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Do actively managed mutual funds deliver positive risk-adjusted performance in emerging markets? The case of South African equity unit trusts

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Abstract

As passive investing gains traction, an important question is whether active fund manager performance justify the fees charged. South Africa's investment industry is arguably the most developed in Africa, and this study therefore investigates whether actively managed South African equity unit trusts, both on average and individually, delivered positive excess returns, gross and net of fees, over the period 2003 to 2019. Using monthly fund returns for an unbalanced panel of the 93 actively managed SA equity funds in existence for at least three years during this period, industry average and individual fund alphas are determined, gross and net of fees, in terms of four well-established multifactor asset pricing models, namely the CAPM, the Fama-French Three-Factor Model, the Carhart Four-Factor Model, and the Fama-French Five-Factor Model. The study finds that, at an industry level, the average actively managed South African equity unit trust underperforms on a risk adjusted basis, delivering a statistically significant negative alpha in most multifactor models, both gross and net of fees. Further, depending on which model was used, between 67% and 92% of funds in the sample did not deliver positive excess returns after fees over the period. This suggests that the performance of most South African actively managed equity funds may not justify the fees charged to investors and supports the case for increased passive equity investing.

Keywords: Actively managed equity mutual funds; factor models; risk adjusted return; fees; passive investing.

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1. Introduction

The question of whether actively managed mutual funds deliver positive risk-adjusted performance, particularly on an after-cost basis, has long been debated in both academia and industry. This question has become particularly important in recent times with the huge growth in the popularity of index (i.e., passively managed) funds[1], mainly due to their much lower costs. The ability of actively managed mutual funds to deliver excess returns net of costs is highly relevant to retail investors globally, who would otherwise be better off investing in passive funds. French (2008), for example, estimate that the typical US investor would have been 67 basis points better off over the period 1998 to 2006 by switching to passive investing, whilst Pace, Hili and Grima (2016), using a sample of 776 US and European-based actively managed equity funds over the period 2004 to 2014, find that the risk-adjusted returns of these funds are similar to index-tracking, but only on a pre-cost basis. Thus, active managers are under increasing pressure to deliver substantial excess returns compared to passive benchmarks to justify their higher costs.

Although this issue has received much attention in developed markets (see, for example, Cremers, Fulkerson and Riley, 2019, for a useful review of research in this regard), this is much less so in emerging economies whose public equity markets have, as a group, been shown to be less efficient than those of developed countries (see, for example, Kayal and Maheswaran, 2018, and Lim and Brooks, 2010). In theory, therefore, it should be more possible to generate positive risk-adjusted equity returns in emerging markets than in developed ones. This lack of research extends to the African continent where South Africa, one of eight African stock markets found by Smith and Dyakova (2014) to have alternating periods of predictability and non-predictability (albeit second only to the Egyptian equity market in this sample with regards to efficiency), makes for an interesting case study in the context of emerging markets. Although it is a developing economy, South Africa has a very sophisticated financial system, including a well-established and significant mutual fund industry[2]. It is therefore not surprising that Kayal and Maheswaran (2018) find the FTSE/JSE All Share Index (ALSI) to be the fifth fastest

[1] For two relatively recent papers relevant to this debate that explore, respectively, (i) the bases on which professional asset managers choose between active and passive management, and (ii) the risk impact of the growth of passive investing at the expense of active investing, see Foster and Warren (2016), and Anadu, Kruttli, McCabe, and Osambela (2020).

[2] South Africa's first mutual fund (known locally as unit trusts) was established in 1965. As at 30 June 2021, the South African collective investment schemes, consisting of over 1,600 funds, had just under R2.9 trillion (approximately US$2 billion) under management (ASISA, 2021).

in adjusting to new information of the 23 emerging market equity indices tested in their study. As a result of a very concentrated local stock market (Raubenheimer, 2010), as well as exchange control regulations which limit offshore flexibility, South African mutual funds face a constrained opportunity set for active equity investment. These factors are typically not relevant to the large and well-diversified developed world equity markets on which much of the previous research on mutual fund returns focus, but do affect many other developing economies – especially those that are natural resource-based. This study therefore not only contributes to the mutual fund and passive vs. active investment debates within South Africa, but also within the developing world in general.

Collective Investment Schemes (CISs) account for nearly a third of investment in South Africa's Johannesburg Stock Exchange (SA National Treasury, 2017). Further, the most popular form of CIS in South Africa are equity mutual funds (also known as "unit trusts"), making this an easily accessible and widely used retail route into listed equity investment. In terms of size, in 2018, the South African mutual fund industry was approximately 31% of the size of the country's gross domestic product (GDP), as compared to 40% for Brazil, 5.6% for India, and 77% for the USA (Nguyen, Muhammad, & Kernohan, 2018). For South African retail investors, the South African active and passive equity unit trust industries, as well as mutual fund industries and investors operating in similar equity markets elsewhere, the issue of risk-adjusted return mutual fund is highly topical. By making use of a comprehensive range of academically well-established asset pricing models, and applying these to the JSE and all actively managed South African equity mutual funds in existence at any point over the period 2003 to 2019, this study investigates whether, on average, these funds delivered excess returns as measured in terms of four of the most recognised factor-based equity asset pricing models. This period was chosen for two reasons. Firstly, the South African asset pricing model factor data required for this study is only available from 2003. Secondly, this period includes the global financial crisis of 2007/8 and the subsequent recovery, which enables a more robust analysis of fund returns given various prevailing market conditions.

