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The Impact of Fund Size on the Risk Adjusted Performance of South African Unit Trust Funds.

A DISSERTATION SUBMITTED TO THE

DEPARTMENT OF ACCOUNTING

UNIVERSITY OF CAPE TOWN

IN FULFILLMENT

OF THE REQUIREMENTS FOR THE

MASTER OF BUSINESS SCIENCE

DEGREE IN

ACCOUNTING

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By

Warren T. Hibbert

11 November 2003

Acknowledgements and Declaration

I wish to thank Professor M. Wormald and Professor E. Uliana of the Department of Accounting, University of Cape Town, for their assistance on the research proposal and their patience in assisting with the research techniques. I would also like to thank I-NET Bridge and The Association of Unit Trusts for providing the data for this study.

I certify that, except as noted above, the report is my own work and all references used are accurately reported.

Signed by candidate

Warren T. Hibbert

13 November 2003

Synopsis

The South African unit trust industry has experienced exponential growth over the past two and a half decades and continues to grow – albeit at a relatively slower pace than it did during the mid nineteen nineties. The spate of generally disappointing and volatile results delivered by the unit trust industry, relative to the JSE ALSI 40 index over the past five and a half years, has resulted in many a detractor questioning the value added by the industry relative to the cost to the unit holders. There are critics who do not believe that the unit trust industry is actively managed – a service for which every unit trust investor is required to pay regardless of fund performance.

Active management, as the name implies, refers broadly to the process of 'actively' monitoring and calibrating the risk-return dynamic of each fund portfolio with the objective of consistently achieving above average, *relative*[*] risk adjusted returns. To this end, it is vital that fund managers take account of all elements that might influence the returns generated by unit trust funds. A variable that is not often associated with the return profile of a portfolio is that of asset size. It is the aim of this study to assess the extent to which fund size affects the performance of unit trust funds.

The primary objective of this study is to investigate the relationship between the sizes of South African unit trust funds, as measured by the market value of assets under management, and their respective risk adjusted returns. The study also seeks to determine the degree to which an identifiable range of asset sizes exists within which the risk adjusted fund returns are maximised.

The results of the regression and ranking analysis, performed on a sample of South African unit trust funds over a ten year period, revealed that no statistically significant evidence was found to suggest that a relationship exists between fund size and total or risk adjusted return. Following on from this

[*] Performance, as it applies to the unit trust industry, is measured relative to the market. Proxies for the market include all South African indices and in particular the JSE All Share Index (ALSI 40).

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there is no basis upon which to suggest that a range exists in which the return on a unit trust portfolio is maximised. These findings add impetus to the suggestion that the South African JSE Securities Exchange is efficient to the extent that fund managers are unable to earn excess returns by calibrating the size of the portfolios they manage.

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CHAPTER 1

1.1. Introduction

1.1.1. An Overview of the South African Unit Trust Industry

The unit trust industry came about as a result of a strong demand for a financial product that acted as a diversified long-term investment vehicle through which investors could curb the effects of inflation, effectively diversify their capital and gain access to the domestic capital markets. The idea originated in the United States where the term used is mutual funds as opposed to unit trust funds.

Unit trusts were originally introduced to South Africa, in 1964 by Messrs Louis Shill and Donald Gordon. The first domestic fund, in the form of the Sage Fund, was initially set up in June of 1965 with funds under management of R600 000. The industry has subsequently grown to 33 management companies and almost 300 unit trust funds, with a market capitalisation of approximately R130 billion at the end of December 1999. It is interesting to note that the proportion of assets invested in the unit trust industry relative to the total asset base of the JSE Securities Exchange is still very small, ranging from between 3% to 4%. In the United States the unit trust (mutual fund) industry makes up approximately 40% of the New York Stock Exchange.

Unit trusts are managed by unit trust management companies, that are incorporated under the Unit Trusts Control Act, 1981 ("UTCA"), as amended, and registered with the Financial Services Board ("FSB"). The Association of Unit Trusts ("AUT") is responsible for monitoring the unit trust industry - a self-regulatory body lacking official authority. The investment management activities

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are usually outsourced to registered investment management companies, that are registered with the FSB and governed by the Financial Markets Control Act ("FMCA") and Stock Exchanges Control Act ("SECA").

In most instances, broker-IFAs (independent financial advisors) recommend funds to investors, who then purchase fund shares either directly from the management company, from a bank or through a linked investment service provider (LISP - also known as investment consolidators or linked product factories).

1.1.2. The Fund Structures

In South Africa the following primary unit trust fund structures are common:

- Domestic funds: These are unit trusts that invest at least 85% of their assets in South African investment markets at all times.
- Worldwide funds: These are unit trusts that invest in both South African and foreign markets. A minimum of 15% of the assets must be held in South African markets at all times and usually between 15% and 50% is invested locally. A minimum of 15% of the assets should be held offshore.
- Foreign funds: These are unit trusts that invest at least 85% of their assets offshore.
- Regional funds: These are unit trusts that invest at least 85% of their assets in a single country or region, excluding South Africa.

Each of the above categories is further subcategorised into a second tier of classification, which acts to further define the investment style of a fund.

The following fund types represent the sub-categories of the above defined fund structures:

- Money market investment funds

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- Fixed Interest investment funds
- Equity investment unit trust funds
- Asset allocation fund-of-funds (mixed funds)
- Real estate investment funds
- Asset allocation wrap funds

(venture capital funds and all other investment fund types not mentioned above, including hedge funds, do not fall within the scope of the UTCA.)

South African unit trust funds are open-ended funds with the option to close (limit the size of the fund) relative to restrictions placed on their ability to invest in foreign markets. All funds have strictly controlled foreign investment restrictions in terms of the extent of assets they are permitted to hold abroad. These restrictions are imposed by the South African Reserve Bank in terms of existing exchange control regulations.

Following on from the investment style classifications detailed above, the most common styles of South African unit trust funds comprise the following:

1. Balanced Funds - invest in a wide spread of investments in the equity, capital, money and property markets in order to achieve long term capital and income growth. Many conform to pension fund investment regulations and are thus often suitable as retirement funding or income generating vehicles. Others aggressively manage their investments, shifting funds between the various markets in order to maximize investment growth.

2. General Equity Funds - have a medium risk profile and are invested in selected shares across all sectors of the stock exchange. These funds are usually heavily invested in equities, offering medium to long-term investment growth.

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3. Fixed Income Funds - invest primarily in long-term bonds and other stable income earning securities.

4. Index funds (Asset Allocation) - invest predominantly in a group of securities that mirror those securities that make up a specific index. The idea is to construct a fund that follows the performance of the index it is supposed to be tracking. These funds are typically passively managed, striving to replicate the stock exchange's performance.

5. International funds - attempt to benefit from foreign earnings by compounding returns through fluctuations in the exchange rate. Up to 10% of these funds can be invested offshore through asset swaps. The remainder of the funds is predominantly invested in local companies whose revenues are generated primarily offshore.

1.1.3. Associated Costs

Typically the service charge, paid to the management company, covers the vast majority of expenses paid for by South African funds. The management company service charge covers portfolio management, as well as all costs incurred by the management company in administering the fund, such as, accounting, pricing, investment management and administration, trustee/custodian expenses and marketing costs. Certain functions may be outsourced, in which case the management company will recover the cost of outsourcing in its management service charge. The management company service charge is paid from the accrued income in the fund.[1]

[1] "Income accruals" are defined as any dividend, interest, or other income for distribution received by or accrued to the fund or its trustee or management company on behalf of its shareholders for that accounting period together with any amounts carried forward from any previous accounting period as not having been distributed.

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The following costs are borne by the investor investing in a unit trust investment vehicle and cover additional costs incurred by the unit trust funds and management companies:

- Initial charges are a portion of the selling price of the unit that represents the management company's charges in respect of expenditure incurred and work performed by it regarding the formation and marketing of each unit. Prior to deregulation this was limited to a maximum of 5% (excl VAT). Of this generally 3% would cover commissions and the remainder marketing and distribution costs. Money market funds tend to bear charges of about 1.11% and are usually sold on a no load basis (no initial fee).

- Brokers' Commission is the sum paid to the brokers by the unit trust managers on behalf of their clients. This fee is generally levied at approximately 2% of the sum invested.

- Compulsory charges include any fiscal charge in connection with the creation and issue of units and any charge payable in connection with the acquisition and disposal of the underlying securities included or to be included in the portfolio. These charges include marketable securities tax (levied at 0.25%), stamp duty, VAT and a negotiable brokerage fee.

1.1.4. The Efficient Market Hypothesis

An efficient capital market is one in which the price of a security (in this case unit trust) fully reflects all information publicly available regarding that security, including its risk profile. In an efficient market, the competitive behavior of a large group of market participants should cause rapid price adjustments in response to any information released. The price of a security should reflect investors' current estimates of the investment's value, including the risk of owning the security. If this theory does not hold, excess returns may be possible.

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A seminal study by Eugene Fama (1977) divided the efficient market hypothesis (EMH) into three categories.

1. The Weak-Form EMH assumes that the security price fully reflects all available *historical* security market information. Hence all historical information will have no relationship with the future direction of security prices. If this form of the EMH holds, investors will not be able to achieve excess returns using technical analysis.

2. The Semi strong-Form EMH asserts that security prices adjust rapidly to the release of all *publicly* available information. This form of the EMH suggests that all public market and non-market information is discounted into the price of the security. If the semi strong-form EMH holds, investors cannot achieve excess returns using fundamental analysis.

3. The Strong-Form EMH asserts that security prices fully reflect all market and non-market information from public and private sources. This assumes that no investors have monopolistic access to information relevant to the pricing of securities. This form of the EMH implies that all information is free and available to all investors simultaneously.

The fund management industry's primary objective is to maximise the returns on the assets under management through actively monitoring and adjusting the composition of the funds relative to changing market conditions. In an efficient market, however, unit trusts should earn returns in direct relation to their respective risk profiles – per the efficient market principle discussed above. In relation to this study and as per the findings of the study by Droms and Walker (1996), for the efficient market hypothesis to hold true, it is expected that the alpha values for the funds in general should not be significantly different from

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zero, indicating that the risk-return profile, for the average South African unit trust fund is linear with a slope (beta) of +1.

1.1.5. The Effect of Transaction Costs on the Efficiency of the Market

Reilly and Brown (2000) identified four groups of investors who are expected to be able to outperform the market or who claim to be able to do so.

1. **Corporate Insider Trader**. Securities Exchange Commission (SEC) insider trading filings in the United States of America indicate that insider traders have historically earned above average returns.

2. **Stock Exchange Specialists**. Reilly and Brown's findings indicate that stock exchange specialists have monopolistic access to information in the limit order book and that they are able to generate above average returns from this information.

3. **Security Analysis**. The question here is whether the advice of analysts leads to excess returns. Reilly and Brown concluded that after consideration of transaction costs, abnormal returns were not achievable.

4. **Professional Money Managers**. Reilly and Brown indicate that American unit trust funds in the pension plans and endowment funds are not able to match the performance of a simple buy-and-hold strategy after transaction costs.

In keeping with the above findings, it would be logical to assume that the magnitude of a fund's expense ratio should be indirectly proportional to the risk-adjusted returns earned on the fund assets.

The local industry experienced dramatic growth between 1994 and 1999. This trend is set to continue into the future in line with the continued growth of capital

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markets in general. The South African financial market in particular exhibits strong potential for growth as the infrastructure and policies align themselves with international best practices. During the period under analysis, returns from the South African equity market have, however, been subjected to periods of significant volatility, particularly over the past five years, with dramatic swings in September/October of 1997, 1998 and 1999. This resulted in reciprocal high volatility in the unit trust funds' market capitalisations and extent of funds invested.

When the size and return data sets are graphed over the 5 year period from March 1995 to December 1999, the results clearly show the significant increases in volatility experienced in the 1997, 1998 and 1999 calender years. It is interesting to note that whilst the extent of assets under management tends to mirror the mean return during the most volatile years, the mean fund value is not as affected by market volatility as fund return (see figure 1.1 below).

The stability of the unit trust fund size, relative to return, can be partly ascribed to the premise that investors are unlikely to sell or purchase additional units until such time as their portfolios show a gain relative to initial cost. Hence, the extent of investment in unit trusts remains stable despite the fact that the returns on the funds may fluctuate.

The volatility of the fund return, relative to size, can be attributed to the fact that the largest funds within the industry between 1995 and 1999 were industrial and general equity funds that demonstrated relatively stable returns whereas the medium-to-smaller funds tended to be less diversified attracting more volatile returns over the same period.

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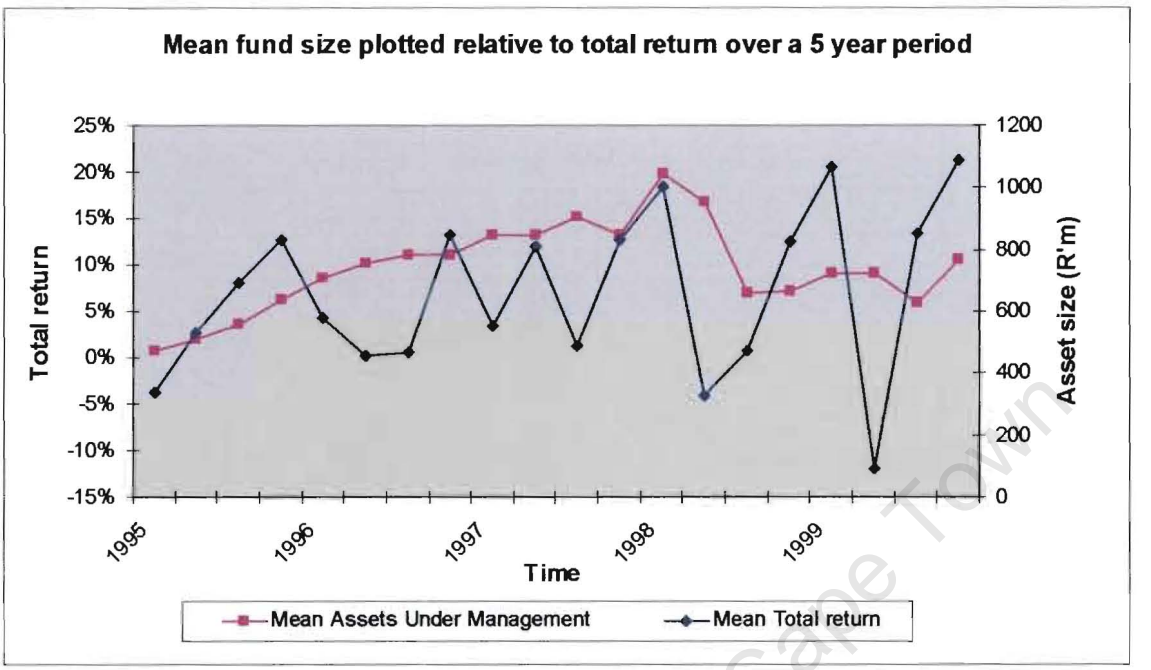

*Figure 1.1: **Mean fund size plotted relative to total return over a 5-year period***

*Figure 1.2: **Mean fund size plotted relative to total return over a 10-year period***

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When an identical analysis is performed over a ten-year period from March 1990 to December 1999, the observation made using the 5-year data is repeated.
It can be seen from figure 1.2 above that the effects of the market crashes experienced in October of 1997, 1998 and 1999, did not translate into comparable volatility in the value of the unit trust funds. These observations indicate that South African unit trust investors tend to adopt a passive rather than an active approach to the management of their savings.

In an effort to maximise the efficiency of their products and limit the effects of market volatility on returns, investment management companies are continually looking for new and innovative products in which to house and or re-engineer portfolio investments, matching respective investors' needs and risk profiles to various new investment types.

