



Style Adjusted Performance of South African General Equity Unit Trusts

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Abstract

The performance of South African General Equity Unit Trusts is investigated in order to establish if managers are able to add value after adjusting for style exposure. The analysis is performed from January 2003 to December 2012 using three alternative methodologies including unconstrained regressions, returns-based style analysis and return decomposition. The results indicate that the majority of unit trust manager's style adjusted excess return is not statistically different from zero and the performance can be replicated using passive style indices. While the majority display negative style adjusted excess return there are individual unit trusts which consistently are able to outperform across the different methodologies and time periods. The economic significance of this positive alpha can be large over a longer period of time.

Keywords: return-based style analysis; general equity unit trusts; managerial performance; return decomposition

Declaration

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I, Christopher Eddy, declare that:

Style Adjusted Performance of South African General Equity Unit Trusts

Is my own work and that all the sources that I have used or quoted have been indicated and acknowledge by means of complete references.

Signature

Christopher Eddy

Date

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1. Introduction

Investment styles such as value, growth and size have been widely documented, both internationally and in South Africa. Many active managers in South Africa subscribe to certain investment styles and incorporate these styles into their investment philosophy. These investment styles seek to exploit capital market anomalies in search of outperformance relative to the general market. In addition, active managers seek to enhance their performance by employing security selection and attempting to time their exposure to these styles.

When adopting specific styles, an active manager is exposed to specific risks relating to each style. Performance should always be viewed in light of the risks taken and as a result, these style tilts should be factored in when analysing the performance of unit trusts. There has been a large amount of empirical literature that suggests that fund managers are unable to add significant economic benefit through stock selection and that returns to funds are mainly driven by exposure to underlying asset classes. It can be argued, that the different styles can be viewed as different asset classes due to each style demonstrating returns that have low correlations with each other; or if not, different standard deviations. This paper undertakes to investigate whether South African General Equity Unit Trust managers possess skill and are able to significantly achieve outperformance on a style risk-adjusted basis.

This study examines and contrasts three methods of measuring style adjusted performance. Firstly, performance is measured in a traditional APT framework adapting and extending the work of Von Wielligh and Smit (2000). Subsequently, returns-based style analysis (RBSA) is used to develop specific custom style benchmarks against which to measure fund performance. Finally, RBSA is used over different estimation windows, to estimate the short term and long term exposures to the underlying indices. The short term and long term weights are used in a generalised return decomposition, to decompose a unit trust's excess

return on a style adjusted basis into return due to stock selection and return due to market timing.

Due to the style benchmark being constituted from passive indices, it is important to note that the performance of this benchmark can be replicated by holding the passive indices in the same weighting as the unit trust. If an active manager is found not to add any value after adjusting for style exposure, the implication is that an investor can replicate this performance using the passive underlying alternatives.

This study follows on with a literature review covering evidence of equity styles both internationally and in South Africa, followed by a review of traditional performance measures, RBSA and style generalised decomposition and concludes with evidence of style analysis and stock selection of mutual funds and unit trusts. After the literature review, the data used in this study is described. This is followed with the outlining of each methodology adopted for this study. The limitations of this study are then explained and the results are stated. The results are then interpreted and conclusions are drawn.

2. Literature Review

2.1 Equity Styles

There has been a large amount of financial literature examining stock market anomalies. Schwert (2002) refers to anomalies as empirical results that seem to be inconsistent with maintained theories of asset pricing behaviour. The value effect is one such anomaly which was first documented in Basu (1977). Basu (1977) finds that over a long period of time, portfolios with low Price-Earnings (PE) ratios tend to outperform on average when compared to portfolios with high PE ratios. The study is conducted on the New York Stock Exchange (NYSE) over the period April 1957 to March 1971. The low PE portfolios tend to outperform the High PE portfolio in absolute and risk adjusted terms. Lakonishok, Shleifer and Vishny (1994) find evidence of a value premium when they examine the value effect using stocks listed on the NYSE and the American Stock Exchange (AMEX), over the period 1963 to 1990. They construct portfolios of stocks based on cash flow-to-price (C/P), earnings-to-price (E/P), book-to-market (B/M), as well as the average historical 5-year growth rate of sales. They found in addition to the documented high earnings yield/low PE effect that stocks which had high B/M, C/P and low historical sales growth outperform their growth counterparts. This work is supported by the findings of Rosenberg, Reid and Lanstein (1995) who find that positive abnormal returns seem to accrue to portfolios of stocks with high book-to-market values.