In addition to examining the South African actively managed equity industry as a whole (i.e., on a monthly industry average basis), risk-adjusted returns are also analysed per mutual fund using the selected asset pricing models and monthly data to further support the findings drawn from this study. Assessing individual funds allows the study to estimate the percentage of funds that over the period, in terms of the various models, outperformed on a risk adjusted basis – a question that is

relevant to both investors and multi-managers, whose business model depends on identifying fund managers who have a high probability of outperformance. Further, this study not only examines whether South African mutual funds deliver excess returns gross of fees, but also on a net of fee basis. The former tests whether South African active equity fund managers outperform the market on a risk-adjusted basis as measured in terms of the various models, whilst the net of fees step examines whether active management costs to retail investors are, on average, economically justified. The latter question is of great importance to investors, who want to obtain the optimal return to cost trade-off, as well as to both the active and passive segments of the investment industry, whose relative market competitiveness and value proposition depend on the answer to this question.

The remainder of this paper is organised as follows. Section 2 examines previous literature on the topic, Section 3 discusses the data collection process and methodology. The study results are presented and discussed in Section 4, and Section 5 concludes.

2. Literature review

The ability of actively managed mutual funds to outperform specific benchmarks has been a topic of academic research ever since mutual funds came onto the scene in the US in the early 1960s[3]. In line with ongoing developments in the fields of portfolio theory and asset pricing, over the years the measurement of fund performance has become increasingly sophisticated. In the 1960s, based on Modern Portfolio Theory, several researchers came to the conclusion that mutual fund performance measures need to consider risk, rather than focus only on returns. This resulted in the development of the well-known and widely used Treynor (1965) and Sharpe (1965) ratios as measures of risk-adjusted returns[4]. However, although useful ranking tools, neither ratio indicates how a particular portfolio performed relative to the market, nor which factors drive performance differences between portfolios (Singal, 2014).

Subsequent development of factor-based asset pricing models overcame the limitations of these early measures, allowing for risk-adjusted performance to be quantified against that of the market (i.e., passive investing). Jensen (1968) defined risk adjusted excess performance, or alpha, as the asset or

[3] For some recent studies in this regard, see Pilbeam.and Preston (2019).

[4] The Treynor Ratio is defined as the return of the asset less the return of the risk-free asset divided by the market risk or portfolio beta, whilst the Sharpe Ratio is defined as the return of an asset less the return of the benchmark, divided by the standard deviation of the asset excess return.

portfolio performance in excess of the performance predicted by the Capital Asset Pricing Model (CAPM) which, in turn, predicts the expected return of a portfolio based on its level of systematic risk (β). If a fund's alpha (also known as Jensen's Alpha) is greater than zero, the fund manager outperformed the market given the portfolio's systematic risk, whereas an alpha below zero is an indicator of risk-adjusted underperformance. Jensen's Alpha therefore allows for quantification of the level of over- or underperformance. However, the CAPM has been much criticised as simplistic in only considering market risk when estimating expected returns (Singal, 2014), and many studies find the relationship between systematic risk and returns predicted by the CAPM to not hold in practice (see, for example, Black, 1972; Reinganum, 1981, and Frazzini and Pedersen, 2014).

As a result, more sophisticated multifactor asset pricing models were developed, starting with the Fama and French (1993) Three-Factor Model. In addition to the market risk premium of the CAPM, this model also added a size factor to capture the tendency of small-cap stocks to outperform large-cap stocks, and a value factor that models the observation that stocks with high book-to-market ratios generally outperform stocks with low book-to-market ratios. The inclusion of these factors for the US equity market explained 20% more variation in expected returns relative to the CAPM (Fama & French, 1993). Unfortunately, the Three-Factor Model is unable to measure momentum-sorted portfolio returns (Fama & French, 1996), which arise from market inefficiencies caused by slow reaction to information. Based on the findings of Jegadeesh and Titman (1993) that stocks with price momentum continue to outperform and vice versa, Carhart (1997) added momentum as an additional factor, giving rise to the Carhart Four-Factor Model. The most recent widely accepted addition to the multifactor model family is the Fama and French (2015) Five-Factor Model, which adds factors that capture profitability and investment intensity, respectively, to the original Three-Factor Model. It is important to note that none of the five models discussed above are without critics, and that in all cases empirical evidence both for, and against, each model exists. Therefore, from a research perspective, it is advisable to cross-check any empirical findings against the main generally accepted academic factor models where possible[5].

[5] The authors acknowledge that the asset pricing literature is constantly evolving with the introduction of new multifactor asset pricing models attempting to address known market anomalies, of which Hou, Xue and Zhang (2020) lists 452. Some recent models include the eight-factor extension of the Fama and French Five Factor Model by Skoir and Lonarski (2018), the inclusion of a volatility factor (Jordan & Riley, 2015 and Jordan & Riley, 2019),

The application of these models to the measurement of risk-adjusted returns in the context of mutual funds, commonly found in research on developed markets such as the US and the UK, has led to diverse findings. Jensen's (1968) original study analysed 115 US mutual funds over the period 1955 to 1964 using his CAPM-derived alpha as a risk-adjusted return measure, and found that the funds, on average, did not outperform the market - not only net of fees, but also gross of fees. However, an exact replication of Jensen's study by Mains (1977), except for the use of monthly instead of annual data, found on average a positive alpha (i.e., outperformance) – an illustration of the sensitivity of results to the research method employed. Fama and French (2010) applied their Three Factor Model and the CAPM to a dataset of equity mutual funds for the period 1984 to 2006 and found that these funds on average delivered negative returns in terms of both models, specifically after management fees. This confirmed earlier results of Carhart (1997), Kosowski *et al.* (2006) and Gruber (1996).

