information	>0.999			Information	0.975
	Alpha	>0.999	Alpha	>0.999	Alpha	>0.999		
	Treynor	0.536	Treynor	0.634	Treynor	0.814		
	Sharpe	0.357	Sharpe	>0.999	Sharpe	0.663		
	Sortino	>0.999	Sortino	>0.999	Sortino	0.837		
Concentrated stock picks	Information	>0.999	Information	>0.999	Information	0.975		

APPENDIX G

Classification according to 60% active share and 8% tracking error with the JSE ALSI as benchmark fund

This appendix presents the data obtained from classifying the unit trusts with the thresholds of 60% active share and 8% tracking error.

Appendix G Figure 1 is referred to in Section 4.4.1.

Appendix G Table 1 is referred to in Section 4.4.1.1

Appendix G Table 2 is referred to in section 4.4.1.2

Figure 1 Classification according to management style

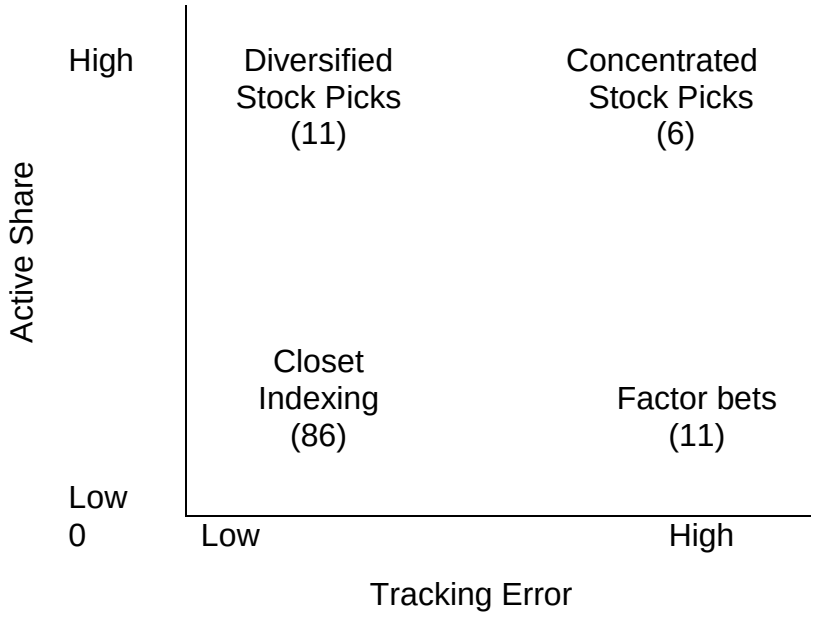

Table 1 Average risk-adjusted performance measures for the classifications of unit trusts (1 January 2008 – 31 December 2015)

Classification	Alpha	Treynor ratio	Sharpe ratio	Sortino ratio	Information ratio
Closet indexers	0.5630	1.6861	0.2753	1.1140	0.0346
Diversified stock picks	0.5940	1.5732	0.2280	0.8639	-0.1140
Factor bets	-0.3017	0.6073	0.0530	0.1031	-0.2195
Concentrated stock picks	0.4085	1.5075	0.0899	0.1825	-0.0994
All unit trusts	0.4744	1.5617	0.2395	0.9463	-0.0113

Table 2 Summary of the p-values between each risk- adjusted measure for each unit trust classification in comparison to other unit trust classification

	Closet indexers		Factor bets		Diversified stock picks		Concentrated stock picks	
			Alpha	0.268	Alpha	>0.999	Alpha	0.999
			Treynor	0.163	Treynor	>0.999	Treynor	>0.999
			Sharpe	0.003*	Sharpe	0.984	Sharpe	0.666
			Sortino	0.423	Sortino	>0.999	Sortino	0.903
Closet indexers			Information	0.077	Information	0.954	Information	0.926
	Alpha	0.268			Alpha	0.819	Alpha	0.916
	Treynor	0.163			Treynor	0.809	Treynor	0.938
	Sharpe	0.003*			Sharpe	0.600	Sharpe	0.995
	Sortino	0.423			Sortino	0.633	Sortino	>0.999
Factor bets	Information	0.077			Information	0.983	Information	0.950
	Alpha	>0.999	Alpha	0.819			Alpha	0.999
	Treynor	>0.999	Treynor	0.809			Treynor	>0.999
	Sharpe	0.984	Sharpe	0.600			Sharpe	0.904
	Sortino	>0.999	Sortino	0.633			Sortino	>0.999
Diversified stock picks	Information	0.954	Information	0.983			Information	0.959
	Alpha	0.999	Alpha	0.916	Alpha	0.999		
	Treynor	>0.999	Treynor	0.938	Treynor	>0.999		
	Sharpe	0.666	Sharpe	0.995	Sharpe	0.904		
	Sortino	0.903	Sortino	>0.999	Sortino	>0.999		
Concentrated stock picks	Information	0.926	Information	0.950	Information	0.959		

APPENDIX H

Classification according to 50% active share and 8% tracking error with the JSE ALSI as benchmark fund

This appendix presents the data obtained from classifying the unit trusts with the thresholds of 50% active share and 8% tracking error.