The size effect was first documented by Banz (1981), and later supported by Reinganum (1981). They find that, after controlling for risk, stocks with small market capitalisation tend to display higher returns than stocks with large market capitalisation. Fama and French (1992) further emphasize the size and value effects and consolidate empirical findings on these anomalies. Both anomalies are tested from 1963 to 1990 on the NYSE, AMEX and the National Association of Securities Dealers Automated Quotations (NASDAQ). They find that B/M ratio and market capitalization are able to describe cross-sectional equity returns over the examination period. Fama and French (1993) construct a 3-

factor model with factors for the market, value and size. They find that the 3 –factor model could explain returns on all style portfolios except for portfolios which are constructed to exhibit short term momentum.

The momentum effect was first documented by Jegadeesh and Titman (1993). A relative strength strategy is implemented on the NYSE and AMEX from 1965 to 1989. The strategy is based on purchasing prior 3- to 12-month winners. They find it to be a profitable strategy and that returns to recent winners tend to outperform returns to recent losers. Important to note however is that they find that this effect only lasts over the short term and tends to start dissipating in the two years after formation. Further evidence supporting the momentum effect is reported in Jegadeesh and Titman (2001).

Van Rensburg (2001) identifies style-based effects in a South African context, after testing 23 candidate style factors on shares listed in the industrial sector on the JSE. The research is conducted over a 16 year period from February 1983 to March 1999. A cluster analysis methodology was used to extract a parsimonious decomposition of style based effects. Of the 23 candidate style factors tested, a total of eleven of the identified effects persisted after being adjusted for risk. The returns to these eleven effects indicated the presence of three groupings of effects, namely the style factors value, size and momentum. In an extension of this work Van Rensburg and Robertson (2003) adopt a cross sectional regression methodology on share returns and style effects. Evidence of the value and size effect is found, however contrary to the earlier work no momentum effect was confirmed. Additional evidence on the value effect in South Africa is documented more recently in Beukes (2011)

Hodnett, Hsieh and Van Rensburg (2012) look at payoffs to firm-specific attributes under five categories. The categories are: 1) fundamental value relative to share price, 2) solvency and liquidity, 3) fundamental growth, 4) size and return momentum, 5) consensus analyst forecasts. All but one of the categories, namely solvency and liquidity, display significant attributes. More specifically, it is found that higher fundamental values relative to their share prices, firms with higher dividend and earnings growth, firms with lower market

capitalization, firms with higher short-term returns and firms with higher earnings forecasts, earn relatively higher returns in the subsequent period in a consistent manner. These findings give further evidence to the existence of the value and size effects and provides new evidence supporting the short term momentum effect on the JSE.

2.2 Traditional Measures of Portfolio Performance

Absolute measures of performance are not adequate when measuring portfolio performance and more specifically manager performance. Developed by Sharpe (1964), Lintner (1965) and Mossin (1966), the Capital Asset Pricing Model (CAPM) forms the basis of many traditional performance measures.

Jensen's Alpha developed by Jensen (1968) is defined by Le Sourd (2007) as the differential between return on the portfolio in excess of the risk-free rate and the return explained by the market model. The CAPM model is used to estimate the return to the portfolio due to its exposure to the market and the Jensen's Alpha measures the share of additional return, negative or positive, that is due to the manager's choice. The statistical significance of the alpha can be evaluated by calculating the associated t-statistic.

As the Jensen's Alpha model contains a benchmark (market proxy), Le Sourd (2007) notes that it only accounts for systematic risk and therefore is only appropriate when ranking portfolios within peer groups. This is because peer groups group portfolios together that are managed in a similar manner and therefore have comparable levels of risk.

According to Le Sourd (2007), criticism of the Jensen's Alpha is that the results are dependent on the choice of reference Index. In addition, when a manager practises market

timing as a strategy, which involves varying the Beta according to anticipated market movements, the Jensen's Alpha can often become negative.