In summary, according to an extensive review of the academic literature on mutual fund performance by Cuthbertson, Nitzsche and O'Sullivan (2010), academic studies overall find between 0% and 5% of UK and US actively managed equity mutual funds to have actual risk-adjusted positive performances net of fees, with about 75% of funds being found to have a close to zero net risk-adjusted performance, and about 20% having a real alpha-negative performance. Cuthbertson and Nitzsche (2013), in an original study, report a very similar result for actively managed German equity funds over the period 1990 to 2009 when using the Fama French Three Factor Model. Specifically, these researchers find 27% of funds to have a negative risk-adjusted performance, and no more than about 0.5% to outperform on this basis.

However, the same picture may not be true of (presumably) less efficient emerging markets. For example, in a study of Malaysian equity funds for the period 1996 to 2005 using the CAPM, the Fama-French Three-Factor Model and the Carhart Four-Factor Model, Lai and Lau (2010) find evidence of positive risk-adjusted returns for the industry overall over the period. A larger study by Huij and Post (2011), involving 137 mutual funds across 22 emerging countries,

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[5 cont] and the q-Factor Model and its augmented version, both of which include an expected growth factor (see Hou, Xue & Zhang, 2015 and Hou, Mo, Xue & Zhang, 2021). These models are not considered in this study as they have (as yet) not been widely adopted or accepted in the academic literature. There are further concerns that some of the plethora of recent factor models appearing in the literature may be based on data mining and/or statistical biases (see Hsu, Kalesnik, and Viswanathan, 2015, and McLean and Pontiff, 2016).

find some evidence that mutual funds can outperform the market, and also significant performance persistence that is greater for emerging markets than for developed markets. A weakness of this study is that it only uses CAPM as pricing model, and as the sample covered 1993 to 2006, it is possible that these markets have become more efficient in the meantime, and these results may no longer hold. Further, in a study of a sample of 520 Chinese equity mutual funds, using the CAPM and Carhart Four-Factor Model, Rao, Tauni, Iqbal and Umar (2017) find positive risk-adjusted returns for the majority of years of their study period of 2004 to 2014. These studies all seem to support the hypothesis that equity mutual funds may be able to deliver positive risk-adjusted returns within emerging markets, which contradicts the bulk of the evidence from developed markets – possibly because of differences in market efficiency. The latter is also advanced by Agarwal and Pradhan (2018) as the probable reason for their finding that Indian equity mutual funds deliver positive risk-adjusted returns. It needs to be noted, however, that most prior emerging market studies do not consider costs. This a major limitation from the perspective of potential investors, whose main concern is with after-cost adjusted returns, and not primarily mutual fund managers' investment skills.

Early studies in the South African context, which all relied on the CAPM as risk-adjusted return measure, assessed fund performance individually, and all suffered from small sample sizes. Thus, the studies of Gilbertson and Vermaak (1982) and Knight and Firer (1989) both used samples of around ten funds, and those of Oldfield and Page (1997) and Oldham and Kroeger (2005) samples of 17 and 20 funds, respectively. The former two studies found that some actively managed mutual funds outperform on the basis of the CAPM, whilst the latter two found that no or very few funds managed to do so. The first study to consider costs, albeit on the basis of nominal and not risk-adjusted returns, was that of Meyer-Pretorius and Wolmarans (2006), which concluded that, on average, equity fund managers did not outperform the market after adjusting for fees. Bertolis and Hayes (2014) analysed South African general equity unit trust risk adjusted performance over the period 1994 to 2012, again based on Jensen's alpha and the CAPM, and found an average alpha of just under 1% over the entire period, which was statistically indistinguishable from luck. Using the Treynor and Mazuy (1966) and the Henriksson and Merton (1981) models applied to a larger sample of 191 South African equity funds for the periods 2006 to 2016, Thobejane, Simo-Kengne and Mwamba (2017) find only weak evidence of market timing and stock selection abilities amongst fund managers, which is consistent with the overall findings in the South African context to date.

The above South African studies have three things in common. Firstly, to a greater or lesser extent, they all fail to find evidence of actively managed equity unit trusts delivering excess risk-adjusted performance (i.e., positive alpha). Secondly, none of the studies consider after-cost risk-adjusted returns, and thirdly, previous studies relied solely on Jensen's Alpha and the increasingly questioned CAPM to derive their findings. One reason for this reliance on only one model is that, until recently, the factors required to use the non-CAPM models in the South African context all had to be calculated from first principles – a time consuming and tedious exercise. However, these factors are now available from Legae Peresec (2020), making it possible for us to not only significantly update existing research in terms of both time period and sample size, but also to obtain more robust results by expanding our methodology to also use more sophisticated asset pricing models than the CAPM at an aggregate and fund-level.