1.2. The Research Problem

At the core of the unit trust industry there exists a potential conflict between unit trust fund managers and their investors. Investors seek the best possible returns relative to their individual risk profiles, while it is argued that fund managers' (management companies) primary motivation is to maximise assets under management in order to maximise the management fees earned. For managers, a substantial asset base often translates into big profits, given that fees are charged based on capital invested - not on absolute returns generated, as in the hedge fund industry for example. This scenario signals, at best, merely a lack of investor-manager goal alignment in cases where the relationship between assets under management and investment performance is positive – the more adverse scenario exists where a negative relationship exists between asset size and investment performance. It is an aspect of the later scenario that this study seeks to investigate.

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The rationale for a relationship between fund size and performance is that as a fund performs well, so the extent of capital inflows rises and hence the fund's asset size grows. Furthermore, there is an argument that suggests that there is an optimal fund size[2] 'range' above which the marginal trading costs of the fund begin to increase relative to the returns generated by the fund. The logic to this argument is based upon the suggestion that a fall in the performance of large funds is as a result of a lack of fund liquidity and hence mobility in the market. This second argument is inconsistent with the theory of an efficient market.

This thesis explores the argument that a relationship between fund size and return exists in a South African context. In addition the study investigates the argument that absolute expenses incurred by the industry are related to fund size.

1.3. Objective

The primary objective of this study is to investigate the relationship between the sizes of South African unit trust funds, as measured by the market value of assets under management, and their respective risk-adjusted returns.

The secondary objective is to investigate the relationship between trading costs and the size of assets under management in order to assess the extent to which economies of scale exist in the South African unit trust industry.

In addition to the core objectives, this study seeks to assess the extent to which an 'optimal' asset size exists within which fund returns are maximised.

[2] As measured by assets under management.

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1.3.1 Hypotheses

This study tests the following hypotheses:

1. H_0^1: There exists a statistically significant relationship between the performance of unit trust funds in South Africa and the size of assets under management.
2. H_1^1: There exists no statistically significant relationship between the performance of unit trust funds in South Africa and the size of assets under management.
3. H_0^2: There exists a statistically significant relationship between the size of unit trust funds in South Africa and the transaction costs incurred by the funds.
4. H_1^2: There exists no statistically significant relationship between the size of unit trust funds in South Africa and the transaction costs incurred by the funds.

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CHAPTER 2

2.1. Literature Review

A finding that concludes a direct association between fund size and fund returns would add significant value to the investment strategies of fund managers in a capital market such as the JSE Securities Exchange. To date, there has been limited research done on South African unit trust performance. It appears that the majority of studies have been carried out using data from the North American unit trust market.

Bradfield (1999) investigated the extent to which fund size restricts the potential for the fund manager to take on risk – to be aggressive in their stock selection. He argues that given the size and relative illiquidity of our local market, large funds may be forced to invest a greater portion of their funds in the larger, institutional stocks – there being too few smaller stocks available with which to diversify their portfolio.

It is argued that this restriction in turn impacts their ability to develop portfolios that deviate significantly from a benchmark fund and hence their ability to be aggressive in this market is limited. Bradfield focuses on the General Equity category of the unit trust market over a 4-year period (between 1996 and 1999). His study found that over the four-year period, no evidence could be found of a statistically significant relationship between fund performance and size, in the General Equity sector of the South African unit trust industry. Interestingly, his study also revealed that the smallest 25% of funds analysed had the worst monthly returns over the four-year period. This finding suggests a possible

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correlation between fund size and risk-adjusted returns at the lower end of the asset size scale.

In his study Bradfield makes reference to the study by Chen, Lee, Rahman and Chan (1992). As part of their study, Chen et al analyse the determinants of fund performance. They found that larger funds performed better than smaller funds, all things being equal. Their study also found that on aggregate, fund managers were able to generate sufficient returns to cover the transactions costs and overheads incurred in trading – in other words, that a positive relationship exists between returns earned and transaction costs incurred. The effects of transaction costs on returns, relative to the size of funds, are discussed later in this chapter.

A further study on the topic of unit trust performance relative to fund size was produced by Indro, Jiang, Hu and Lee (1999) based on data from the United States unit trust industry. Indro et al suggest that research and transaction costs do not capture all of the trading costs inherent in an active management strategy and hence they investigated the effect of fund size on performance. The prime example, used in their study, of a fund that became too large to service its investors' interests, was the Fidelity Magellan Fund, which closed for new subscriptions on 30th September 1997.

Indro, Jiang, Hu and Lee (1999) concluded that during the period 1993 to 1995, of the 683 non-indexed US Dollar funds included in their study, 20% were smaller than the determined "break-even" fund size and 10% of the largest funds were over-invested in information acquisition and trading. Their findings are relevant to this study to the extent that a fund size range was identified in which the returns over the 683 funds were maximised on an aggregate basis.

In his analysis of the "characteristics of winning mutual funds", Isrealson (1998) found that larger funds (those funds with asset sizes above the average for the industry) have a higher mean return than those below the average fund size

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calculated. Whilst a parallel cannot necessarily be drawn between Isrealson's study and that of Indro et al, Isrealson's findings suggest that if an 'optimal' size range exists, it is likely to be skewed towards the upper end of the fund size scale.

Williamson (1999) found that, based on research done by the Financial Research Corporation (F.R.C.) in the United States, for the 10 years ended 30th September 1999, 25% of the smallest US domestic equity funds outperformed their fund category averages 87% of the time. However, during the same period the largest 25% of the equity funds beat their fund category averages only 48% of the time.

The F.R.C. isolated the 10 largest domestic equity funds (determined by market value of assets under management) as at September 30th 1998 and compared their mean return over the previous 11 years with the returns of the S&P500 over the same period. On average the group outperformed the S&P500 for the first 6 years but as assets under management increased in 1995, these 10 funds began to under-perform the index.

A cycle was identified whereby a track record of substantial out-performance by a fund led to a flood of new money into a fund (purchases), which, in turn, resulted in a decline in the performance of the fund in the following year. The explanation offered for this being that as a fund's asset size increases, so the ability of the asset manager/portfolio manager to alter the individual weighting of the fund's holdings (in keeping with the funds' respective mandates) becomes more and more constrained.

Williamson attributes her findings to the additional investment flexibility a relatively small portfolio affords the investment manager. This additional flexibility facilitates easier construction and liquidation of portfolio positions with minimal affect on the price of the security. This in turn supports the theory that marginal

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fund size and return become negatively correlated once a fund's assets under management reach a particular size. Fund liquidity is discussed in more detail below.

In addition to Indro et al and Williamson, Droms and Walker (1996) also studied the multivariate relationship between investment performance and size. Their analysis includes data over a twenty-year period (January 1980 to December 1999). Droms et al suggest in their introduction that investment performance is negatively related to asset size. Their findings, however, indicate that returns (as measured by total return, the Treynor and the Sharpe indices) are not related to fund size. Furthermore, their findings revealed that, in the context of the Capital Asset Pricing Model, excess rates of return are generally not attainable from investing in a broad cross-section of unit trust funds. This suggests that the 151 unit trust funds analysed by Droms and Walker earned returns in accordance with their respective risk profiles. With regard to the discussion in the previous chapter, on the Efficient Market Hypothesis, this latter finding would suggest that the unit trusts behaved as efficient investments over the period of analysis.

A popular theory that has been postulated regarding the relationship between fund size and risk-adjusted return is as follows. As a fund's asset size grows, so the asset managers are forced to execute larger tranche transactions, relative to the rest of the market. To this end, it becomes more and more difficult for the trader(s) to find buyers and/or sellers of the respective securities on the other side of the transaction, within the defined time frame and price range. These incidences of poor liquidity will push up the total trading costs as fund managers find it increasingly difficult to fill their investment strategies at their predefined price levels.

A counter argument states that there exists an incentive for active management to invest heavily in research and trade vigorously on their expertise in the market, causing the economic gains achieved using such information to outweigh the

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costs of research and trading (Grosman and Stiglitz 1980). This argument, albeit in opposition to the Efficient Market Hypothesis (EMH) supports the suggestion that, all things being equal, larger unit trust funds are able to minimise transaction and research costs relative to returns by leveraging off their stronger capital and expertise bases. In other words, on an aggregate basis large funds are able to afford greater levels of expertise and research, and hence generate better returns than other smaller counterparts per unit of cost.

Studies that have focused on the relationships between risk-adjusted fund returns and the costs of research and trading (expense ratio), associated with active management, have produced mixed results. Sharpe (1966) observed that funds with higher reward-to-volatility (return-to-risk) ratios tend to be those with lower expense ratios. Friend, Blume and Crockett (1970) found a statistically insignificant negative correlation between risk-adjusted fund returns and expense ratios – this substantiated Sharpe's findings. Friend et al also found a weak relationship existed between risk-adjusted returns and turnover. In contrast, Ippolito (1989) concluded that risk-adjusted fund returns are *unrelated* to expense ratios and turnover. None of these studies, however, investigated the effects of fund size on the performance of the fund although an argument exists suggesting that fund size is related to fund performance and the expense ratio. It was suggested by Perold and Saloman (1991) that the ability to add value through active management is a function of the degree of assets under management in addition to the effects of economies of scale associated with the costs of researching and trading on information.

The potential effect of economies of scale on the returns of a fund can be summarized as follows. Growth in the size of net assets under management initially provides cost advantages because *marginal* costs per transaction decrease. This occurs as a result of the fixed nature of primary costs such as the cost of access to data, research services, and general administration expenses.

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On the basis of this argument, it is reasonable to infer that there are potentially points on either end of the fund size spectrum at which the marginal returns fall as a result of diseconomies of scale caused by both cost disadvantages and a lack of fund liquidity. The lack of fund liquidity is caused inherently by the size of the South African equity market where there is typically a constraining effect on the amount of stock available (Bradfield, 1999) and in particular by the limited number of matching open large-tranche trades. Given the lack of a significant number of counterparties who are willing to fill these large tranche transactions, inevitably the expected transaction prices are not achieved to the detriment of the respective funds' returns.

Possible reasons for the large funds finding it difficult to sell and acquire securities in a predefined price range has been researched by Loeb (1983). Loeb argues that, in addition to the expected risk-adjusted returns, an equity strategy should be based upon the liquidity of the trade and size of the commitment required to implement the strategy. Loeb found that the size of the bid-offer spread (arguably the largest component of transaction cost) is proportional to the trade block[3] size due to informational asymmetry between market participants. The sheer size of a large fund makes it an obvious target for attention, resulting in a curtailment of the manager's ability to trade freely without signaling his intentions to the market. This phenomenon is commonly known as 'Market Herd Mentality'.

With an ever-increasing fund size, a fund manager is also more likely to engage in strategies or invest in assets beyond the bounds of the respective funds' mandated constraints. An example of this is where a large index fund is unable to invest further assets in a particular stock due to there being insufficient scrip available on the open market. This in turn restricts the manager's ability to balance his fund relative to the respective index weights. Through being induced to invest additional funds beyond the index weighting equilibrium, the fund

[3] Single tranche of securities purchased.

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manager changes the risk profile and expected returns of the fund relative to the original mandate.

A study by Manakyan and Liano (1997) examines the decisions to close funds to new investors. Their findings suggest that funds that subsequently close, out perform the control funds during the 1 to 3 year periods *prior* to closing but that there is no significant difference in the performance of closed funds and the control funds *after* closing. Their hypothesis is that funds that close because they have reached a critical size threshold should, at the very least, be able to maintain performance after the decision to close. They also add, "there seems to be no consistency regarding the extent to which a large fund is permitted to grow prior to closing". If the hypothesis that a positive relationship between fund performance and size up to a point of maximum returns holds true, a possible support for Manakyan and Liano's findings may be that the funds under analysis were closed at levels above their "optimum"[4] fund size. This would suggest that fund managers might be setting incorrect levels at which to cap their portfolio sizes before closing respective funds.

"Theory suggests that a fund's size will have a positive causal effect on its relative ranking among its peer group. Large funds should experience greater economies of scale than small funds. Once a fund's critical mass is large enough to be effectively managed, the incremental resources required to manage a greater asset base should result in a decline in the funds returns" (Walker, 1997). In this case, Walker's reference to incremental resources includes the likes of additional staff, research materials, and costs of additional applications required to manage the larger asset base.

Walker's study (1997) concluded that the size of assets under management was not a significant factor in the performance of US mutual funds and that the best investment approach is to identify those funds that charge low fees and are well

[4] The point at which the fund begins to experience negative marginal returns on assets under management

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diversified. Their returns may vary relative to their peers but their costs will consistently be lower and this compounded effect will lead to a maximization of real returns. However, to this end it is worth noting that funds that are able to charge lower fees as a result of economies of scale would logically be funds with larger asset bases that are able to generate greater fee revenue per Rand invested in research and transaction costs.

An interesting unpublished study conducted by Undiscovered Managers LLC, on the American market, examined the performance of domestic small-cap mutual funds from the beginning of 1993 until the end of 1997 using data supplied by Morningstar. Results indicated that once the assets under management of small-cap funds increased beyond $800 million in asset size, they suffered a substantial decline in performance relative to the levels of their risk. In this case, however, it is important to realise that in most cases, small-cap securities are less liquid than medium to large cap investments resulting in greater switching costs within the fund, as discussed above per the findings of Loeb (1983). The study also concluded that management companies with large funds consisting of small capitalisation equities tended to exhaust further investment opportunities within the scope of their current investment mandates. This is as a result of the limited availability of attractive, small cap investment opportunities (relative to mid to large cap investments).

The study by Undiscovered Managers would suggest that unit trust management companies should limit their fund sizes relative to the extent that the funds are invested in relatively illiquid stocks. The suggestion made in Loeb's study, discussed above, is similar but goes further to infer that whilst a stock may be liquid, the trade being executed may be too large to be executed in the time frame allowed. Where the liquidity of a trade is limited, so too is the potential for the fund manager to maximise returns.

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This chapter has focused on prior studies concerning relationships between risk-adjusted return, fund size and transaction costs. Other particular studies that investigate relevant market anomalies regarding fund performance in the unit trust industry have also been identified. These are investigated to the extent that a relationship between risk-adjusted returns and fund size may add insight into their findings.

In summary, the findings of previous studies put forward conflicting results concerning the relationship between fund size and risk-adjusted return. Only two of these studies (Indro et al, 1999; Williamson, 1999) have attempted to define a fund size range in which returns from unit trusts might be maximised. Both studies have suggested that the funds at the lower and higher ends of the asset size scale exhibit weaker risk-adjusted returns relative to other funds analysed. The other studies analysed in this chapter analyse various factors, primarily fund liquidity and transaction cost that effect risk-adjusted returns. These studies are relevant to the extent that the factors they use to explain risk-adjusted returns are associated with fund size. These latter studies have been included so as to address the extent to which their respective findings may provide further insight into the relationship between risk-adjusted return and fund size.

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CHAPTER 3

3.1. Methodology and Analysis

As stated in the first chapter, the primary aim of this study is to investigate the hypothesis that there exists a relationship between the risk-adjusted performance of unit trust funds and the size of assets under management. In keeping with the methodologies applied by previous studies, regression analysis has been used to determine the extent to which a relationship exists between the various dependant and independent variables. The dependant variables include the total quarterly returns of each fund, the quarterly Alpha measures and Treynor and Sharpe indices in addition to the expense ratio calculated on a quarterly basis. The independent variable, against which the dependant variables are regressed, is the size of each fund recorded on a quarterly basis.

The initial approach taken was to regress the dependant against the independent variables in order to observe and document any statistically significant relationships that exist between the respective parameters for each defined period. The second analysis performed was to rank the average size of each fund relative to the sizes of the other funds in the population and compare the dependant return variables generated relative to each funds' size rankings. This ranking analysis was used as a basis for assessing the extent to which a range could be identified within which the fund returns were maximized on an aggregate basis.