Treynor and Mazuy (1966) develop a quadratic version of the CAPM, which provides a framework for taking time-varying Beta adjustments into account when evaluating a manager's performance. It in essence becomes a model for measuring a manager's ability to time the market. Managers who possess market timing ability will correctly lower their portfolio's beta when the market falls and increase it when the market is rising. Market timing ability is measured by the sign of the coefficient of the quadratic term and whether it is statistically different from zero.

Von Wielligh and Smit (2000) note that conclusions reached in any one study of performance are model and benchmark dependent. In a South African context, Van Rensburg (2002) found that when accounting for market risk, two individual factors as opposed to one general market factor better describe this risk. Van Rensburg (2002) builds on prior research by Van Rensburg and Slaney (1997) which finds, using an Arbitrage Pricing Theory (APT) model, the two factors that most appropriately describe market risk to be the JSE All Gold and Industrial Indices. In Van Rensburg (2002) these two factors are updated to the Resources and Financial-Industrial Indices.

Von Wielligh and Smit (2000) employ three performance models when examining the persistence in performance of South African unit trusts, namely the CAPM, the Van Rensburg and Slaney (1997) two-factor APT model and a three-factor APT model which they develop in the study. The third model builds on the two-factor model of Van Rensburg and Slaney (1997), with an additional factor for the standard deviation of monthly returns. It is found that the three-factor model does not do substantially better than the two-factor model in terms of adjusted R-squared. Additionally, the third factor is often found to be insignificant. Clear evidence is found of persistence in performance amongst South African Unit Trust managers, it is even more strongly evident when just examining General Equity Unit Trusts.

2.3 Determinants of Portfolio Performance

Brinson, Hood and Beebower (1986) develop a framework for decomposing total portfolio return into return attributable to security selection and return attributable to market timing. The majority of prior papers focused on risk-adjusted returns, without giving much attention to multiple asset performance measurement. The framework they develop is conceptually sound, yet computationally simple. In order to perform the decomposition, passive benchmarks need to be specified. A combination of these benchmarks in weightings that sum to one should represent the portfolio's investment policy and long term allocation. These long-term weights are called the policy weights. The actual weights represent the asset weighting in the actual portfolio at a point in time. Passive returns are defined as the return to the underlying asset benchmark, while actual returns represent the fund's return to each asset class in each period.

Brinson, *et al.* (1986) combine the passive benchmark returns, actual portfolio returns, long term policy weights and short term actual weights in four different combinations of returns and weights, or 'quadrants' as they refer to it:

Quadrant I represents the Policy Benchmark return. In order to calculate this return, the weights of all asset classes need to be specified in advance. Then, the return is the sum of the product of the pre-specified policy weights and passive returns to those weights.

Quadrant II represents the returns to Policy Benchmark and Timing. It is defined as the actual portfolio asset class weights and the passive returns to those weights. Timing is strategic under- or over-weighting of an asset class, relative to its normal weight, for purposes of return enhancement or risk reduction.

Quadrant III represents returns to the Policy Benchmark and Security Selection. It is defined as the policy asset class weights and the actual asset class returns. This represents

the actual asset class returns of a fund in excess of the returns of the passive underlying asset class benchmarks.

Quadrant IV represents the actual return to the total fund for the period. This is defined as the actual portfolio asset class weights and actual asset class returns.

Total active returns would be the difference between the Actual Fund return and Policy Benchmark portfolio return (IV-I). This total active return can be decomposed into:

1. Active returns due to Timing would be equal to II-I.
2. Active returns due to Selection would be equal to III-I.
3. Active returns due to other factors would be equal to IV-III-II+I.

Active return due to other factors captures the residual excess return not attributable to market timing or security selection. The reason behind this other factor component is that Brinson *et al* (1986) segmented the benchmark into stocks, bonds, cash equivalents and a miscellaneous category called "others". This "others" factor represents holdings in convertible securities, international holdings, real estate, venture capital, insurance contracts, mortgage-backed securities and private placements. A complete history of the contents of the "other" component is not available for all funds in their study. As a result, a sub-portfolio of stocks, bonds and cash equivalents is calculated for use in all quadrants except the total return. This residual was the remaining excess return that was not attributable to market timing or security selection.