3. Data and methodology

3.1. Sample and data selection

This study focuses on the *South African – Equity – General* category of funds. Such funds must invest at least 60% of assets in South Africa. 10% of assets may be invested in Africa (excluding South Africa) and the remaining 30% may be invested globally. Funds must always invest at least 80% of asset value in equities and should generally seek capital appreciation as the primary objective. No restrictions are placed on how funds allocate capital across different equity industries or shares, allowing fund managers to use different investment styles and invest across a wide range of equities (ASISA, 2018). Survivorship bias[6] was avoided by including all funds active at any time during the sample period. This resulted in a final sample of 92 funds, after the removal of funds with less than 36 months of return data (10), passive/index funds (14), large cap funds (9), mid and small cap funds (6), property equity funds (13), industrial equity funds (3), financial equity funds (2), income funds (1), unclassified funds (3), and funds without return data (3). The sample period comprised of 192 months from July 2003 to June 2019. On average, data was available for 129 months (10.75 years) per fund. 19.4% of funds (18 funds) were in existence throughout the sample period, and more than 50% of funds existed for over 139 months

[6] Survivorship bias is the tendency to view the fund performance of existing funds in the market as a representative comprehensive sample. Survivorship bias can result in the overestimation of historical performance and general attributes of a fund (Chen, 2017, Pawley, 2006).

(11.58 years). In total, 23,892 monthly observations were included in the study, of which half were fund returns net of fees, and the other half were fund returns gross of fees.

Monthly fund returns and expense ratios were sourced from Bloomberg. Where expense ratios were not available, they were collected directly from the respective fund fact sheets. In addition, for a group of randomly selected funds, expense ratio data as obtained from Bloomberg were cross-checked against original fund factsheets. Monthly risk-free rates were collected from Bloomberg, using the change in the Short-Term Fixed Interest (STeFI) index, which tracks the performance of different short-term risk-free assets, as a proxy for the prevailing one-month market interest rate. The FTSE/JSE All Share Index, which contains most of the shares held by unit trusts, was used as a market benchmark. Additionally, this study assesses fund performance using the Shareholder Weighted Index (SWIX) in place of the JSE All Share Index to further validate fund performance against market benchmarks. Monthly returns on the SWIX were obtained from Bloomberg. Monthly market cap-weighted factor data for the JSE single-factor and multifactor asset pricing models used in this study were obtained from Legae Peresec, a registered South African financial services provider.

Net monthly returns were calculated for each fund as the percentage change in its total return index (TRI), which includes both changes in net asset value (NAV) and distributions paid. The NAV is net of fund management, administration and other fees extracted from fund assets. Sales charges are not considered, as they reflect a payment for financial advice received and is not relevant for evaluating the performance of fund managers. Therefore, the net monthly return gives an accurate indication of the return earned by investors in the fund after costs associated with receiving fund management services are considered. Gross monthly returns were determined by adding back the most recent monthly total expense ratio[7], an approximation derived from the annual total expense ratio obtained from Bloomberg, to the net monthly return[8].

Risk-adjusted returns were determined using four asset pricing models, namely the CAPM, the Fama-French Three-Factor Model (FF3FM), the

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[7] The total expense ratio measures the percentage of fund assets paid for services used in the management of a portfolio, including operating expenses and management fees.

[8] Our analysis indicated that the total expense ratio for a specific fund does not vary significantly over time, and therefore this approximation appears to be justified.

Carhart Four-Factor Model (C4FM), and the Fama-French Five-Factor Model (FF5FM). The monthly market cap-weighted factor scores for the four models were obtained from Legae Peresec and were regressed against the monthly mean return of all funds in the sample during the sample period. Market cap-weighted (instead of equally-weighted) factor scores were used, as this was considered more representative of the market cap-weighted benchmarks against which funds typically invest. Simple (used for the CAPM approach) and multiple linear regression (used for all multi-factor asset pricing models) was used to assess fund returns (both on average and for each individual fund) relative to factor returns on a monthly basis. All regression models were run twice, using as dependent variables, respectively, return in excess of the risk-free rate before fees, and then returns in excess of the risk-free rate after fees. This was done using the mean returns of all funds in the study, as well as for each of the 92 individual funds. Gross risk adjusted fund performance serves as an indication of whether active fund managers on average outperformed (by skill or by luck or a combination of the two), whilst net risk adjusted fund performance tests whether active management costs were justified by gross outperformance, if any.

The asset pricing model factors that were obtained from Legae Peresec (2020) were estimated as per the original methodologies of Fama and French (1993), Carhart (1997), and Fama and French (2015) for the Three-, Four- and Five-Factor Models, respectively, with a minor adjustment to the Three-Factore Model as indicated below. In all regression models, the market risk premium (total ALSI return minus risk-free rate) was used as the market factor. Size is defined as the market capitalisation value of the stock as at the end of the previous month (Fama & French, 1993). The shares in issue and share price are taken directly from the underlying FTSE/JSE index data. Value is defined as the ratio of book value to market value and is computed by taking the most recent book value six months prior to the current month and dividing it by the market value as at the end of the previous month. This is slightly different to the original definition of Fama and French (1993), but is in-line with the alteration proposed by Asness and Frazzini (2013). Momentum is defined as the prior twelve-month total stock return, less the prior month's return to account for any short-term reversal effects (Carhart, 1997). Lastly, profitability is defined as the ratio of total operating profit (total revenue, net of sales and other expenses) to the most recent book value for the previous year (Fama & French, 2015). Investment is defined as the relative growth in total assets six months prior to the current month (Fama & French, 2015).

In order to confirm statistical significance of findings, the t-statistic for calculated alphas was recorded and analysed for each model, gross and net of fees. Additional indicators, such as R-square (or adjusted R-square in the case of multi-factor models), variance inflation factors (VIFs), and F-statistics were also considered to assess overall model quality.