The periods chosen over which to analyse the data are 5 and 10 years for the regression analysis and ranking analysis respectively. The 5-year period was included for the purpose of judging what effect, if any, the relatively high growth

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in the number of unit trust funds over this period has had on the industry – particularly with reference to the results obtained from the 10 year period. The five-year period is also relevant given the increase in capital market volatility experienced over this time. 32 equity unit trust funds were included over the five-year and 14 over the ten-year period.

Droms and Walker (1994) made extensive use of the cross-sectional, time series estimation approach. According to the study by Droms et al, this approach has been widely applied to international mutual fund performance analysis. This study has employed a cross-sectional time series approach in the analysis of the available data in order to facilitate comparability between respective previous studies.

The cross-sectional, time series estimation approach is advantageous in that the parameter estimates are not specific to one fund or group of funds. Similarly, the parameters used in this study are common characteristics of all funds in the population and are applicable in each of the respective time ranges.

Another advantage of applying a time series approach is that the statistical tests are particularly thorough when it comes to identifying a significant relationship between the variables. To accept the hypothesis that a coefficient is statistically different from zero, the impact of the independent variable must be considerable. This is especially relevant since the variables in this case are being tested over a lengthy period of time and originate from a heterogeneous group of funds using a high frequency of observations. As with any analysis of this nature, it is important for all data to be tested for serial correlation. This has been achieved by running Durbin-Watson tests for serial correlation on the data sets of each fund.

The risk measures used to analyse the data in this study have been used successfully in previous[5] evaluations of emerging market unit trust funds. In order

[5] Huang and Satchell 1998; Manakyan and Liano, 1997; Droms & Walker, 1996; M. Veitch, 1990

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that the findings of past research remain comparable to the findings of this study, the nominal and risk-adjusted return variables including total return, Jensen's Alpha, the Sharpe index and the Treynor index have been used.

Jensen's Alpha measures the deviation of a portfolio from the securities market line. Fabozzi, Francis and Lee (1980) show that the Jensen performance measure is robust when returns are measured monthly and it is not influenced by bull and bear markets. This will be of use when controlling for the effects of the sizeable market fluctuations experienced during the periods 1997 to 1999.

Jensen's Alpha is based on the Capital Asset Pricing Model. The alpha (α) variable in the equation depicted below indicates whether the portfolio manager is superior or inferior with respect to market timing and/or stock selection. A superior manager would yield a positive α value. The α represents the extent to which the fund's returns are attributable to the portfolio manager's ability to generate above-average risk-adjusted returns. The return premium is calculated based on beta (systematic risk) and hence this measure does not take into account the fund manager's ability to diversify the portfolio. The alpha measure is derived from the CAPM model as follows:

CAPM: $\mathbf{R_i = RFR + \beta_i (R_p)}$

Therefore $\mathbf{R_i - RFR = \beta_i (R_p)}$

Where:

$\mathbf{R_i}$ = the return on an asset adjusted for systematic risk

RFR = the risk-free rate of return

$\mathbf{\beta_i}$ = the systematic risk specific to the asset

$\mathbf{R_p}$ = the excess return relative to the risk free rate of return

The above linear equation, where the dependant variable is (R_i – RFR), does not have a constant where all assets and portfolios are in equilibrium. However, if

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superior portfolio managers are able to consistently earn positive, above average returns, this factor should be incorporated into the above model as a non-zero coefficient such that the equation becomes:

$$R_i - RFR = \alpha_i + B_i (R_p)$$

Therefore $\alpha_i = R_i - RFR - B_i (R_p)$

Figure 3.1: Alpha performance measure

A comparison of unit trust performances is usually based on the nominal rate of return generated in the individual unit trusts over a specific period (see fig 3.2). This rate of return includes capital appreciation of the value of the unit trust portfolios on a quarterly basis. The total return has been widely used in past studies on the subject of unit trust performance and is used in this study in tandem with the Alpha, Sharpe and Treynor risk-adjusted return measures.

$$\text{Return} = \frac{\text{(clean offer price at weekend – clean offer price at previous weekend)}}{\text{Clean offer price at previous weekend}}$$

Figure 3.2: Nominal return

Droms et al used three measures of annual total return in their regression model - unadjusted total return, the Sharpe index and the Treynor index. The Sharpe portfolio performance measure followed Sharpe's earlier work on the capital asset pricing model (CAPM). The measure is defined as:

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

Figure 3.3: Sharpe ratio performance measure

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Where:

$\mathbf{R_i}$ = the return on an asset adjusted for systematic risk

RFR = the risk-free rate of return

σ_i = the total risk or standard deviation specific to the asset

This ratio acts to assess the return premium earned per unit of *total* risk. The equation is similar to that used by Treynor but differs to the extent that it adjusts for the standard deviation (total risk) of the portfolio rather than only the systematic risk in the form of beta. The Sharpe measure evaluates the fund manager relative to both the rate of return as well as the fund diversification. The Sharpe index is viewed, on the whole, as a more stable indicator of risk-adjusted return than Treynor given the greater stability associated with the measurement of standard deviation relative to beta. As stated earlier, Micropal and JP Morgan who have tested the stability of fund betas and believe the data supplied to be of a consistent and stable nature have supplied the betas used in this fund.

The Treynor index indicates the fund's return premium per unit of systematic risk – a risk averse fund would strive to maximize this value. As in the Capital Asset Pricing Model (CAPM), the Treynor index assumes a fully diversified portfolio thereby implying that beta is the only relevant risk variable. Beta is defined as the systematic risk associated with each portfolio of assets. The CAPM equation detailed above is the basis upon which the Treynor index is calculated.

Using the CAPM equation as a basis, the Treynor equation can be constructed to solve for the unit of return premium per unit of systematic risk. The Treynor equation is depicted below.

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

Figure 3.4: Treynor composite performance measure

The risk free rate of return used in the equations above to calculate the respective risk-adjusted returns is based upon the rate offered on government issued debt that is generally used as a proxy for 'risk free' financing. Up to 30 April 1993 the rate used was the discount rate on treasury bills. Thereafter the accommodation for overnight loans against collateral of treasury bills, short-term government stock, land bank bills or reserve bank bills with an outstanding maturity of less than 92 days was used. This rate is commonly referred to as the Repo rate[6].

The Sharpe, Treynor indices as well as Alpha ratios, which allow the user to adjust fund returns for different risk elements (systematic vs. total), have been chosen due to the fact that they have been extensively used in numerous studies of asset performance and thus enhance the comparability of the results of this study.

3.2. Statistical Methodology Overview

3.2.1. Regression Analysis

The linear regression equation $y = a + \beta x$ describes the relationship between a dependent and independent (explanatory) variable. This linear relationship is plotted such that it represents a best-fit line between the data points. A regression analysis is practical to the extent that a significant correlation is identified.

[6] See Appendix 5 - Quarterly CPI and Treasury Bill Data

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The coefficient of determination (R^2) measures the proportion of the total variability of the dependant variable (risk-adjusted return) that is "explained" by the regression line. For example, in the context of this study, if the coefficient of determination is 0.57 - it means that 57% of the variation in risk-adjusted return is explained by the variation in the independent variable – size of assets under management. The R^2 is only relevant, however, to the extent that the t-statistic indicates that it is significantly different from zero at the 95% confidence level (where $t > 2$ for the ten-year and $t > 2.1$ for the five-year tests).

The Durbin-Watson statistic has been calculated for each period and each fund under analysis to determine the extent to which the data exhibit serial correlation. Serial correlation exists where the Durbin-Watson statistic is significantly greater than 2.

The probability that the null hypothesis (i.e. that the coefficient value is equal to zero) is true has also been measured in the regression analysis on a quarterly basis per fund. Where the probability is less than 0.05 the null hypothesis can be rejected at the 95% level of confidence.

In addition to the above elements of the regression analysis, the Beta coefficients were measured and included in the analysis. The Beta coefficient measures the slope of the linear equation. The slope indicates the movement of the dependant variable relative to the independent variable. If the slope is not significantly different from zero there is little if any statistical relationship between the two variables.

The regression analysis was conducted as follows. Firstly, risk-adjusted (Alpha, Sharpe and Treynor) and total returns were regressed against the size of assets under management on a quarterly basis. These initial results gave an indication of the extent to which the asset size of each fund, per quarter, was able to

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explain the movements in the respective return measures. These results also gave an indication of the respective asset managers' abilities in terms of fund diversification relative to return maximization.

Secondly, the mean expense ratios of each fund in existence during the 1995-1999 period were regressed against the mean return variables for each fund over the same period. The objective here was to assess the extent to which economies of scale could be observed.

"The Expense Ratio is defined by the costs incurred by uninformed investors for investment management to become informed" (Indro, Jiang, Hu and Lee, 1999). The expense ratio reflects the transaction costs associated with research and trading information. The expense ratio is the sum of all costs incurred in the operation of a unit trust fund divided by the size of the fund. This measure was calculated on a quarterly basis using data from the respective funds' annual financial statements in addition to data supplied by I-Net Bridge. The costs were apportioned on an equal basis between quarters for each financial year.

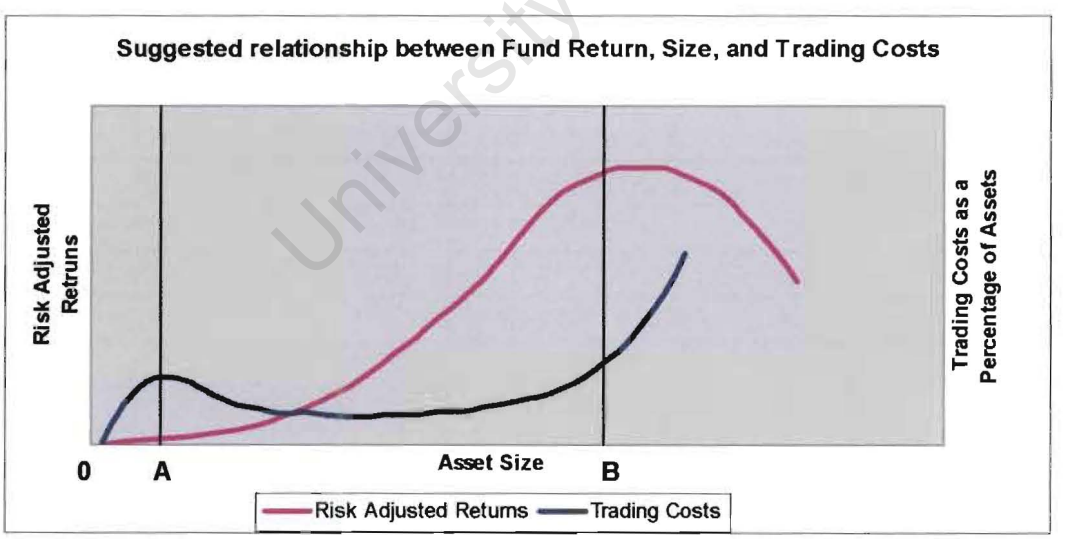

Figure 3.5: Projected relationship between Fund Return, Size and Trading Costs

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Figure 3.5 above graphically depicts the projected relationship between risk-adjusted returns, trading costs and asset size. It is anticipated that if transaction costs were to be measured relative to size, economies of scale would be observed. A typical economies of scale relationship has been plotted for the relationship between transaction cost and fund size. Initially the costs/fund size ratio increases rapidly as the fund grows. Between a fund size of zero and point A, fixed costs are high relative to assets under management. At point A the costs incurred per rand invested begin to fall as cost efficiencies are realised. At point B the fund reaches a particular size where the marginal costs incurred per rand invested increase due to the fund's inability to adjust to market movements timeously and cost effectively. In order to prove the validity of this illustration it would have to be proved that a significant relationship exists between trading costs incurred and fund size.

The projected plot of risk-adjusted returns against fund size (figure 3.5) reflects a direct relationship between the two variables from a fund size of zero to point B. For fund sizes greater than B, the fund's respective positions in the equity market become so large that the fund manager is unable to unwind and enter into positions as efficiently as the manager of a smaller fund and hence is unable to maximize return per rand invested. By the same token, this argument requires that there exist a statistically significant relationship between fund size and risk-adjusted return in order for it to be valid.

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3.2.2. Ranking Analysis

The next stage in the methodology is to sort all the funds into equal groups relative to their rank based on size of assets under management. Each dependent variable is then grouped in the same group relative to the *asset size* ranking. Based on this analysis, it is possible to observe any discernable patterns that may exist in the data group, with reference to the hypothesis that a size range exists in which fund returns are maximised.

The above analysis ignores the suggestion that the efficiency of active management may not be constant for all fund sizes. Because of size differences, the contribution of active management to various funds returns may differ even though the costs of information acquisition and trading may be the same. The topic of management styles and the impact of fund size upon this variable are dealt with extensively by Bradfield (1999). The consistency of the investment style was also looked at by Bradfield to determine whether the consistency of the fund manager's investment style affected the results obtained.

3.2.3. Comparative Analysis

An analysis was performed where each fund's size was compared to the average size for the population on a quarterly basis, over both the five and ten-year periods. A mean quarterly total return was then calculated based upon only those funds whose asset sizes were larger than the population mean. This average quarterly total return was then compared with quarterly inflation as measured by the Consumer Price Index (CPI). An identical test was performed using the Sharpe index as a measure of risk-adjusted return. The Sharpe index for all the above average sized funds was compared the to the average Sharpe index across all the funds in the population.

It was found that the funds with above average asset sizes exhibited inflation beating total returns 55% of the time over a ten-year period. When the total return variable was substituted for the Sharpe index, it was found that the larger-than-average funds beat the risk-adjusted return of the total population of funds 63% of the time.

Over the five year period, the funds with above average asset sizes exhibited inflation beating total returns 60% of the time and the respective Sharpe indices

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for the identical group of funds beat the average for all the funds in the group 65% of the time.

The above analyses were performed for the purpose of examining whether a relationship might be suggested at a broad level. From this analysis, it is evident that the larger funds appear to out-perform the smaller funds. This analysis does not indicate whether or not a statistically significant relationship exists between the variables.

Droms et al found that for every year in their analysis of American unit trusts, the standard deviation of total assets was at least 135% of the mean. In this South African study, over the ten-year period, the standard deviation of total assets was found to be 180% of the mean. This finding suggests the existence of a few super-sized funds with the majority consisting of small to medium sized funds. This result is consistent with other market compositions around the world.

The distinct spreads, observed in the graph below, between the mean, standard deviation and the median for South African funds over a ten year period from 1 January 1990 to 31 December 1999 further highlight the existence of 'super-size' funds relative to the medium to small sized funds as discussed above. The graph below (fig 2.1) also depicts the fall in portfolio values as a result of the significant market collapses and intense volatility experienced particularly during the third quarters of 1998 and 1999.

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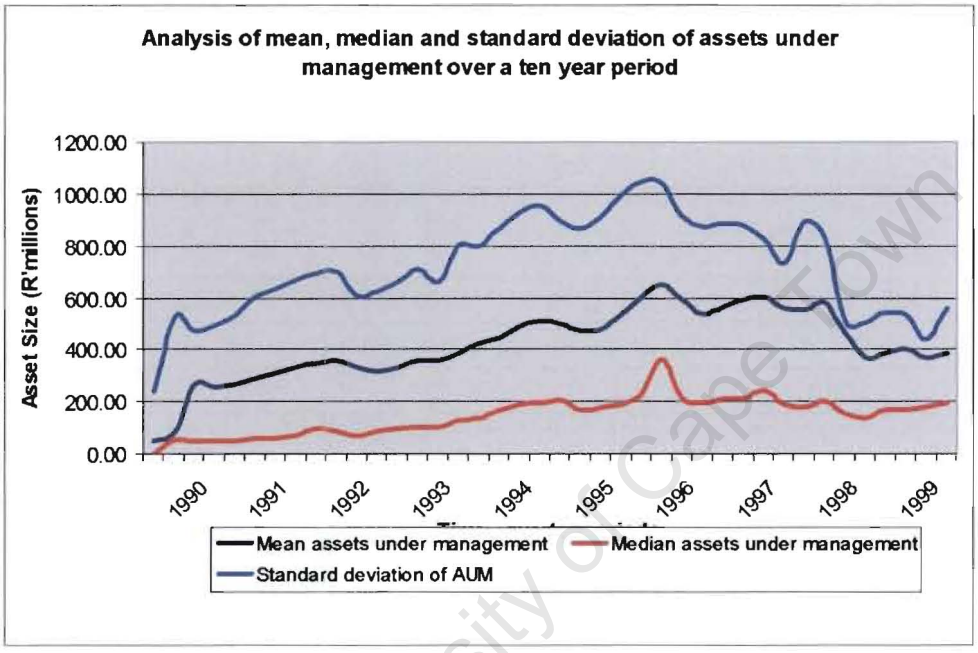

Figure 3.6: Analysis of mean, median and standard deviation of assets under management over a ten-year period

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In addition to the volatility experienced in the 1998 and 1999 calendar years, significant growth in the number of unit trust funds and fund sizes has contributed to the overall degree of fluctuation in the fundamentals underlying this industry.