Appendix H Figure 1 is referred to in 4.4.2.

Appendix H Table 1 is referred to in 4.4.2.1.

Appendix H Table 2 is referred to in 4.4.2.2.

Figure 1 Classification according to management style

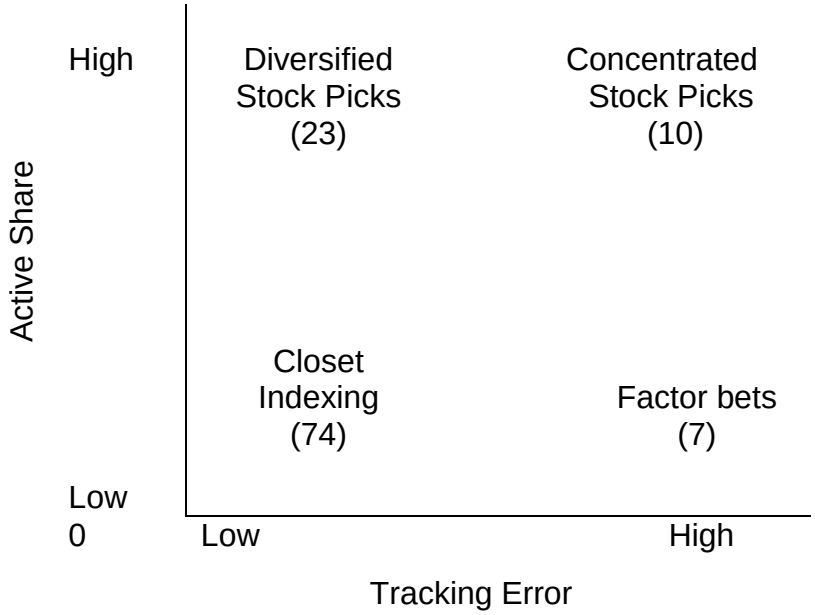

Table 1 Average risk-adjusted performance measures for the classifications of unit trusts (1 January 2008 – 31 December 2015)

Classification	Alpha	Treynor ratio	Sharpe ratio	Sortino ratio	Information ratio
Closet indexers	0.5349	1.6745	0.2630	0.8133	-0.0537
Diversified stock picks	0.6680	1.6696	0.2924	2.2873	0.2479
Factor bets	-0.2611	0.4923	0.0357	0.1047	-0.2048
Concentrated stock picks	0.0960	1.2278	0.0870	0.1460	-0.1577
All unit trusts	0.4744	1.5617	0.2395	0.9463	-0.0113

Table 2 Summary of the p-values between each risk- adjusted measure for each unit trust classification in comparison to other unit trust classification

	Closet indexers		Factor bets		Diversified stock picks		Concentrated stock picks	
			Alpha	0.390	Alpha	0.995	Alpha	0.928
			Treynor	0.307	Treynor	>0.999	Treynor	0.963
			Sharpe	0.021*	Sharpe	0.981	Sharpe	0.336
			Sortino	0.561	Sortino	0.078	Sortino	0.540
Closet indexers			Information	0.447	Information	0.489	Information	0.893
	Alpha	0.390			Alpha	0.521	Alpha	0.972
	Treynor	0.307			Treynor	0.444	Treynor	0.908
	Sharpe	0.021*			Sharpe	0.049*	Sharpe	0.966
	Sortino	0.561			Sortino	0.117	Sortino	0.979
Factor bets	Information	0.447			Information	0.206	Information	0.992
	Alpha	0.995	Alpha	0.521			Alpha	0.911
	Treynor	>0.999	Treynor	0.444			Treynor	0.974
	Sharpe	0.981	Sharpe	0.049*			Sharpe	0.357
	Sortino	0.078	Sortino	0.117			Sortino	0.094
Diversified stock picks	Information	0.489	Information	0.206			Information	0.382
	Alpha	0.928	Alpha	0.972	Alpha	0.911		
	Treynor	0.963	Treynor	0.908	Treynor	0.974		
	Sharpe	0.336	Sharpe	0.966	Sharpe	0.357		
	Sortino	0.540	Sortino	0.979	Sortino	0.094		
Concentrated stock picks	Information	0.893	Information	0.992	Information	0.382		

APPENDIX I

Classification so that 50% of funds lie on either side of the tracking active share and tracking error thresholds with the JSE ALSI as benchmark fund

This appendix presents the data obtained from classifying the unit trusts so that 50% of the funds lie on either side of the active share threshold and 50% of the funds lie on either side of the tracking error threshold.