The five asset pricing models used are as given by Equations 1 to 4 below. In all cases, the variable of interest was the alpha, which measures the monthly average return in excess of the risk-adjusted return predicted by the specific model, with positive and negative alphas

3.2. Models

OLS regression models were used to assess risk-adjusted returns, with the independent variables being excess monthly returns relative to the risk-free rate, and the dependent variables the monthly factor scores as obtained from Legae Peresec. The OLS model has been commonly used for assessing mutual fund performance in past studies[9].

Model 1: The CAPM:

$$R_t - R_{ft} = \alpha + \beta_1 (R_{Mkt} - R_{ft}) + e_t \quad (1)$$

Where R_t is the average monthly returns of all the funds, R_{Mkt} is the corresponding monthly return of the ALSI, and R_{ft} is the corresponding monthly return of the STeFI.

Model 2: The Fama-French 3-Factor Model (FF3FM):

$$R_t - R_{ft} = \alpha + \beta_1 (R_{Mkt} - R_{ft}) + \beta_2 Size_t + \beta_3 Value_t + e_t \quad (2)$$

Where *Size* is the size factor score return for month *t*, and *Value* is the value factor score return for month *t*, and the other variables are as above.

Model 3: The Carhart 4-Factor Model (C4FM):

The C4FM is an extension of the FF3FM and the regression equation is as follows:

$$R_t - R_{ft} = \alpha + \beta_1 (R_{Mkt} - R_{ft}) + \beta_2 Size_t + \beta_3 Value_t + \beta_4 Momentum_t + e_t \quad (3)$$

Where β_4 is the coefficient of the independent variable, momentum, and *Momentum* is the momentum factor score return for month *t*, and the other variables are as above.

[9] For recent examples, see Jordan and Riley (2016), Agarwal and Pradhan (2018), and Sha and Gao (2019).

Model 4: The Fama-French 5-Factor Model (FF5FM):

$$R_t - R_{ft} = \alpha + \beta_1(R_{Mkt} - R_{ft}) + \beta_2 Size_t + \beta_3 Value_t + \beta_4 Profitability_t + \beta_5 Investment_t + e_t \quad (4)$$

Where *Profitability* is the profitability factor score return for month *t*, *Investment* is the investment factor score return for month *t*, and the other variables are as above.

4. Research findings and analysis

The descriptive statistics for the regression variables across all models are shown in Table 1.

Table 1: Descriptive Statistics for Regression Variables

	Excess gross return	Excess net return	Cap weighted model factors					
			MRP	**Size**	**Value**	**Momentum**	**Profitability**	**Investment**
Mean	0.73	0.60	0.75	1.24	1.25	1.72	1.49	1.36
Std Error	0.25	0.25	0.31	0.28	0.28	0.31	0.28	0.30
Median	0.86	0.73	0.87	1.32	0.94	1.86	1.59	1.41
Std Dev.	3.41	3.41	4.28	3.85	3.90	4.26	3.88	4.17
Ex. Kurtosis	0.69	0.69	0.62	1.66	0.56	0.82	0.24	0.18
Skewness	-0.32	-0.32	-0.18	-0.61	-0.12	-0.29	-0.21	-0.06
Range	18.73	18.74	25.88	24.03	23.96	25.97	20.63	23.23
Minimum	-10.29	-10.41	-14.25	-14.09	-12.96	-13.86	-10.19	-11.07
Maximum	8.45	8.33	11.63	9.94	11.00	12.11	10.44	12.16
Count*	192	192	192	192	192	192	192	192

For the equally-weighted portfolio consisting of the 93 funds in this study, the average monthly excess return, gross and net of fees, was 0.73% and 0.60%, respectively, over the sample period. Thus, over the 16-year sample period the average monthly active management cost was 13 basis points, or 1.45% annualised. All variables display negative skewness. The momentum factor of the C4FM displays the greatest average monthly return, indicating that over the period the momentum factor had the greatest impact on excess returns. On average, the equally-weighted portfolio of mutual funds slightly underperformed the market by approximately two basis points per month (0.24% per annum) before accounting for fees. Once fees are considered, the

same equally-weighted portfolio underperformed the market by an average of fifteen basis points per month (1.80% per annum). The standard deviation of excess returns of the portfolio (both net and gross of fees) is lower than the standard deviation of excess returns of the market. Given that equity mutual funds sometimes also hold limited amounts of cash (which does not earn any return and hence has no volatility), this is expected.

All independent variables were tested for multicollinearity using two measures. Firstly, a correlation matrix (see Table 2 below) was constructed for each multifactor model to assess whether variables were highly correlated with one another. In many cases, this showed positive correlations above 0.5. Secondly, the Variance Inflation Factor (VIF) was calculated for each independent variable for each multifactor model. The largest observed VIF was 3.63, which lies well within the acceptable range of 1 to10 for VIF scores.

TABLE 2: CORRELATION MATRIX FOR MULTIFACTOR MODELS

FF3FM	**MRP**	**Size**	**Value**
MRP	1		
Size	0.69	1	
Value	0.68	0.86	1

C4FM	**MRP**	**Size**	**Value**	**Momentum**
MRP	1			
Size	0.70	1		
Value	0.68	0.87	1	
Momentum	0.84	0.80	0.69	1

FF5FM	**MRP**	**Size**	**Value**	**Profitability**	**Investment**
MRP	1				
Size	0.69	1			
Value	0.68	0.86	1		
Profitability	0.80	0.86	0.76	1	
Investment	0.84	0.80	0.80	0.77	1

The summarised outputs of the eight regression models (four asset pricing models, both gross and net of fees) are shown in Tables 3 to 6 below.