3.3. Survivorship Bias

As with all studies concerning data sets, there is potential survivor bias. In this study the survivorship bias stems from the problems of dealing with liquidated or merged funds during the time period analysed. Although shortening the time period could reduce the bias in the current study, one of the important objectives

of the study is to examine a significantly long time series. In order to mitigate the effects of survivorship bias, only funds that were in existence at or subsequent to 31 December 1989 were selected and followed through to 31 December 1999.

There remains, however, a further area of bias in a study attempting to assess the relationship between unit trust investment performance and asset size[7]. This bias involves the case where merged funds are treated as continuations of the original funds. This causes problems for two reasons. First, treating two merged funds in the data base as continuations of both funds involves some degree of "double counting" to maintain a constant sample size and secondly, merging two funds of, say, moderate size into one fund of large size and treating that merged fund as a continuation of the two smaller funds distorts any attempt to measure the relationship between asset size and investment performance.

With the above in mind, the data collection began with identification of all funds designated equity funds in the periods 01 January 1990 and 31 December 1999 on the I-NET Bridge database. Using fund lists from both ends of the ten-year time range allowed identification of the largest possible survivor sample. A complete data set was then assembled for all funds in existence, or started during the 10-year period.

In order to avoid the size effect and the problem of double-counting merged funds, one of two procedures was followed. If a fund in the database *merged* into another fund also in the database, the surviving fund (consisting of both merged funds) was carried forward and the pre-merger years of the acquired fund were dropped entirely. Although this approach will in most cases artificially increase the size of the acquiring fund and potentially distort the fund's performance/size relationship, it is necessary in order to maintain a constant number of fund observations for all 10 years. If a fund changed its name this was noted but no

[7] These were first identified by Droms and Walker (1994).

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changes were made to the fund data as long as the fund fundamentals remained largely unchanged.

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CHAPTER 4

4.1. Construction of the Database

The data included in this study covers equity unit trusts in continuous existence on the South African market over the 10-year period from 1 January 1990 to 31 December 1999. This population includes only those funds in continuous existence in order that survivorship bias is minimized. The fund size and risk-adjusted return data included in this study has been analysed and was found to be normally distributed. Data has been supplied primarily by I-NET Bridge, with significant data also being provided by the Association of Unit Trusts. In addition to these sources, there have been numerous management companies who have contributed generously to the data collection exercise particularly with reference to expense data.

The primary variables include the respective quarterly asset sizes and total returns. The majority of unit trust management companies and information providers canvassed did not hold financial statements for their respective funds earlier than 1995. Hence, any tests and/or calculations relating to the expense ratio, Treynor and Alpha variables are limited to the period 1 January 1990 to 31 December 1999.

The data was extracted from the I-NET Bridge database using their Money Mate application and downloaded onto excel spreadsheets. Additional data not available from I-NET was sourced from the audited financial statements of the respective management companies as well as hard copies of data supplied by the Association of Unit Trusts.

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Data extracted from the I-NET database included:

- Total returns per fund on a quarterly basis from 1st January 1990 to 31st December 1999.
- Fund size per fund on a quarterly basis from 1st January 1995 to 31st December 1999.
- Alpha risk-adjusted return measure per fund on a quarterly basis from 1st January 1995 to 31st December 1999.
- Sharpe risk-adjusted return index per fund on a quarterly basis from 1st January 1990 to 31st December 1999.
- Treynor risk-adjusted return index per fund on a quarterly basis from 1st January 1995 to 31st December 1999.
- A list of management service fee charges for each unit trust fund from 1st January 1995 to 31st December 1999

The Association of Unit Trusts provided the asset sizes from 1st January 1990 to 31st December 1994, in hard copy.

The expenses incurred by a management company, including portfolio management as well as all costs incurred in administering the fund, such as general administration, accounting, pricing, investment management and administration, trustee/custodian expenses and marketing costs are covered by the management company service charge. Expenses incurred by the unit trust funds themselves, include brokerage charges, VAT of 14% on the brokerage charge, a marketable securities tax of 0.25%, and a stamp duty for the issuing of share certificates, if applicable. Other general overhead expenses include audit fees and regional services council levies.

The unit trust total returns, Alpha, Sharpe and Treynor measures have been calculated quarterly, using the Money Mate software, on a sell-to-sell basis with dividends reinvested on payment date.

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The various risk-adjusted return measures were decided upon for the following reasons:

1. Alpha is used in this study to determine the extent to which the fund managers are able to earn superior risk-adjusted returns in relation to the rest of the market. It is anticipated that as the funds' sizes increase, so this will become increasingly difficult on a relative basis.

2. The Treynor and Sharpe indices were chosen in order that a comparison could be made between the effects of diversification on the relationship between risk-adjusted returns and fund size. The Sharpe index assumes no diversification, making use of the fund standard deviation, which is the total risk associated with the fund. The Treynor index, on the other hand, assumes the fund returns have been diversified by computing the risk-adjusted return based on the beta of the portfolio.

The expense ratio is made up of the expenses incurred by each fund divided by the assets under management. The audit fees and regional services council levies were obtained from the respective annual reports of each unit trust management company. The annual management service fee, which covers most of the operating costs incurred in addition to overheads, was obtained off the Money Mate database.

Once the database had been compiled, the data was sorted with respect to the number of years the respective funds had been in existence up to 31 December 1999. This resulted in two groups, the '10 year old' and '5 year old' funds. For obvious reasons, the funds in continuous existence for the full 10-year period were common to the 5-year group.

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4.2. Analytical Tools

Regression analysis was used to determine the extent to which relationships exist between the various dependant and independent variables. The regression was undertaken using the econometrics analysis software E-Views. A ranking analysis was also performed using the excel ranking function.

4.3. Integrity of the Database

The data has been examined for completion and consistency. The data obtained from I-Net Bridge, off their Money Mate database is compiled and verified by Morgan Stanley & Company Incorporated. In addition to this, the data is supplied to and vetted by all South African unit trust management companies.

In particular, I-Net Bridge thoroughly tests the beta variables they use in their packages and distribute to their users for stability and validity. It has been confirmed by I-Net Bridge that the beta values supplied in addition to all calculations performed using these variables have been tested. The same was confirmed for all other data supplied by I-Net Bridge. In addition to the tests run by I-Net Bridge, the considerable number of asset managers who have access to the I-Net Bridge database further verify the validity of the data by reporting any discrepancies observed. These are followed up and corrected on a real-time basis by the research staff at I-Net Bridge.

Only funds that have been in existence for the full duration[8] of each respective time period have been included in the database. At 31 December 1999, the number of equity unit trusts in existence totalled 120, managed by 25 different

[8] Where fund names/legal owners have changed the funds have been included if the fundamental characteristics and generic style of the fund did not change subsequent to the name change.

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unit trust management companies. This study analyses 32 equity unit trust funds over the five-year and 14 over the ten-year period.

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CHAPTER 5

5.1. Results

This chapter focuses on the tests of the primary hypothesis that there exists a statistically significant relationship between the performance of unit trust funds in South Africa and the size of assets under management. In addition to the first hypothesis, this chapter also deals with the test of the second hypothesis - that there exists a relationship between the extent of assets under management and the costs associated with the management of unit trust funds. The statistical results detailed below indicate clearly the extent to which relationships exist and the significance of such relationships at a 95% level of significance.

The approach taken was to first test the hypotheses at an aggregate level across the industry. It is clear from the figures presented in Chapter One (Fig. 1.1 and Fig. 1.2) and Chapter Four (Fig. 4.6), that whilst asset size has remained relatively stable over periods of market volatility, fund returns have fluctuated significantly. In an attempt to minimise the effects of industry volatility, the first hypothesis has also been tested on a fund-by-fund basis as a comparison against the industry test results. In addition to the regression analyses, the results of the overall industry ranking analysis have also been incorporated in this chapter.

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5.1.1 Industry Regression Results

Regression Analysis

Industry - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000083	1.76	0.533792	0.021871	0.63
Alpha	0.002628	1.87	0.231803	0.078407	1.24
Sharpe	-0.000495	2.57	0.928817	0.000456	-0.09
Treynor	0.002506	2.35	0.700586	0.008410	0.39

Table 5.1: Regression results of industry – 5-year

Industry - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000016	2.07	0.75153	0.00267	0.32
Sharpe	-0.000480	2.75	0.83411	0.00117	-0.21
Expense ratio	-0.0000397	1.71	0.23341	0.07789	-1.23

Table 5.2: Regression results of industry – 10-year

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Where the respective quarterly fund data was averaged and regressed no statistically significant correlations were found to exist between asset size and total return, Alpha, the Sharpe or Treynor indices. This indicates that the correlations between the various dependant variables and fund size, are not significantly different from zero at the 95% level. Furthermore, the beta coefficients in all cases are not significantly different from zero indicating that the slopes for each relationship are almost completely flat.

The regression of the mean expense ratio per fund against the mean asset size revealed neither a statistically significant relationship nor a significant correlation. This result indicates that economies of scale do not exist in the South African unit trust industry. A possible reason for this may be that the fees on additional transactions that must be entered into by the large funds in order to fill the larger deal orders negate any cost savings generated by a large fund in the form of lower negotiated fees per transaction.

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5.1.2 Individual Fund Regression Results

The objective behind analysing each fund on an individual basis is to give more rigorous insight into the potential relationships between the respective data groups in each fund. In addition to this, these tests are compared against the results of the industry as a whole in order to assess the consistency of the findings. This section is a commentary on the results of the regression analyses for each fund over the ten-year and five-year periods.

ABSA Funds

Balanced Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000218	2.35	0.296528	0.060339	1.08
Alpha	-0.002062	2.05	0.485153	0.027446	-0.71
Sharpe	-0.012492	1.65	0.190192	0.093353	-1.36
Treynor	0.069466	2.44	0.210202	0.085759	1.30

***Table 5.3**: Regression results of ABSA Balanced Fund*

No serial correlation was identified in any of the analyses performed on the ABSA Balanced Fund data as observed in the Durbin-Watson statistic. No significant relationships were observed between Fund Size and Total Returns, Alpha, the Sharpe and Treynor indices – this assessment is based upon the fact that none of the t-stats were greater than 2. In addition, to the above, the R-squareds in each regression were very low and the beta coefficients are close to zero indicating that, in the case of the ABSA Balanced Fund, size is not a good explanatory variable in relation to returns.

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General Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000253	2.21	0.042745	0.055044	1.13
Alpha	0.001742	2.13	0.274835	0.021118	1.79
Sharpe	0.004327	2.38	0.090574	0.158350	1.84
Treynor	0.003125	2.03	0.493583	0.026415	0.70

Table 5.4: Regression results of ABSA General Fund

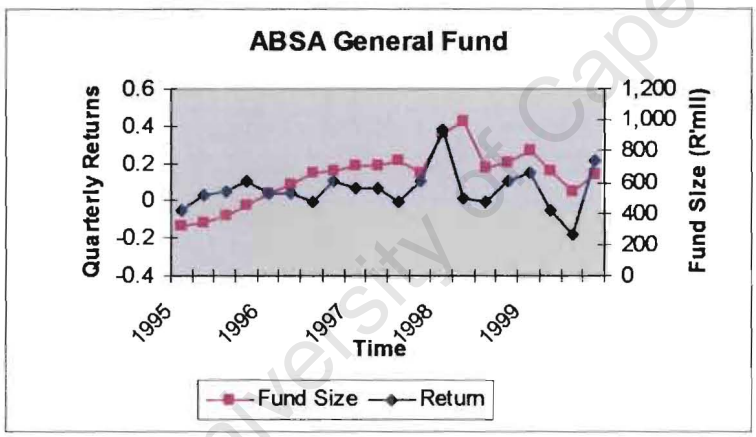

Figure 5.1: Graph of ABSA General Fund - Fund Return against Fund Size

In a similar vein to the Balanced Fund results, the General Fund exhibited statistically poor correlations between the dependant return variables and size as reflected in the weak R-squareds. Despite the significant R-square observed for the Sharpe variable, the t-stat deemed it statistically insignificant at a 5% level.

From the General Fund graph above (Fig. 5.1), it would appear that the fund size and return track each other particularly during the 1998 and 1999 calendar years.

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This observation is more likely to be a case of both fund size and return reacting to the market crashes experienced in October of 1998 and 1999 in addition to the generally high levels of volatility experienced over these periods.

BoE Funds

BoE Equity Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000019	2.10	0.331203	0.052497	1.00
Alpha	-0.000481	2.67	0.425015	0.035695	-0.82
Sharpe	0.001870	2.31	0.062912	0.179202	1.98
Treynor	0.002503	2.29	0.167516	0.103078	1.44

Table 5.5: Regression results of BoE Equity Fund

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No statistically significant relationship was observed between fund size and the respective dependant return variables. This is concluded based upon the t-stats observed being less than the required 2.101 and the R-squareds and beta coefficients generally being very low, with the exception of the Sharpe and Treynor variables. The regression results are clearly evidenced in the graph 5.2 below.

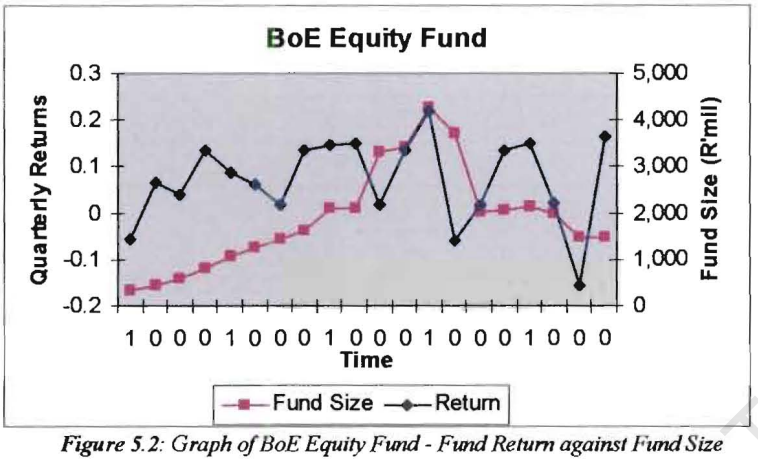

Figure 5.2: Graph of BoE Equity Fund - Fund Return against Fund Size

BoE Managed Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000003	1.90	0.834742	0.002483	0.21
Alpha	0.000492	2.48	0.753895	0.005598	0.32
Sharpe	0.000749	1.90	0.190063	0.093404	1.36
Treynor	-0.000514	1.68	0.790490	0.004024	-0.27

Table 5.6: Regression results of BoE Managed Fund

The results in the table above indicate that no significant relationships exists between any of the Managed Fund's dependant return variables and fund size. Fund size is a poor explanatory factor when it comes to the respective return variables as can be seen from the very weak r-squareds (only one of which is greater than 1%) and the fact that the betas are consistently very small.