Appendix I Figure 1 is referred to in Section 4.4.3.

Appendix I Table 1 is referred to in Section 4.4.3.

Appendix I Table 2 is referred to in Section 4.4.3.1.

Appendix I Table 3 is referred to in Section 4.4.3.2.

Table 1: Classification thresholds of the unit trusts

Management style	Active Share	Tracking Error
Closet indexing	<42.57%	<5.48%
Diversified stock picks	>42.57%	<5.48%
Factor bets	<42.57%	>5.48%
Concentrated stock picks	>42.57%	>5.48%

Figure 1 Classification according to management style

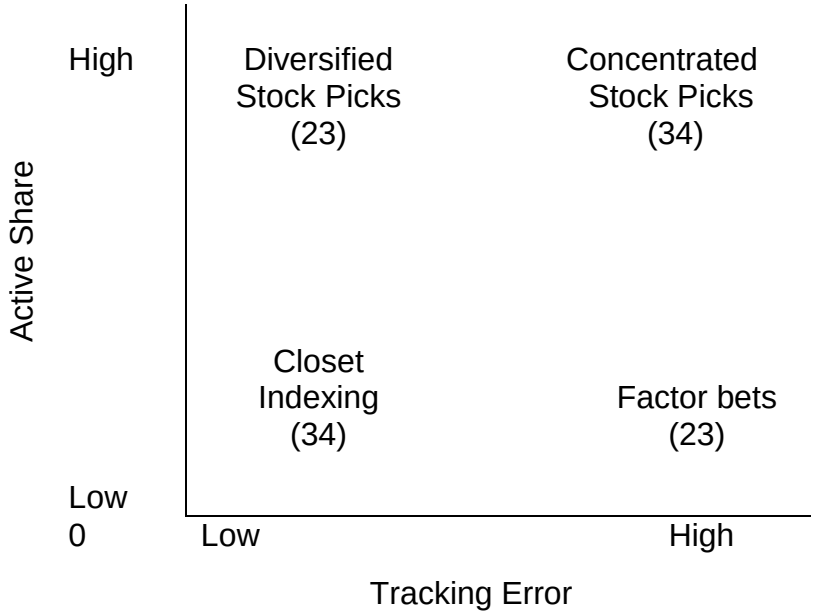

Table 2 Average risk-adjusted performance measures for the classifications of unit trusts (1 January 2008 – 31 December 2015)

Classification	Alpha	Treynor ratio	Sharpe ratio	Sortino ratio	Information ratio
Closet indexers	0.1009	1.5584	0.2458	0.5019	-0.0845
Diversified stock picks	0.7789	1.8322	0.3597	2.5012	0.2432
Factor bets	0.9793	1.4291	0.2005	0.9531	-0.0657
Concentrated stock picks	0.3005	1.4718	0.1784	0.5257	-0.0734
All unit trusts	0.4744	1.5617	0.2395	0.9463	-0.0113

Table 3 Summary of the p-values between each risk- adjusted measure for each unit trust classification in comparison to other unit trust classification

	Closet indexers		Factor bets		Diversified stock picks		Concentrated stock picks	
			Alpha	0.376	Alpha	0.140	Alpha	0.962
			Treynor	0.990	Treynor	0.787	Treynor	0.998
			Sharpe	0.747	Sharpe	0.153	Sharpe	0.711
			Sortino	0.848	Sortino	0.577	Sortino	>0.999
Closet indexers			Information	0.995	Information	0.392	Information	0.999
	Alpha	0.376			Alpha	0.986	Alpha	0.725
	Treynor	0.990			Treynor	0.827	Treynor	>0.999
	Sharpe	0.747			Sharpe	0.111	Sharpe	>0.999
	Sortino	0.848			Sortino	0.780	Sortino	0.897
Factor bets	Information	0.995			Information	0.433	Information	>0.999
	Alpha	0.140	Alpha	0.986			Alpha	0.750
	Treynor	0.787	Treynor	0.827			Treynor	0.894
	Sharpe	0.153	Sharpe	0.111			Sharpe	0.105
	Sortino	0.577	Sortino	0.780			Sortino	0.596
Diversified stock picks	Information	0.392	Information	0.433			Information	0.453
	Alpha	0.962	Alpha	0.725	Alpha	0.750		
	Treynor	0.998	Treynor	>0.999	Treynor	0.894		
	Sharpe	0.711	Sharpe	>0.999	Sharpe	0.105		
	Sortino	>0.999	Sortino	0.897	Sortino	0.596		
Concentrated stock picks	Information	0.999	Information	>0.999	Information	0.453		