Table 3: Summarised CAPM Regression Outputs

	α (%) monthly	**α (%) annualised**	**T-Stat (α)**	**MRP (β)**	**R^2**
Equally-Weighted Portfolio (Gross)	0.17*	2.06	1.91	0.74***	0.87
Equally-Weighted Portfolio (Net)	0.05	0.60	0.52	0.75***	0.87

Note: Statistically significant at 1% (***), 5% (**), or 10% (*) significance level.

The single-factor CAPM produced a positive monthly alpha of 0.17% which is statistically significant at the 10% level. Thus, in terms of the CAPM, South African equity mutual funds on average outperform the market by 2.06% per year on a risk-adjusted basis, but net of fees, the monthly alpha decreases to 0.05% (0.60% per year annualised). This finding is not statistically significant, however, and therefore it cannot with any degree of statistical certainty be concluded that funds perform better than the market net of fees. These findings are in line with those of Meyer-Pretorius and Wolmarans (2006) but contradict the results of Oldfield and Page (1997).

When analysing each individual fund's performance using the single factor CAPM model, 53 funds (57% of the total sample) were found to deliver a positive average monthly alpha gross of fees. When adjusting for fees this decreases to 31 funds (33% of the sample). Further, when considering annualised returns, only 20 funds (22% of the sample) delivered an average alpha of greater than or equal to 1% net of fees (compared to 44 funds, 47% of the sample, gross of fees). These findings indicate that a high proportion of funds who are able to deliver outperformance relative to the market risk premium, on average charge fees that largely negate this benefit to investors.

Table 4: Summarised Fama-French 3-Factor (FF3FM) Regression Outputs

	α (%) monthly	**α (%) annualised**	**T-Stat (α)**	**MRP (β_1)**	**Size (β_2)**	**Value (β_3)**	**R^2 adj**
Equally-Weighted Portfolio (Gross)	-0.09	-1.08	-1.34	0.54***	0.23***	0.10***	0.94
Equally-Weighted Portfolio (Net)	-0.21***	-2.49	-3.25	0.54***	0.23***	0.10***	0.94
VIF			2.12	1.34	2.31	2.28	

Note: Statistically significant at 1% (***), 5% (**), or 10% (*) significance level.

The FF3FM generates negative annualised alphas both gross and net of fees, but neither is statistically significant. Interestingly, the funds in the sample seemed to have had much greater exposure to the size factor (coefficient ~0.23) than the value factor (coefficient ~0.10).

At an individual fund level, only 13 funds (14% of the sample) deliver a positive average monthly alpha net of fees when using the FF3FM (compared to 29 funds, or 31% of the sample, who deliver a positive average monthly alpha gross of fees). Of the 13 funds, 4 funds delivered an average annualized alpha of greater than or equal to 1% net of fees.

TABLE 5: SUMMARISED CARHART 4-FACTOR (C4FM) REGRESSION OUTPUTS

	α (%) monthly	**α (%) annualised**	**T-Stat (α)**	**MRP (β_1)**	**Size (β_2)**	**Value (β_3)**	**Momentum (β_4)**	**R^2 adj**
Equally-Weighted Portfolio (Gross)	-0.19***	-2.26	-2.95	0.46***	0.18***	0.10***	0.14***	0.95
Equally-Weighted Portfolio (Net)	-0.32***	-3.77	-4.88	0.46***	0.18***	0.10***	0.14***	0.95
VIF				2.12	3.46	2.60	2.81	

Note: Statistically significant at 1% (***), 5% (**), or 10% (*) significance level.

In terms of the C4FM, on average monthly alpha was found to be -0.19% gross of fees and 0.32% net of fees, with both being highly statistically significant. Therefore, after adjusting for fees, there is significant evidence of a risk-adjusted underperformance of 3.77% per year over the sample period. Further, the average fund had a larger exposure to the size and momentum factors, in comparison to the value factor.

Further, when using the C4FM, 7 funds (8% of the sample) deliver a positive average monthly alpha net of fees (compared to 22 funds, or 24% of the sample, who deliver a positive average monthly alpha gross of fees). One fund delivered an average monthly alpha of greater than or equal to 1% net of fees.

TABLE 6: SUMMARISED FAMA-FRENCH 5-FACTOR (FF5FM) REGRESSION OUTPUTS

Mean fund returns	**α (%) monthly**	**α (%) annualised**	**T-Stat (α)**	**MRP (β_1)**	**Size (β_2)**	**Value (β_3)**	**Profitability (β_4)**	**Investment (β_5)**	**R^2 adj**
Equally-Weighted Portfolio (Gross)	-0.13*	-1.55%	-1.86	0.52***	0.18***	0.11***	0.10***	-0.03	0.94
Equally-Weighted Portfolio (Net)	-0.25***	-2.96%	-3.68	0.52***	0.18***	0.11**	0.10***	-0.03	0.94
VIF				2.51	3.63	2.40	3.04	2.87	

Note: Statistically significant at 1% (***), 5% (**), or 10% (*) significance level.

The FF5FM-based model indicates negative monthly alpha on average, statistically significant at a 1% level, once fees have been considered. The results indicate that the market risk premium, size and value factors, have statistically significant effects on the fund returns, and that the funds are most sensitive to the market and small cap shares than the other factors. Equity mutual funds appear to have had very limited exposure to both the investment and profitability factors over the sample period.

At a fund level, when using the FF5FM model, 13 funds (14% of the sample) deliver a positive average monthly alpha net of fees (compared to 17 funds, or 18% of the sample, who deliver a positive average monthly alpha gross of fees). 7 Funds (8% of the sample) delivered an average monthly alpha of greater than or equal to 1% net of fees.