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Community Growth Fund

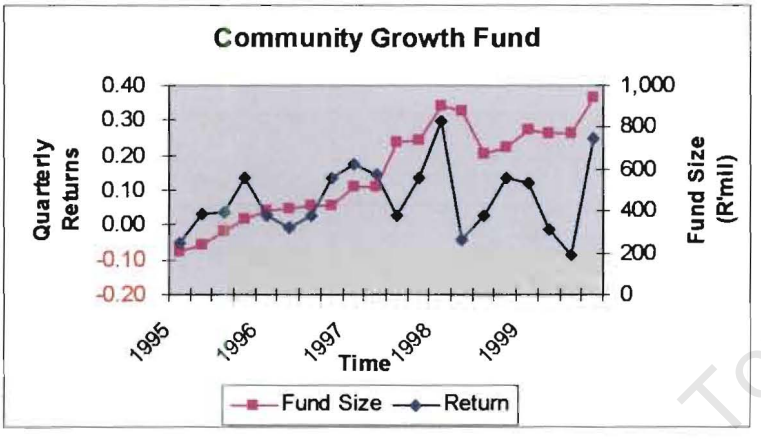

Figure 5.3: Graph of Community Growth Fund - Fund Return against Fund Size

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000141	2.01	0.167318	0.103169	1.44
Alpha	-0.003348	2.21	0.310807	0.056980	-1.04
Sharpe	0.000185	2.57	0.977486	0.000045	0.03
Treynor	-0.000434	2.26	0.973594	0.000063	-0.03

Table 5.7: Regression results of Community Growth Fund

It is evident from the graph depicting the size return relationship that, as with most of the funds analysed, there is very little exhibited relationship between size and return aside from the dips in portfolio value and return in October of 1998 and 1999. In the case of the Community Growth Fund, the fund size has continued to grow despite the extreme levels of volatility experienced during 1999. This appears to be further evidence supporting the theory that South African unit trust investors are passive managers of their wealth. The graphical

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results are mirrored by the regression test results, which, in addition to displaying no correlation are in any case insignificant at the 95% level.

What is interesting to note is that every December the fund's performance rises dramatically. An explanation for this phenomenon could possibly be that at year end the funds were 'window-dressed'[9] by culling those equities that have performed poorly over the year and substituting them for stronger short term performers. These equities would not have been chosen based on a long-term hold strategy and are hence likely to expose the fund to greater risk. This, in turn, would offer an explanation for the consistent fall off in performance in the New Year.

Investec Funds

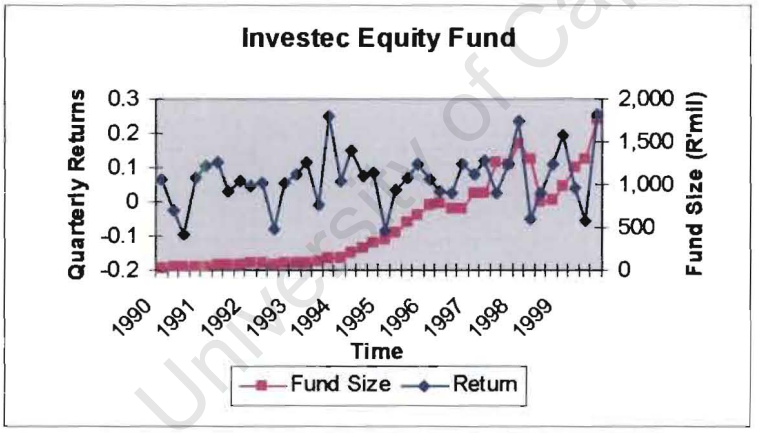

Figure 5.4: Graph of Investec Equity Fund - Fund Return against Fund Size

[9] Window Dressing is the term commonly used where fund managers substitute poor performers with strong ones at year end in an effort to falsely enhance the merit of their disclosed holdings at year end.

Investec Equity Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000099	2.23	0.079256	0.161264	1.86
Alpha	-0.000323	2.11	0.822711	0.002863	-0.23
Sharpe	-0.006099	2.33	0.618616	0.014055	-0.51
Treynor	0.002608	2.30	0.730672	0.006745	0.35

Table 5.8: Regression results of Investec Equity Fund – 5-year

Investec Equity Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000040	2.19	0.130096	0.059264	1.55
Sharpe	-0.00592	2.31	0.17305	0.04829	-1.39

Table 5.9: Regression results of Investec Equity Fund –10-year

The Investec Equity fund has been in existence for the full ten-year period from 1 January to 31 December 1999. In the five years to 1999 little if any relationship existed between the dependant return variables and fund size. The t-stats indicate that, at the 95% level, the correlation between the variables is not significantly different from zero. This finding is reinforced by the weak R-squareds (with the exception of the 5-year total return R-square) that indicate the extent to which the independent variable (size) explains the behavior of the dependant

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variables (return). Similar results are observed in the regression of the total return and Sharpe index against fund size over the ten-year period. All tests have very low beta coefficients further indicating that no significant relationship exists between the variables.

The relationships identified in the regression analysis are verified by the 10-year graph of fund size against return. Quarterly returns appear to follow no pattern whatsoever in relation to size.

Investec Index Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000484	1.99	0.293906	0.060978	1.08
Alpha	0.007775	2.21	0.136235	0.119060	1.56
Sharpe	0.011222	2.54	0.899022	0.000919	0.13
Treynor	0.016848	2.59	0.618493	0.014065	0.51

Table 5.10: Regression results of Investec Index Fund

It is clear from the results of the Investec Index Fund tests that no significant relationship exists between fund size and return. It may be suggested that as an index fund this fund has different fundamentals to others in the Investec stable of funds analysed. This, however, is not necessarily the case as it has been observed that the Index Fund held, on average, 42% and 23% of its funds in the industrial and financial sectors respectively, versus the Equity Fund's 53% and 23% in the respective sectors over the five-year period to 31 December 1999. From this it would seem that the investment and risk profile of the two funds were

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indeed similar. A similar phenomenon was observed when other general equity funds were compared to their index counterparts.

Liberty Funds (formerly Guardbank)

Liberty Industrial Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000218	2.35	0.296528	0.060339	1.08
Alpha	-0.005533	1.74	0.169757	0.102056	-1.43
Sharpe	0.006762	2.44	0.338119	0.051054	0.98
Treynor	0.004144	1.78	0.594735	0.016035	0.54

Table 5.11: Regression results of Liberty Industrial Fund

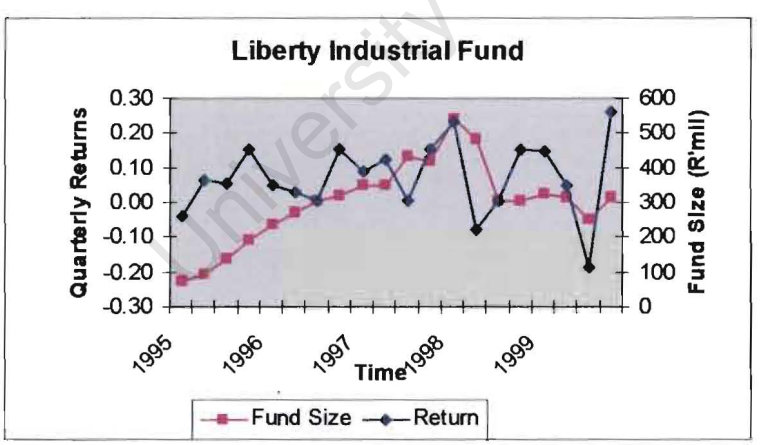

Figure 5.5: Graph of Liberty Equity Fund - Fund Return against Fund Size

It is clear from the regression test results that no significant relationship exists between fund size and return on the portfolio within the Liberty Industrial Fund. Once again, it is evident from the fund's graph that the only similar movements

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between fund size and performance occur in October of 1998 and 1999 – the explanatory variable in that case being the equity market's performance as opposed to size.

Liberty Prosperity Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000051	2.10	0.618473	0.014066	0.51
Alpha	-0.003109	1.66	0.114936	0.132287	-1.66
Sharpe	0.001880	2.61	0.482519	0.027774	0.72
Treynor	0.000495	1.97	0.858410	0.001816	0.18

Table 5.12: Regression results of Liberty Prosperity Fund

Like the Industrial fund, there exists no clear relationship between return and size of the Prosperity fund. It is clear from the table 5.10 that the beta coefficients and r-squareds are not significantly different from zero.

Liberty Resources Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000508	0.96	0.522305	0.023109	0.65
Alpha	0.067773	1.91	0.356964	0.047307	0.95
Sharpe	0.073421	2.52	0.738975	0.006322	0.34
Treynor	0.226393	2.05	0.558133	0.019397	0.60

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Table 5.13: Regression results of Liberty Resources Fund – 5-year

Liberty Resources Fund - 10-years

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000497	1.70	0.346038	0.023397	0.95
Sharpe	-0.06721	2.17	0.64848	0.00553	-0.46

Table 5.14: Regression results of Liberty Resources Fund – 10-years

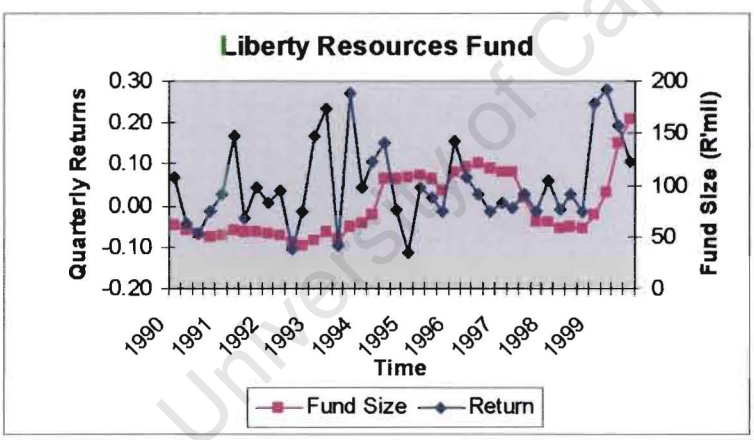

Figure 5.6: Graph of Liberty Resources Fund - Fund Return against Fund Size

The test results for both the five and ten-year periods indicate that there is no significant relationship between the dependant return variables and fund size. The graph above clearly indicates the volatility in quarterly fund returns relative to the stability of fund size over the equivalent periods. A degree of serial correlation was observed between the total return and fund size variables. Given the

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insignificance of the test results, this phenomenon has not been further investigated with respect to this fund.

Liberty Stability Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000442	2.21	0.210024	0.085823	1.30
Alpha	-0.015859	1.76	0.342212	0.050218	-0.98
Sharpe	0.008643	2.45	0.212685	0.084872	1.29
Treynor	0.019814	1.79	0.373225	0.044275	0.91

Table 5.15: Regression results of Liberty Stability Fund

Liberty Growth Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	-0.000010	2.21	0.696067	0.008678	-0.40
Alpha	0.000763	2.18	0.407957	0.038354	0.85
Sharpe	0.000525	2.68	0.537168	0.021516	0.63
Treynor	-0.000952	1.49	0.260892	0.069644	-1.16

Table 5.16: Regression results of Liberty Growth Fund – 5-year

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Liberty Growth Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000001	2.20	0.925702	0.000232	0.09
Sharpe	0.03641	2.07	0.59853	0.00737	0.53

Table 5.17: Regression results of Liberty Growth Fund – 10-year

Both the Stability and Growth funds test results are weak and not significantly different from zero at the 95% level of significance. No relationship was found to exist between the dependant and independent variables.

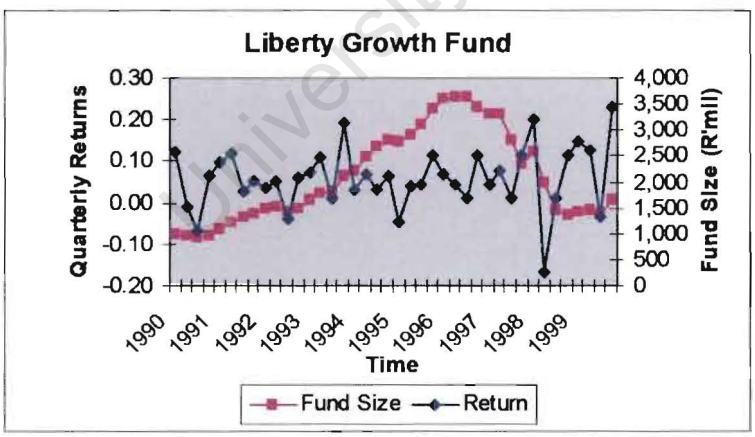

Figure 5.7: Graph of Liberty Growth Fund - Fund Return against Fund Size

The Liberty Growth fund test results are clearly evidenced by the size – return plot above. There was significant growth in the size of the fund between the 1994

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and 1997 years followed by a corresponding fall during the periods of high volatility experienced in 1997, 1998 and 1999. The total quarterly returns, however, have remained relatively stable over the ten-year period.

Marriot Equity Fund

Marriot Equity Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	-0.000247	1.96	0.829345	0.002650	-0.22
Alpha	-0.052869	2.27	0.113336	0.133380	-1.66
Sharpe	-0.007337	2.09	0.789426	0.004065	-0.27
Treynor	0.023149	2.24	0.670201	0.010306	0.43

Table 5.18: Regression results of Marriot Equity Fund – 5-year

Marriot Equity Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000235	2.16	0.492797	0.012465	0.69
Sharpe	0.00590	2.00	0.79329	0.00183	0.26

Table 5.19: Regression results of Marriot Equity Fund – 10-year

The regression results for the Marriot Equity fund indicate that no significant relationship between the variables exists. This is further evidenced by the r-squareds and betas that are not significantly different from zero.

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Metropolitan Fund

Metropolitan Equity Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000044	1.97	0.676857	0.009872	0.42
Alpha	-0.003283	1.50	0.226645	0.080091	-1.25
Sharpe	-0.008561	2.33	0.261070	0.069594	-1.16
Treynor	-0.002925	1.60	0.518833	0.023492	-0.66

Table 5.20: Regression results of Metropolitan Equity Fund

The test results indicate that no significant relationship exists between the dependant return variables and fund size.

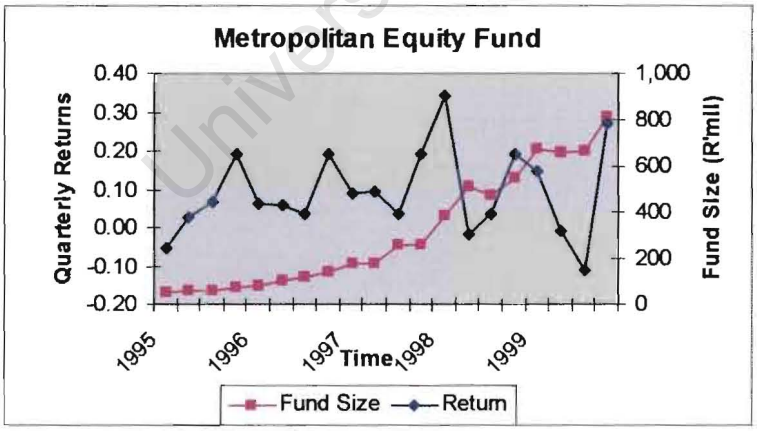

Figure 5.8: Graph of Metropolitan Equity Fund - Fund Return against Fund Size

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The regression results are reflected in the plot of total return against fund size. It is observed from the graph that over the five-year period fund size has grown steadily whereas the returns have been random – the latter affected more by the volatility of the financial markets during the 1998 and 1999 calendar years than fund size. Once again, however, we see evidence of passive wealth management in that investors do not appear to liquidate their holdings following a period of poor and often negative performance.