APPENDIX J

Statistical tests used to find the p-values of the comparisons of the unit trust classifications

This appendix indicates the specific statistical analyses performed on the data. The type of analyses was chosen as described in Section 3.10. Appendix J Table 1 and Table 2 is referred to in Section 3.10, Section 4.3 Section 4.4 and Section 5.2.1.2

Table 1 Statistical tests used for unit trusts with the lowest active share index fund as benchmark

Classification threshold	Risk-adjusted measure	Statistical test
60% Active share 8% Tracking error	Alpha	Games-Howell
	Treynor ratio	Bonferroni
	Sharpe ratio	Bonferroni
	Sortino ratio	Bonferroni
	Information ratio	Games-Howell
50% Active share 8% Tracking error	Alpha	Games-Howell
	Treynor ratio	Bonferroni
	Sharpe ratio	Games-Howell
	Sortino ratio	Bootstrap
	Information ratio	Games-Howell
37.09% Active share 5.06% Tracking error	Alpha	Bonferroni
	Treynor ratio	Games-Howell
	Sharpe ratio	Bootstrap
	Sortino ratio	Bootstrap
	Information ratio	Bootstrap

Table 2 Statistical tests used for unit trusts with the JSE ALSI as benchmark

Classification threshold	Risk-adjusted measure	Statistical test
60% Active share 8% Tracking error	Alpha	Games-Howell
	Treynor ratio	Games-Howell
	Sharpe ratio	Games-Howell
	Sortino ratio	Bootstrap
	Information ratio	Games-Howell
50% Active share 8% Tracking error	Alpha	Games-Howell
	Treynor ratio	Games-Howell
	Sharpe ratio	Games-Howell
	Sortino ratio	Bootstrap
	Information ratio	Games-Howell
42.57% Active share 5.48% Tracking error	Alpha	Games-Howell
	Treynor ratio	Games-Howell
	Sharpe ratio	Bootstrap
	Sortino ratio	Games-Howell
	Information ratio	Games-Howell

APPENDIX K

Results for Hypothesis $H_{0(1)}$

This appendix presents the results for hypothesis $H_{0(1)}$ for all classification methods of the unit trusts, and is referred to in Section 5.2.1.2.

Table 1 Results for $H_{0(1)}$ unit trusts in comparison to their lowest active share index fund

Benchmark	Classification thresholds	Risk-adjusted return measure	$H_{0(1)}$
Lowest active share index fund	60% Active share 8% Tracking error	Alpha	Failed to reject
		Treynor ratio	Failed to reject
		Sharpe ratio	Failed to reject
		Sortino ratio	Failed to reject
		Information ratio	Failed to reject
	50% Active share 8% Tracking error	Alpha	Failed to reject
		Treynor ratio	Failed to reject
		Sharpe ratio	Failed to reject
		Sortino ratio	Failed to reject
		Information ratio	Failed to reject
	37.09% Active share 5.06% Tracking error	Alpha	Failed to reject
		Treynor ratio	Failed to reject
		Sharpe ratio	Failed to reject
		Sortino ratio	Failed to reject
		Information ratio	Failed to reject

Table 2 Results for $H_{0(1)}$ unit trusts in comparison to the JSE ALSI

Benchmark	Classification thresholds	Risk-adjusted return measure	$H_{0(1)}$
JSE ALSI	60% Active share 8% Tracking error	Alpha	Failed to reject
		Treynor ratio	Failed to reject
		Sharpe ratio	Failed to reject
		Sortino ratio	Failed to reject
		Information ratio	Failed to reject
	50% Active share 8% Tracking error	Alpha	Failed to reject
		Treynor ratio	Failed to reject
		Sharpe ratio	Failed to reject
		Sortino ratio	Failed to reject
		Information ratio	Failed to reject
	42.57% Active share 5.48% Tracking error	Alpha	Failed to reject
		Treynor ratio	Failed to reject
		Sharpe ratio	Failed to reject
		Sortino ratio	Failed to reject
		Information ratio	Failed to reject