The coefficient of the market-risk premium (MRP) of 0.74 for the CAPM, is positive and highly significant at the 1% level. As other factors are added into the other multifactor models, the coefficient of the MRP decreases (to 0.54 for the FF3FM, 0.46 for the C4FM, and 0.52 for the FF5FM). The adjusted coefficients of determination (R2 adj.) for all the models are greater than 0.87, and average 0.93, indicating that the models fit the data quite well.

Some South African mutual funds use the JSE's Shareholder Weighted Index (the SWIX) as a benchmark instead of the All-Share Index. Therefore, to test for robustness of the findings, separate regressions were run where the SWIX was used as the market proxy instead of the All-Share Index. The results mostly confirmed that funds, on average, deliver negative excess returns gross

and net of fees for all multifactor models. In line with the findings above, the single factor model illustrated (on average) that funds deliver positive excess returns gross and net of fees. However, the single factor model using the SWIX displayed an R-Square of less than 1%, indicating the data poorly fits the mode, thereby reducing the validity of the results. This is not surprising, as the model factors obtained from Legae Peresec (2020) were obtained through regressions involving the ALSI, and not the SWIX. The adjusted R-Square statistics for the SWIX multifactor models ranged from 71% to 87%, indicating that the additional factors significantly improve the model fit. For three multifactor models (i.e., excluding the CAPM), the average monthly alpha gross and net of fees was -0.41% (-4.81% annualised) and -0.53% (-6.19% annualised), respectively.

Table 7 summarises the overall results of this study with regards to risk-adjusted returns derived against the various pricing models.

Table 7: Summary of Results for the Period 2003-2019

	Industry monthly alpha based on equally weighted average monthly returns				**% of funds with positive monthly alpha's**			
Model	CAPM	F&F 3-Factor	Carhart 4-Factor	F&F 5-Factor	CAPM	F&F 3-Factor	Carhart 4-Factor	F&F 5-Factor
Gross of fees	0.17*	-0.09	-0.19***	-0.13*	57%	31%	24%	18%
Net of fees	0.05	-0.09	-0.32***	-0.25***	33%	14%	8%	14%

Note: Statistically significant at 1% (***), 5% (**), or 10% (*) significance level.

The results reported above largely correspond to similar research done in the UK and the US, where most evidence using factor models report positive alpha's for typically between 0% and 5% of funds (Cuthbertson, Nitzsche & O'Sullivan, 2010). They do, however, differ from studies conducted in a number of developing countries, such as China, for which Rao, Tauni, Iqbal and Umar (2017) report mostly positive alpha values in terms of the CAPM and Carhart Models, and India, where Agarwal and Pradhan (2018) similarly find evidence that equity mutual fund managers have stock picking abilities when tested against the Carhart and Fama French Models. For the latter study, these results are ascribed to the relative inefficiency of the Indian stock market relative to developed stock markets which, considering our results, implies that the South African equity market is possibly relatively more efficient compared to that of (at least some) other emerging countries. This is consistent with a view that South Africa's public equity market is relatively well developed.

5. Conclusion

This paper evaluates the performance of actively managed equity unit trusts in South Africa by assessing their observed monthly excess returns, both individually and on average. It is found that, when using more sophisticated multi-factor pricing models than the commonly used measures such as the Sharpe and Treynor ratios to evaluate fund performance, on average South African mutual funds (as has been found in several prior developed country studies) typically underperform both gross and net of fees. The CAPM is the only asset pricing model tested that suggest that active managers on average outperformed the market before and after fees, although net of fees even this outperformance is marginal, and only statistically significant at the 10% level. After including various additional independent risk variables by applying the FF3F, C4F, and FF5F Models, no evidence of outperformance is found, even gross of fees. Across these models, average industry alphas ranged from -0.21% to -0.32% per month, net of fees. Furthermore, only between 8% (using the C4F Model) and 34% (using the CAPM) of funds in the sample delivered a positive risk-adjusted return net of fees over the period investigated. Our findings at a fund-level further indicate that only a small proportion of funds outperformed market risk-return benchmarks to deliver positive alphas net of fees. This proportion decreases further when using more multi-factor models as performance benchmarks.

These results support several conclusions with regards to South African actively managed equity mutual funds. Clearly, the assessment of risk-adjusted fund performance is very dependent on the benchmark or model used. Thus, funds that deliver positive "alpha" under traditional risk-return ratios such as the Sharpe, Treynor and Information Ratios, may not do so when assessed in terms of more sophisticated asset pricing models. In fact, our findings suggest that the industry on average does not deliver positive alpha, both gross and net of fees, under most of the well-known asset pricing models. However, the study finds that there is a minority of funds (between 8% and 33%, depending on asset pricing model used) that deliver positive alpha net of fees. Further, these fees play a substantial role in eroding away risk-adjusted returns for many funds that would otherwise have delivered small positive alpha values. Thus, whilst between 24% and 57% funds delivered positive risk-adjusted gross returns depending on the model used, only between 8% and 33% of funds (again depending on the model used) did so after adjustment for fees[10].

[10] Note that in both the gross and net adjusted return cases the higher end of the range was found using the CAPM, whereas the three more comprehensive models gave averages of 24% and 12% of funds in the sample delivering positive gross and net risk adjusted returns, respectively.