Old Mutual Funds

Old Mutual Balanced Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000187	2.21	0.239680	0.075915	1.22
Alpha	-0.000193	2.23	0.968956	0.000087	-0.04
Sharpe	0.012379	2.40	0.014624	0.288391	2.70
Treynor	0.023217	1.81	0.060746	0.181914	2.00

Table 5.21: Regression results of Old Mutual Balanced Fund

The Old Mutual Balanced fund exhibits a statistically significant relationship between the independent variable fund size and the dependant Sharpe risk-adjusted return variable. This is evidenced by the significantly greater than 2.1 t-stat. Twenty eight percent of the risk-adjusted return, as measured by Sharpe, is explained by the size of assets under management, indicating a relatively strong relationship at the 95% level. The value of this observed relationship is, however, somewhat diminished by the fact that none of the other return variables demonstrated statistically significant relationships with fund size.

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Old Mutual Gold Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000336	2.02	0.591143	0.016347	0.55
Alpha	-0.045432	1.67	0.666132	0.010577	-0.44
Sharpe	0.005974	0.72	0.778507	0.004508	0.29
Treynor	0.024005	0.84	0.649534	0.011725	0.46

***Table 5.22**: Regression results of Old Mutual Gold Fund*

Given the low t-stats the results of this test are weak and statistically insignificant at a 95% level. No relationship between fund size and return is evident. It is interesting to note that between 1995 and 1999, the Old Mutual Gold Fund had approximately 6% of its assets invested in the JSE gold sector and 54% invested in industrial and financial equities. This finding is further evidence suggesting that South African unit trust funds tend not to invest consistently within the parameters of their mandates. Breaches of investment mandates may generate better than expected returns for investors. An example of this is where gold has historically performed poorly in periods of strong general equity performance, a 'gold' fund is likely to perform better by investing in general equities as opposed to gold stocks. Importantly, however, this approach will have negative results in the case where the active investor wishes to diversify his wealth by investing in a unit trust fund exposed to gold.

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Old Mutual Growth Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000159	2.15	0.114447	0.132620	1.66
Alpha	0.001222	2.09	0.773777	0.004708	0.29
Sharpe	0.003567	1.96	0.175699	0.099415	1.41
Treynor	0.003428	2.28	0.518902	0.023485	0.66

Table 5.23: Regression results of Old Mutual Growth Fund

The t-tests are weak at the 95% level of significance and the beta coefficients are negligible. Despite the 13.2% R-square observed for the total return variable, the R-squareds indicate very little, if any, evidence of a consistent explanatory relationship between fund size and the respective dependant return variables.

Old Mutual Industrial Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000322	2.27	0.194164	0.091778	1.35
Alpha	0.003619	1.80	0.369682	0.044921	0.92
Sharpe	0.012460	2.37	0.134962	0.119789	1.57
Treynor	0.015148	1.73	0.295618	0.060560	1.08

Table 5.24: Regression results of Old Mutual Industrial Fund

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The Old Mutual Industrial fund results indicate no statistically significant relationship between fund performance and the size of the fund on a nominal or risk-adjusted basis.

Old Mutual Investors Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000005	2.08	0.830402	0.002617	0.22
Alpha	-0.000158	2.28	0.805036	0.003474	-0.25
Sharpe	0.000584	2.22	0.342004	0.050260	0.98
Treynor	0.000086	1.66	0.921282	0.000558	0.10

Table 5.25: Regression results of Old Mutual Investors Fund – 5-year

Old Mutual Investors Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000015	2.13	0.250952	0.034532	1.17
Sharpe	0.00131	2.07	0.63957	0.01245	0.48

Table 5.26: Regression results of Old Mutual Investors Fund – 10-years

Old Mutual Mining & Resources Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	-0.000179	0.95	0.709606	0.007889	-0.38
Alpha	0.003209	1.88	0.929623	0.000445	0.09
Sharpe	0.128381	2.34	0.225148	0.080588	1.26
Treynor	0.250059	2.22	0.116210	0.131429	1.65

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Table 5.27: Regression results of Old Mutual Mining & Resources Fund – 5-year

Old Mutual Mining & Resources Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	-0.000043	1.42	0.923384	0.000247	-0.10
Sharpe	0.07307	2.08	0.23014	0.03767	1.22

Table 5.28: Regression results of Old Mutual Mining & Resources Fund – 10-year

Old Mutual Top Companies Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000161	2.39	0.258721	0.070258	1.17
Alpha	-0.000616	1.78	0.820622	0.002932	-0.23
Sharpe	0.008467	2.17	0.375563	0.043854	0.91
Treynor	0.006266	1.86	0.311394	0.056846	1.04

Table 5.29: Regression results of Old Mutual Top Companies Fund

As in the case of the other Old Mutual funds, on aggregate no significant relationship was identified between the return variables and fund size for the Old Mutual Investors, the Old Mutual Mining & Resources or the Top Companies funds.

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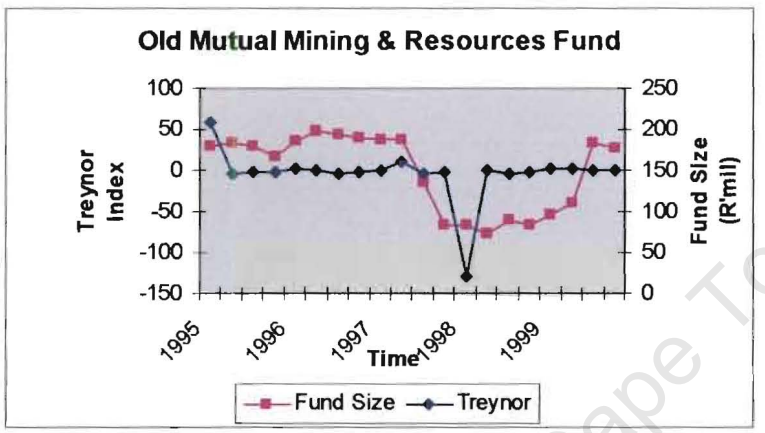

Figure 5.9: Graph of Old Mutual Mining & Resources Fund - Fund Return against Fund Size

The graph above indicates the extent to which the movements of the fund's returns are unrelated to the size of assets under management. It is interesting to note, however, that the risk-adjusted Treynor return measure did not react with the same degree of volatility over the forth quarters of 1998 and 1999 as observed in the other funds. This is a clear indication of the extent of their resource stock holdings that typically act as strong hedges against general equities in uncertain markets. In contrast to the small gold sector holdings of the Old Mutual Gold Fund, the Old Mutual Mining and Resources Fund held 67% in gold, mining and resource stocks.

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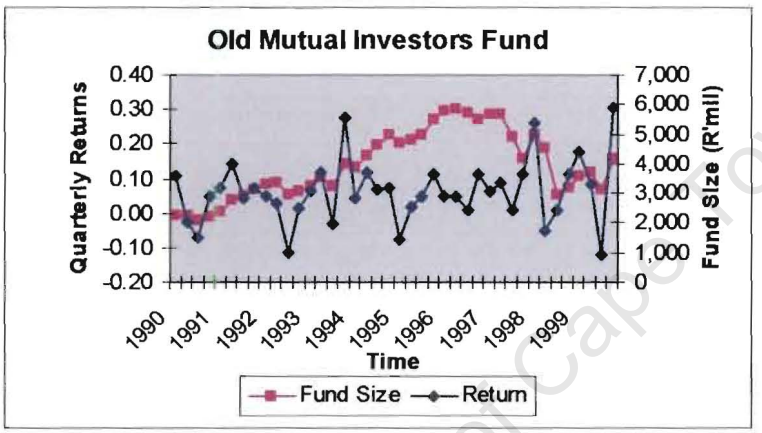

Figure 5.10: Graph of Old Mutual Investors Fund - Fund Return against Fund Size

The Investors fund is one of the oldest and the largest funds in the South African unit trust industry. As seen from the data plotted above, the performance of this fund was pedestrian between 1990 and 1998. Despite this, the extent of assets under management continued a steady climb to almost R6 billion in value. This could possibly be a case of investors investing on the basis of relative performance as well as the notion that 'bigger is better' given this was the largest fund in the industry at the time. Alternatively it may be a case of investors acting passively in response to market fluctuations.

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Rand Merchant Bank Fund

RMB Equity Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000088	2.19	0.328203	0.053134	1.01
Alpha	-0.000190	1.85	0.943319	0.000289	-0.07
Sharpe	0.004092	2.17	0.510736	0.024403	0.67
Treynor	0.003242	1.99	0.482499	0.027777	0.72

Table 5.30: Regression results of RMB Equity Fund – 5-year

RMB Equity Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	-0.006803	1.98	0.017811	0.139021	-2.48
Sharpe	0.00002	2.51	0.99679	0.0000010	0.0041

Table 5.31: Regression results of RMB Equity Fund – 10-years

The RMB Equity fund is the only fund from the RMB stable that existed continuously from 1990 to 2000. The results of the RMB Equity fund are

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consistent with those for the other funds. No significant beta coefficients are observed between the dependant and independent variables tested. Whilst a total return – size relationship would appear to exist from the t-stat result over the ten-year period, the fact that only 14% of total return is explained by fund size, renders the result weak.

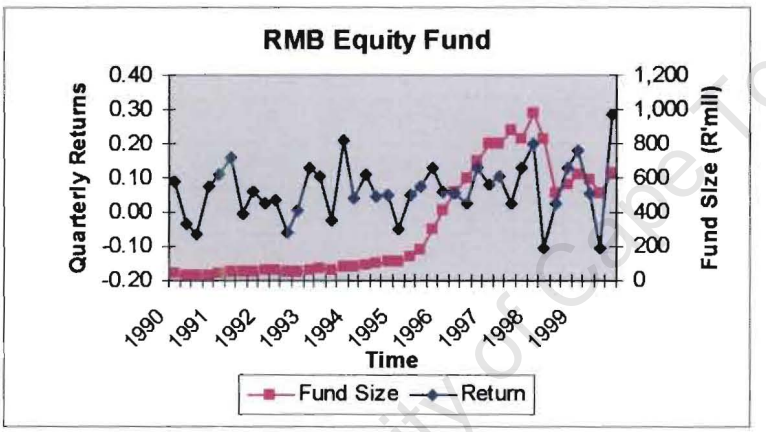

Figure 5.11: Graph of RMB Equity Fund - Fund Return against Fund Size

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A graph of the RMB Equity fund size against the total returns reinforces the test results in that it is clear that the size of the fund does not impact the performance of the portfolio in any of the ten years under analysis. The only corresponding movements occur in October of 1998 and 1999 in relation to the respective market collapses that occurred during those periods as discussed above.

SAGE Funds

The Sage Financial Services Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000033	2.15	0.691731	0.008940	0.40
Alpha	-0.002686	2.18	0.657992	0.011131	-0.45
Sharpe	0.000306	2.32	0.901537	0.000874	0.13
Treynor	-0.003977	2.04	0.359947	0.046738	-0.94

Table 5.32: Regression results of Sage Financial Services Fund

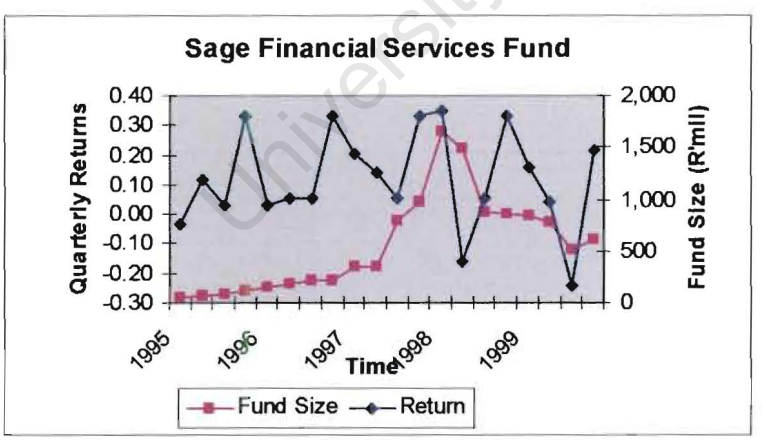

Figure 5.12: Graph of Sage Financial Services Fund - Fund Return against Fund Size

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The Sage Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000044	2.15	0.609790	0.014768	0.52
Alpha	-0.001197	1.95	0.601602	0.015449	-0.53
Sharpe	0.000332	1.28	0.968372	0.000090	0.04
Treynor	0.001390	1.17	0.904151	0.000828	0.12

Table 5.33: Regression results of Sage Fund – 5-year

The Sage Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000043	2.31	0.279849	0.030658	1.10
Sharpe	0.00892	1.97	0.33507	0.02447	0.98

Table 5.34: Regression results of Sage Fund – 10-year

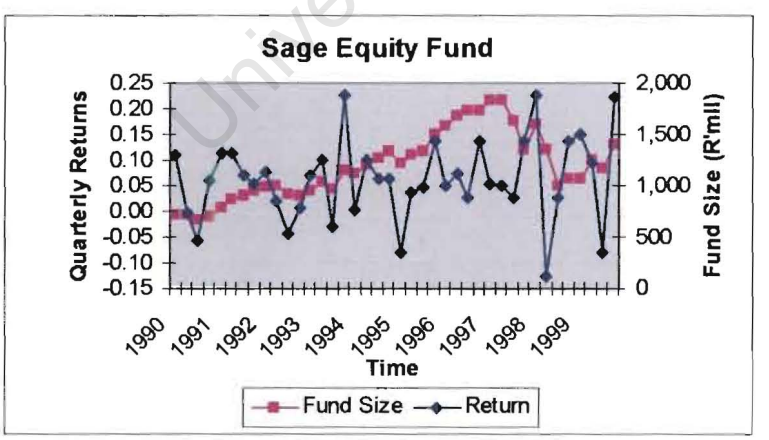

Figure 5.13: Graph of Sage Fund - Fund Return against Fund Size

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The Sage Resources Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000517	0.86	0.414374	0.037336	0.84
Alpha	0.045638	1.63	0.421323	0.036258	0.82
Sharpe	0.025638	1.69	0.418840	0.036640	0.83
Treynor	-0.006024	1.31	0.929055	0.000453	-0.09

Table 5.35: Regression results of Sage Resources Fund – 5-year

The Sage Resources Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000346	1.74	0.433764	0.016205	0.79
Sharpe	-0.01332	1.99	0.75623	0.00257	-0.31

Table 5.36: Regression results of Sage Resources Fund – 10-year

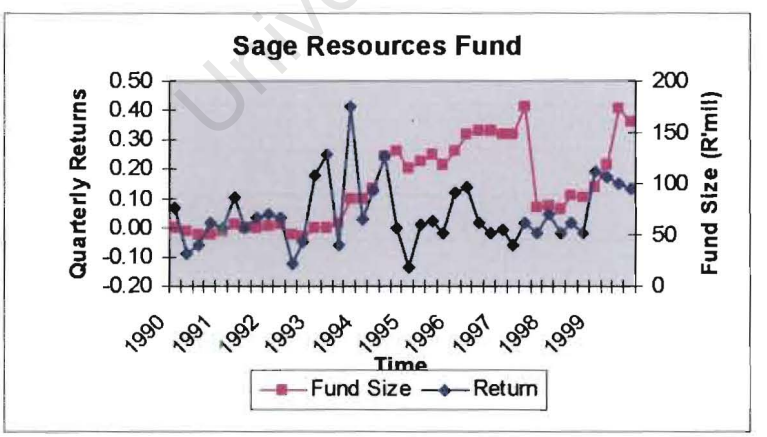

Figure 5.14: Graph of Sage Resources Fund - Fund Return against Fund Size

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It is clearly evident from the above tests, that none of the Sage funds exhibited any relationship between fund size and total or risk-adjusted returns. The graph for each fund shows how the fund sizes have shown very little evidence of volatility, barring the effects of the market collapses in 1998 and 1999 respectively. The returns, however, have randomly moved between positive and negative nominal performance over the ten years. The regression results reflect these observations.