The implications for the industry and investors are as follows. For investors, these results seem to support the widely held view that most investors (especially retail ones) are better off simply investing in low fee passively managed index-tracking funds (so-called exchange traded funds, or ETFs). Those investors who do want to extract additional risk adjusted return through actively managed investing, will have to do extensive homework to identify the small group of funds that do deliver risk-adjusted returns, and even these returns are in most cases marginal at best, at least in terms of the models we used. Furthermore, it is extremely difficult to determine whether any historical positive fund alpha performance resulted from luck or skill, and hence whether this is likely to persist or not.

For the industry, the first implication is that achieving positive alpha is very difficult once more sophisticated risk-return measures are used. As investors become more aware of these, more funds are likely to move from actively to passively managed funds, a trend that is already evident worldwide. Furthermore, these results once again underline the important impact of fund management fees and their effect on the risk adjusted returns experienced by the investor, and hence the increasing importance of finding ways to minimise these in an increasingly competitive industry. The above results also have implications for multi-managed funds. Specifically, although there seems to be a role for multi-managers to research and find the small subsample of actively managed equity funds that do deliver positive alpha, this value-adding service can easily be eroded away by the additional layer of fee involved. Thus, this part of the South African investment industry faces an extremely difficult challenge of balancing costs with the equally complex task of identifying positive alpha funds and fund managers.

Biographical notes

Francois Toerien is Associate Professor of Finance in the Department of Finance and Tax at the University of Cape Town, South Africa. His research interests are in asset pricing and the financial markets, as well as alternative assets and, more recently, entrepreneurial finance and financial literacy. He is also both a CFA and CAIA charter holder.

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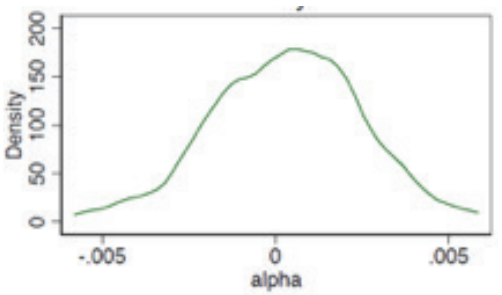
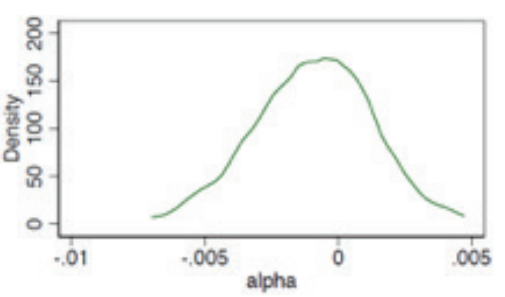
Appendix 1: Fund excess return distributions by model

A. Capital Asset Pricing Model (CAPM)

Gross of Fees

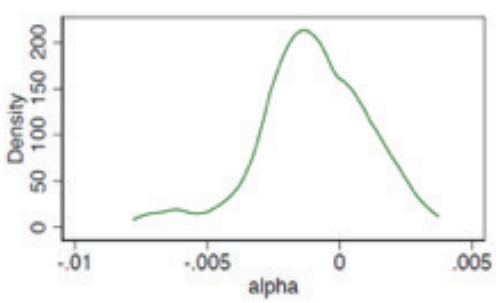


Net of Fees



B. Fama-French Three-Factor Model (FF3FM)

Gross of Fees



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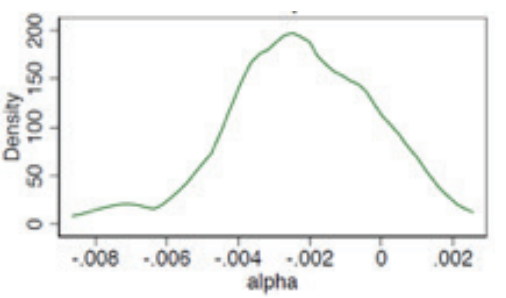
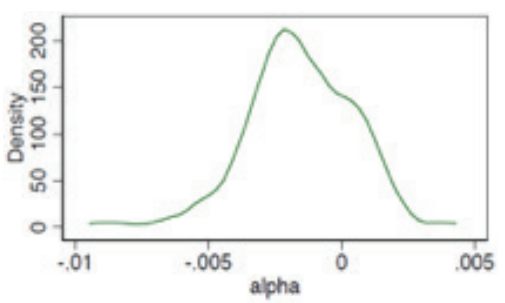
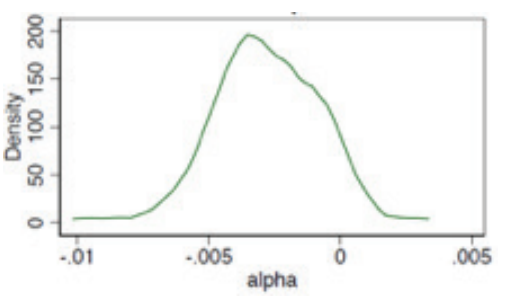


C. Carhart Four-Factor Model (C4FM)

Gross of Fees

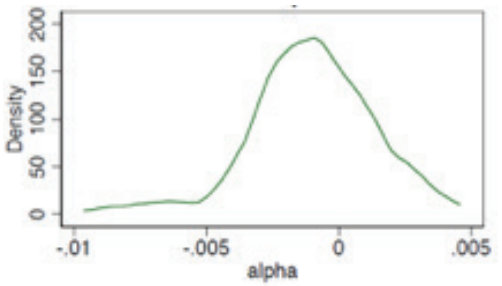


Net of Fees



D. Fama-French Five-Factor Model (FF5FM)

Gross of Fees



Net of Fees