Sanlam Funds

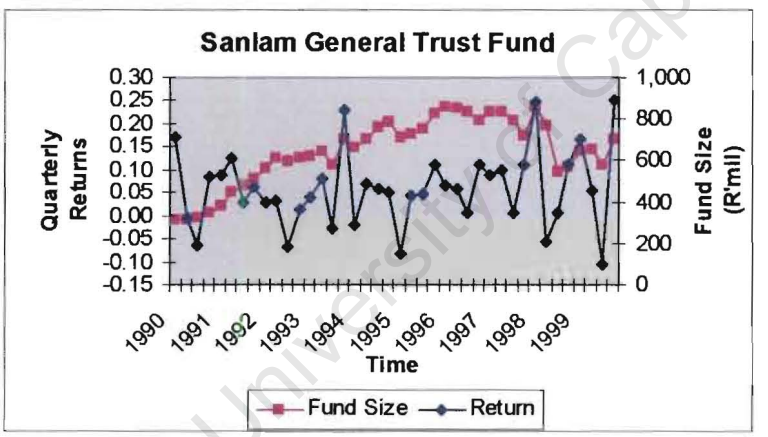

Figure 5.15: Graph of Sanlam General Trust Fund - Fund Return against Fund Size

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The Sanlam General Trust Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000210	2.03	0.336196	0.051451	0.99
Alpha	0.009106	1.62	0.065287	0.176331	1.96
Sharpe	0.038291	2.26	0.098089	0.144647	1.74
Treynor	-0.013565	2.18	0.342206	0.050219	-0.98

Table 5.37: *Regression results of Sanlam General Trust Fund – 5-year*

The Sanlam General Trust Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000083	2.20	0.325457	0.025451	1.00
Sharpe	0.00982	2.25	0.35521	0.02253	0.94

Table 5.38*: Regression results of Sanlam General Trust Fund – 10-year*

Despite the fact that the 5-year Alpha and Sharpe R-square results are significant, none of the t-test results are greater than 2 and hence it can be concluded that the size of the Sanlam General Trust Fund does not influence total or risk-adjusted returns over either the five or ten year periods at a 95% level.

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The Sanlam Industrial Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000462	2.05	0.075739	0.164797	1.88
Alpha	0.005712	1.80	0.452842	0.031674	0.77
Sharpe	0.029592	2.16	0.102759	0.141019	1.72
Treynor	-0.005810	1.94	0.745445	0.006002	-0.33

Table 5.39: Regression results of Sanlam Industrial Fund – 5-year

The Sanlam Industrial Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000102	2.23	0.189048	0.044952	1.34
Sharpe	0.00131	2.29	0.78843	0.00192	0.27

Table 5.40: Regression results of Sanlam Industrial Fund – 10-year

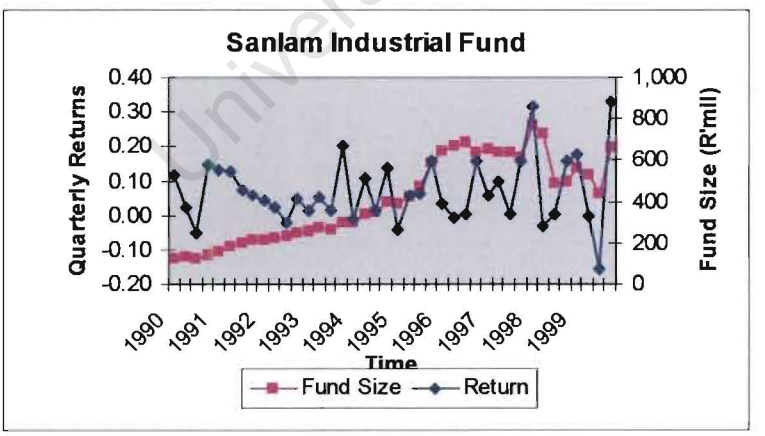

Figure 5.16: Graph of Sanlam Industrial Fund - Fund Return against Fund Size

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The Sanlam Prime Growth Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000132	2.03	0.124488	0.126070	1.61
Alpha	0.001651	1.87	0.184034	0.095866	1.38
Sharpe	0.004080	1.78	0.334004	0.051908	0.99
Treynor	0.002592	2.16	0.190623	0.093180	1.36

Table 5.41: Regression results of Sanlam Prime Growth Fund – 5-year

The Sanlam Prime Growth Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000045	2.07	0.146134	0.054759	1.48
Sharpe	0.00163	2.15	0.41502	0.01756	0.82

Table 5.42: Regression results of Sanlam Prime Growth Fund – 10-year

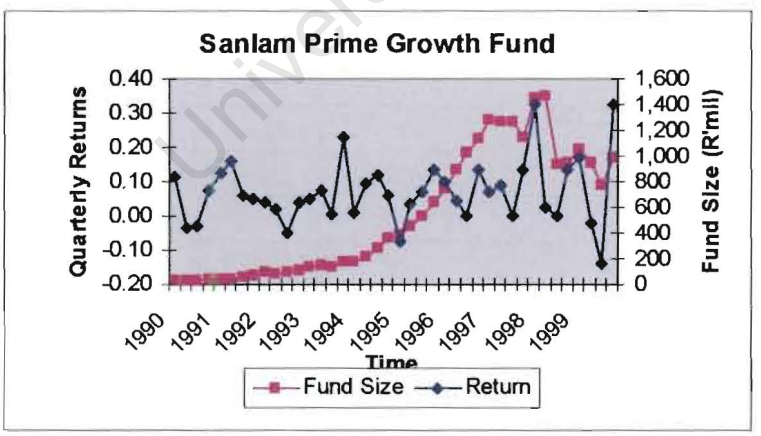

Figure 5.17: Graph of Sanlam Prime Growth Fund - Fund Return against Fund Size

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Neither the Sanlam Industrial nor the Prime Growth funds demonstrate any statistically significant relationship between the dependant return variables and portfolio size. As observed in most of the funds tested in this study, the degrees of explanation (r-squared) are random and statistically insignificant. Furthermore, the slopes of each equation are almost completely flat indicating no relationship between the variables.

Standard Bank Funds

Standard Bank Gold Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	-0.000159	1.76	0.814102	0.003153	-0.24
Alpha	-0.000159	1.76	0.814102	0.003153	-0.24
Sharpe	0.000681	1.23	0.971020	0.000075	0.04
Treynor	0.028199	0.95	0.575778	0.017725	0.57

Table 5.43: Regression results of Standard Bank Gold Fund – 5-year

Standard Bank Gold Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000220	1.88	0.551508	0.009411	0.60
Sharpe	0.02206	1.87	0.29190	0.02919	1.07

Table 5.44: Regression results of Standard Bank Gold Fund – 10-year

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A relatively high degree of serial correlation was observed in the Standard Bank Gold fund test results. However, once again the betas and R-squareds are not significantly different from zero at the 95% level.

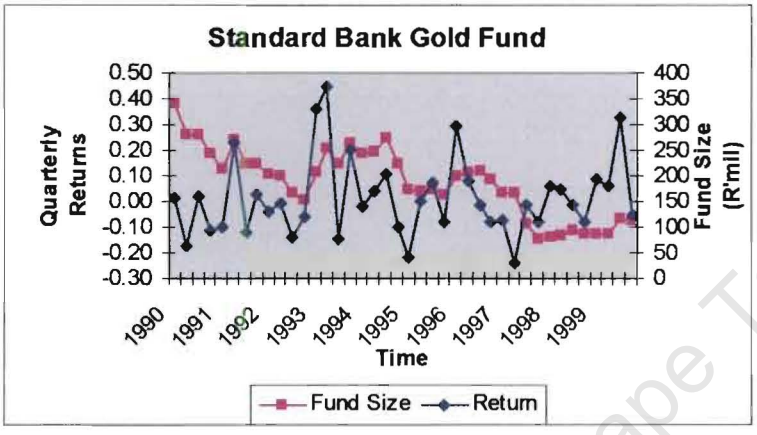

Figure 5.18: Graph of Standard Bank Gold Fund - Fund Return against Fund Size

It is clear from the figure above that the fund size of the Standard Bank Gold fund moves in as random a manner as the returns with very little consistency or pattern being displayed relative to one another. Interestingly, it is noted that the returns over the 1998 and 1999 calendar years were generally positive and significantly greater than its peers. This is most likely to be as a result of the fund keeping within its mandate and investing primarily in the gold sector of the JSE. 85% of this fund was invested in the mining and gold sector, which performed well as a hedge against other equities.

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Standard Bank Industrial & Financial Fund

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000388	2.32	0.335763	0.051541	0.99
Alpha	-0.007561	1.88	0.465628	0.029947	-0.75
Sharpe	0.013467	2.53	0.505003	0.025063	0.68
Treynor	-0.004706	1.18	0.796372	0.003796	-0.26

Table 5.45: Regression results of Standard Bank Industrial & Finance Fund

None of the test results in the case of the Industrial & Financial fund are significant indicating unmistakably that no relationship exists between the dependant return variables and the size of the fund.

Standard Bank Mutual Fund - 5-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000032	2.38	0.704112	0.008204	0.39
Alpha	0.002559	2.10	0.312244	0.056652	1.04
Sharpe	0.011910	2.46	0.114427	0.132633	1.66
Treynor	-0.004940	2.33	0.292951	0.061212	-1.08

Table 5.46: Regression results of Standard Bank Mutual Fund – 5-year

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Standard Bank Mutual Fund - 10-year

	Beta coefficient	Durbin-Watson Stat	Probability	R2	T-stat
Total return	0.000023	2.34	0.485820	0.012869	0.70
Sharpe	0.01713	2.10	0.47376	0.01359	0.72

Table 5.47: Regression results of Standard Bank Mutual Fund – 10-year

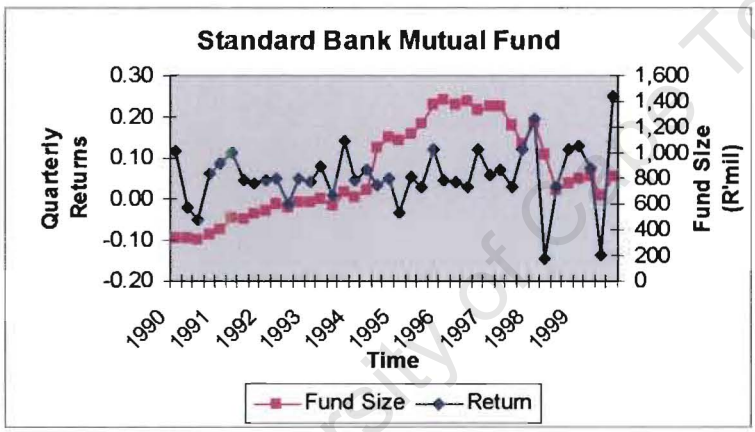

***Figure 5.19**: Graph of Standard Bank Mutual Fund - Fund Return against Fund Size*

The graph above shows that performance remained relatively stable within a band of between 0% and 10% per quarter before the market collapse in October 1998. The size of the fund remained stable until January 1996 when it increased significantly in size before stabilizing in the R1.4 billion range and then falling dramatically in 1998. Despite the seemingly relative stability of both variables prior to 1998, the regression results indicate that no statistically significant association exists between the nominal and risk-adjusted return variables as evidenced by the low beta coefficients and insignificant t-stats.

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Given the results of the above tests it would appear feasible to cluster the funds relative to their particular underlying equity holdings. To this end, an analysis was performed of the asset split, per sector, for each fund. It was found that the funds had 42% of their funds invested in the Industrial sector and 23% in the financial sector over the five-year period from 1 January 1995 to 31 December 1999 (no asset split data was available from I-Net prior to 1995). These statistics indicate that there existed little diversification within the South African unit trust industry over this period and hence clustering the funds per sector will not necessarily result in significantly different results. Further tests on clustered data will merely compound the results documented above.

5.1.3. Ranking Analysis

The aim of the ranking analysis was to determine the extent to which a range could be identified in which the fund returns, relative to fund sizes, were at their greatest. Although no significant relationship was identified between fund size and the dependant return variables, the ranking analysis was designed to reveal a point, or points where returns were consistently high in relation to fund size across all funds.

Each fund was ranked relative to its fund size on a quarterly basis using excel. The funds were then arranged into equal groups based upon their respective rankings. For the five-year period the 14 funds were grouped into seven groups of two and for the ten-year data the 32 funds were grouped into eight groups of four. In keeping with the time frame used in the regression analysis, this test was performed over a five and ten year period on those funds in continuous existence over these respective time periods.

For each quarter, the average for each of the respective dependant return variables, across all funds, was graded according to the fund size ranking. As no

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Alpha or Treynor data was available earlier than 1995, Sharpe and Total Returns were the only dependant variables used in the 10-year rank analysis. In the case of the 5-year data, eight groups of four funds were created making up the total population of 32 funds. The 10-year data was sorted into seven groups of two. The following results were observed.

5-year Ranking Analysis

5 YEAR Ranking Analysis					
Grouping	**Total Return**	**Alpha**	**Sharpe**	**Treynor**	**Asset Size**
1	1	5	1	6	2637.62
2	6	4	6	4	1072.76
3	2	6	5	5	715.79
4	3	7	4	8	577.68
5	5	3	2	1	442.51
6	7	1	7	7	243.20
7	8	8	3	2	132.18
8	4	2	8	3	100.81

Table 5.48: 5-year Ranking Analysis

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Total Return

The results of the total return ranking analysis indicate that the greater returns are experienced in the fund size range above R500 million. There appears to be drop offs in the performance of funds at the lower end of the size range, in the R100m to R240m size range, and at the upper end, between approximately R800m and the R2bn.

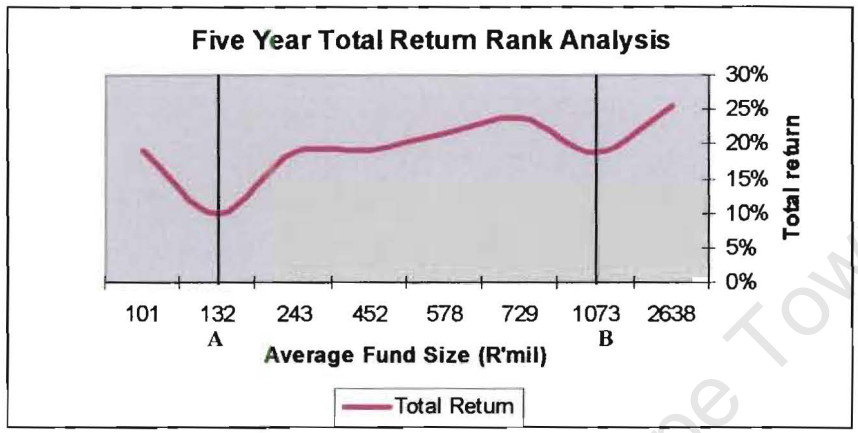

Figure 5.20: Graph of Five Year Total Return Rank Analysis

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The relationship depicted in the table is reflected graphically above. This analysis suggests that instead of there being a critical fund size range in which returns are maximized, the opposite would appear to be the case. Two points have been broadly identified at the upper and lower ends of the fund size range where nominal returns on equity unit trust funds fall significantly before rising again to their previous levels. These points are depicted as 'A' and 'B' above.

Alpha

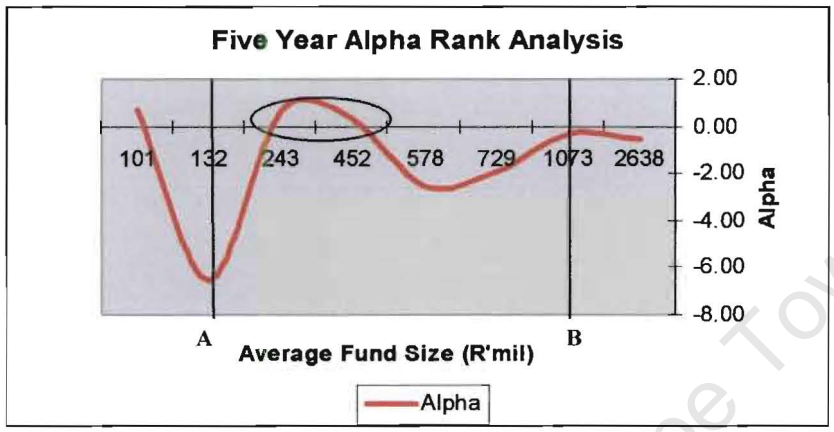

Figure 5.21: Graph of Five Year Alpha Rank Analysis

When the average Alpha variables per fund are plotted relative to each funds' fund size ranking, a similar phenomenon to that identified in the nominal return analysis is observed at the lower end of the fund size scale. Two lines 'A' and 'B', similar in position to those in the Total Returns graph, were plotted on the Alpha graph above. The dramatic fall in risk-adjusted performance at point 'A' would suggest that the portfolio managers of funds in the size bracket R100m to R230m are unable to generate superior returns relative to their counterparts at firms with fund sizes above and below this range. From the graph above, management of funds in the R240m to R450m bracket are able to generate positive, above average risk-adjusted returns. It would appear from the graph that most unit trust managers are unable to generate risk-adjusted returns as calculated by the Alpha equation. By implication, it would appear that most fund managers in the period 1 January 1995 to 31 December 1999 did not actively manage their respective portfolios and as a result were unable to beat the market most of the time. It is important to note, however, that whilst the investors' savings were eroded, fees continued to be earned on the assets under management.

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Sharpe

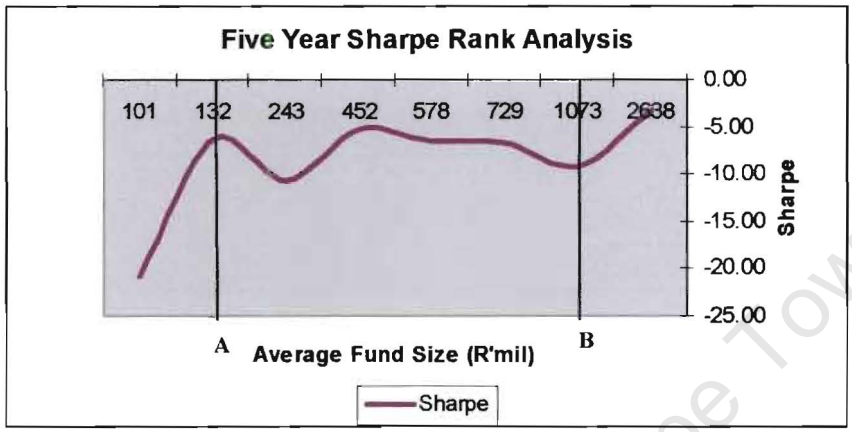

Figure 5.22: Graph of Five Year Sharpe Rank Analysis

When an identical analysis is performed using the Sharpe index, a similar pattern emerges except for the fact that point 'A' is one of the highest points of risk-adjusted return observed in relation to the rest of the series. As observed in the Alpha graph 5.20 above, this graph indicates that unit trust funds yield a return deficit per unit of total risk. The implication of this statement is that the average unit trust investor would have been better off investing in the money market over the five-year period. The suggestion that there exists a return-maximising fund size range would expect points 'A' and point 'B' on the graph above to mirror each other. This is, however, not the case as the risk-adjusted returns appear to rise beyond point 'B' as observed in the total returns, and to a lesser extent the Alpha analyses.

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Treynor

The Treynor index rank analysis suggests that between 1995 and 1999 no unit trust fund was able to generate positive risk-adjusted returns – this finding is consistent with the findings of the Alpha and Sharpe analyses. The results of the Treynor rank analysis indicate that funds greater than approximately R1bn in size tend to experience falling risk-adjusted returns whilst the best *relative* returns were generated by funds of approximately R450m in size.

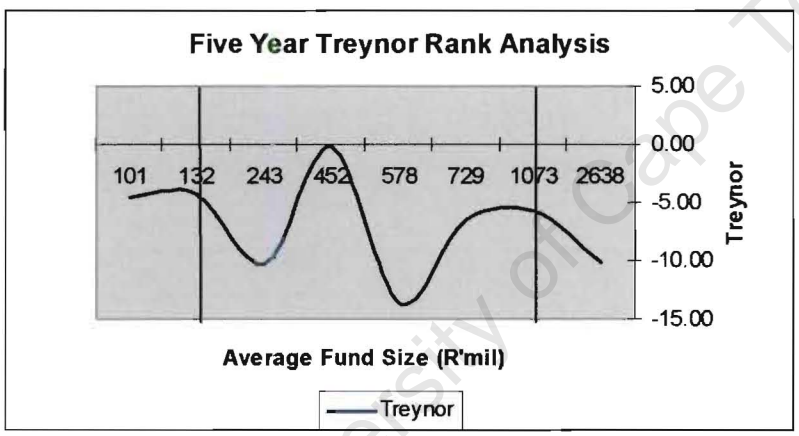

Figure 5.23: Graph of Five Year Treynor Rank Analysis

The ranking analysis does not suggest that a significant relationship between the dependant return variables and fund size exists. On the contrary, the analysis confirms the observations made in the regression analysis, namely that no consistent, significant relationship can be observed between fund size and return when testing all funds across the complete fund size spectrum. In addition, the ranking analysis does not suggest that a consistently identifiable optimum size range exists in which risk-adjusted returns are maximised.

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Ten-Year Ranking Analysis

10 Year Averages			
Group	Performance	Sharpe	Asset Size
1	3	5	3020.12
2	4	6	1018.90
3	2	4	593.41
4	1	3	466.18
5	7	1	251.64
6	6	2	120.40
7	5	7	76.46

Table 5.49: 10-year Ranking Analysis

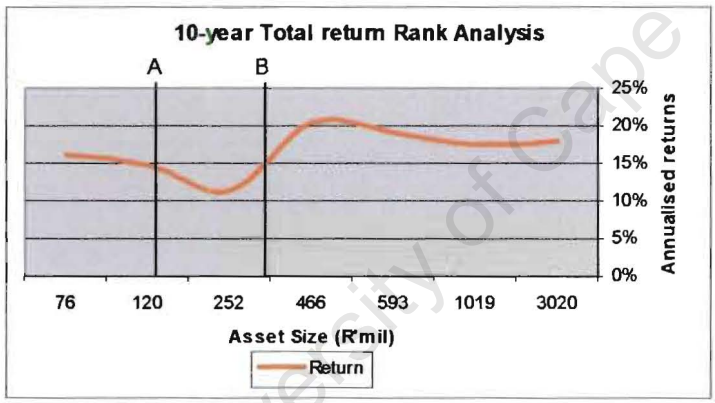

Figure 5.24: Graph of Ten Year Total Return Rank Analysis

It appears from the table and graphs in the 10-year analysis that the phenomena observed in the 5-year graphical analysis above are evident in the ten-year data too. Where, in the 5-year graph for total return, the fall off in performance was observed in the R100m to R240m size range, in the 10-year graph the same trend is observed broadly in the R100m to R300m range. Beyond the R300m fund size, the returns rise before steadying at about the R1bn mark.

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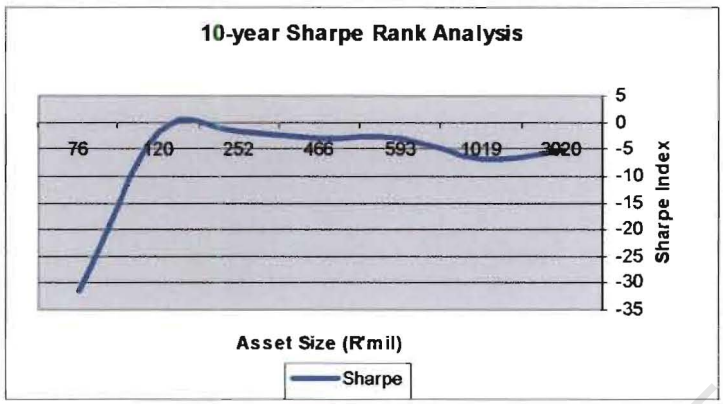

Figure 5.25: Graph of Ten Year Sharpe Rank Analysis

The Sharpe analysis over a 10-year period followed a similar path to that observed in the 5-year analysis. From the above graph, it would appear that the point of greatest risk-adjusted returns occurs in the R100m to R200m fund size range. Both the 5-year and 10-year analyses indicate that risk-adjusted returns appear to be lowest at the lower end of the asset size scale.

Whilst the regression findings indicate that no cause-effect relationship exists between the variables under analysis, this is not to say that an asset size range may exist in which consistently high relative returns are observed across the industry. This has, however, not been the case with regard to the findings detailed above.

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CHAPTER 6

6.1. Conclusion

As stated in the first chapter, the objective of this study was to investigate the following hypothetical relationships as a means of further defining the efficiency of the South African unit trust market:

1. There exists a statistically significant relationship between the performance of unit trust funds in South Africa and the size of assets under management (hypothesis 1).
2. There exists a statistically significant relationship between the size of unit trust funds in South Africa and the transaction costs incurred by the funds (hypothesis 2).

This study offered rationale for possible relationships between fund size and performance. Firstly, that as a fund performs well, so the extent of capital inflows rises and hence the fund's asset size increases. Secondly that the large size of a fund can cause it to become relatively illiquid and unable to transact efficiently in the secondary market – negatively effecting performance. In addition, this study suggested that an optimal fund size 'range' might exist in which returns on investment are maximised.

The results of the aggregate total and risk-adjusted return data as well as the expense data tested proved the null hypotheses to be valid in the case of both the first and second hypotheses. When the tests of the first hypothesis were

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performed on each fund individually, the findings were consistent with those observed for the industry as a whole.

Of the thirty-two funds analysed, using the total return measure, only the RMB Equity Fund exhibited results statistically different from zero at the 95% level - as tested by the t-stat. In this specific test, however, only 14% of the variation in total return was explained by fund size. In some cases R-squareds of between 15% and 20% were observed, which suggests that the potential for an excess return opportunity exists. However, when these results are observed in aggregate the relationships are random and insignificant. From these results, it can be concluded that, on aggregate, there exists no significant relationship between the total returns of unit trust funds and the size of assets under management.

The regression results of the Alpha tests were similar to those observed for the total return analysis. No fund under analysis exhibited a statistically significantly relationship between the fund managers' abilities to generate superior relative returns and the size of the assets they manage.

The t-stat was significant at the 95% level for the Old Mutual Balanced Fund when the Sharpe risk-adjusted returns of the thirty-two funds were regressed against fund size. Despite the fact that in this case asset size explained 29% of the movement in risk-adjusted return, as measured by the Sharpe index, no evidence of a consistent excess return opportunity was observed. From the results of the Sharpe tests, it can be concluded that no consistent support for the hypothesis that the extent of assets under management influences the return unit trust management companies are able to generate, per unit of total portfolio risk.

The Treynor regression results yielded similar results to those detailed above in the total return, Alpha and Sharpe analyses. No fund exhibited a consistent, statistically significant relationship between fund size and risk–adjusted return as measured by the Treynor measure.

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It is clear from the results of the return regression analysis that the first null hypothesis, which states that 'there exists *no* statistically significant relationship between the performance of unit trust funds in South Africa and the size of assets under management', must be accepted. It could be argued that a number of the results are significant at a 0.1 level as opposed to the 0.05 level used in this study. However, given the randomness observed in the results it is suggested that raising the significance level would not affect the findings of this study.

The findings of this study are consistent with the findings of Bradfield (1999) that over a four-year period, no evidence could be found of a statistically significant relationship between fund performance and size in the general equity sector of the South African unit trust industry. These findings are also consistent with those of Droms and Walker (1996) who found that US Dollar returns (as measured by total return, the Treynor and the Sharpe indices) are not related to fund size. In another study, Walker (1997) also found that the size of assets under management was not a significant factor in the performance of US mutual funds.

The secondary hypothesis that 'there exists a statistically significant relationship between the performance of unit trust funds in South Africa and the transaction costs incurred by the funds' is rejected and the null hypothesis accepted, on the grounds that no statistically significant relationship was found to exist between fund size and the expense-ratio. Given the lack of any statistically significant relationship between unit trust costs and fund size, it can also be concluded that economies of scale were not evident in the South African unit trust industry during the period from 1995 to 1999. A likely reason for this phenomenon is that cost savings generated by a large fund in the form of lower negotiated fees per transaction, are negated by the fees on additional transactions that must be entered into by the large funds in order to fill the larger deal orders. This finding is, however, contrary to the findings of Grosman and Stiglitz (1980) who found

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that larger unit trust funds were able to minimise transaction and research costs relative to returns by leveraging off their stronger capital and expertise bases.

Based upon the findings of these regression tests, it is suggested that the South African JSE Securities Exchange is efficient to the extent that fund managers are unable to achieve superior returns by adjusting the size of assets they manage yet inefficient to the extent that the secondary market does not exhibit levels of liquidity observed in the United States and Europe.

It is clear from the results of this study that South African fund managers were inefficient when it came to generating positive risk-adjusted returns over the period 1990 to 1999 – as suggested by the largely negative Alpha, Sharpe and Treynor risk-adjusted returns observed. Over the period 1990 to 1999, on average, investors would have been better off investing their wealth in the money market where lower levels of risk prevail.

The results of the 5-year ranking analysis of total returns, Alpha and Treynor indices, in addition to the 10-year analyses of total returns, indicated that at the lower end of the fund size scale there exists a fund size range where average total and risk-adjusted returns fall significantly relative to the rest of the population. These observations are consistent with the findings of Bradfield (1999). Bradfield's study found that the smallest 25% of funds analysed had the worst monthly returns.

This phenomenon is possibly as a result of a lack of fund management experience in the medium to small cap funds. During the period of analysis, from 1990 to 1999, there has been a surge in the growth of the unit trust industry. This unprecented growth has resulted in many a new unit trust management company opening its doors. From these results and in particular the finding that on average South African fund managers were unable to generate positive risk-adjusted returns over the period 1990 to 1999, it is suggested that the South African unit

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trust market is over-traded to the extent that there are too few experienced fund managers and too many funds. To this end, it is likely that the South African unit trust market will undergo a period of consolidation in the years to come.

As far as the identification of a return-maximising fund size range is concerned, neither the regression nor the rank analysis offered any indication of an optimal size range. It is concluded that no 'optimal' size range existed between 1990 and 1999 in the South African unit trust industry. This is not consistent with the findings of Indro, Jiang, Hu and Lee (1999) who found that during the period 1993 to 1995, of the 683 US Dollar funds analysed, 20% were smaller than the determined break-even fund size and 10% of the largest funds were over-spending on information and trading.

In summary, it is concluded that between 1 January 1990 and 31 December 1999 no significant relationship existed between total or risk-adjusted unit trust return and asset size and that fund size does not influence the extent of marginal costs incurred by South African unit trust funds.

Other potential areas for future research include the following:

- The impact of management tenure on the performance of unit trusts.
- The study of the fixed-income funds within the unit trust market. Given the relative ease of substitution of the underlying assets within these funds, their ability to generate economies of scale would appear to improve with increases in asset size.
- Although fixed income unit trust funds have not been included in this research paper, the following finding is of interest in the context of this thesis's objective. In relative contrast to the arguments put forward above, regarding the relationship between asset size and performance, Philpot and Hearth (1998) reported that economies of scale are experienced for bond mutual

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funds in the US, due to the relative[10] substitutability of bond issues for one another (liquid mobility of funds between issues) irrespective of the size of the fund. Thus size does not hinder the market mobility of the bond mutual fund - as the fund size increases, so the funds experience economies of scale over a wider range of fund sizes relative to equity funds. This phenomenon indicates the likelihood of there existing inefficiencies in the equity funds market in particular. The above observation regarding fixed income unit trusts is, however, an issue to be considered in further studies.

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[10] Relative to equity

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