2.4 Overview of Return-Based Style Analysis

RBSA which was first introduced by Sharpe (1992), has become a popular way to analyse the risk adjusted performance of mutual funds. A multi factor asset class model is developed to explain fund returns. The factors of the asset class model are the underlying asset class and style returns, which are derived from benchmark portfolios. The model measures the fund's exposures to variations in the returns of the factors.

A key assumption of factor models is that the error term or rather the non-factor return for one asset is assumed to be uncorrelated with the non-factor return of every other asset. This leaves the factors as the only source of correlation among returns. The asset class factor model, as used by Sharpe (1992), can be considered a special case of factor model where the factor loadings need to sum to one. The return to a fund is then represented as the return to the portfolio of underlying asset classes and styles plus a residual error. For the purpose of style analysis, Sharpe (1992) describes the return to the portfolio of underlying asset classes and styles, as the return attributable to style and market exposure. The residual component of return can be viewed as the return attributable to stock selection.

The usefulness of an asset class factor model depends on the asset classes chosen for its implementation. While not necessary, it is desirable that the asset classes are 1) mutually exclusive, 2) exhaustive and 3) have returns that have low correlations with one another or, if not, then different standard deviations. Otten and Bams (2000) state that the appropriate choice of benchmarks is a crucial ingredient that may heavily influence the outcome of return-based style analysis.

Sharpe (1992) uses 12 factors, namely, the 90-day U.S. Treasury bill, the intermediate-term government bond index, the long-term government bond index, the corporate bond index, the mortgage-backed security index, the large-cap value stock index, the large-cap

growth stock index, the medium-cap stock index, the small-cap stock index, the non-U.S. government bond index, the European stock index and the Japanese stock index. The local equity exposure as stated above is split up into four mutually exclusive and exhaustive equity styles.

The large capitalisation stocks that form the Standard and Poor's 500 (S&P500) are split into loosely defined groupings of value and growth along a market-to-book value measure. Non-S&P500 stocks are then split into medium capitalisation and small capitalisation stocks, by apportioning 80% of the value of market cap into the aforementioned group while the remaining 20% of value of market cap into the later grouping.

Otten and Bams (2000) also note that simpler models, as opposed to Sharpe's 12 factor model, often yield more sensible results. When choosing benchmarks, if the correlations between specific benchmarks are too high, one can consider dropping some of the factors to diminish the multicollinearity problem. Ideally, the resulting model should be able to span the whole portfolio asset mix. Lucas and Riepe (1996) note that if benchmarks are too highly correlated with each other, when the regression attempts to match the fund's returns, the factor weightings may oscillate between the two highly correlated underlying assets or styles. This would most likely occur over shorter periods, as the regression will have trouble trying to accurately pin down a benchmark that consistently explains the variability of returns from period to period.

Due to the fact that it is a constrained regression, if the benchmarks are inadequate, it will likely alternate between those that temporarily provide the best fit. This is also likely to be reflected in a low R-squared. However, even with multicollinearity Buetow, Johnson and Runkle (2000) demonstrate that the results of the analysis can be meaningful, as long as the factors properly capture the investment objective of the portfolio. They conclude that the only way to implement returns-based analysis is to use portfolio-specific benchmarks that properly capture the investment objectives of the portfolio.

The weights of the factors can be estimated using multiple regression analysis. To get the coefficients (weights of the factors) that most closely reflect the funds' actual positions, two restraints are placed on the regression to mimic real life conditions experienced by funds: the factor loadings must sum to one and all weights must be positive. All the weights need to sum to one in order to give the representation of portfolio weights. The factors need to be positive to relate to the fact that managers may only take long positions. This last constraint may be relaxed when looking at funds that may take short positions. The returns to the fund become the dependent variable and the returns to the asset classes and styles the independent variables. Sharpe (1992) regresses the returns over a 60-month rolling period window. As the most recent two months of returns data become available it would be added to the data set and the oldest two months would be excluded. This method gave an estimation of style across time. Swinkels and Van Der Sluis (2006) note that, periods of anything from 24 to 60 months are used in empirical work. Funds that change their style exposures frequently would require a shorter window, when compared to funds that keep their exposures stationary over time.

Factor models on the whole are typically evaluated on the basis of their ability to explain returns to the asset in question. A way to determine this is to look at the R-squared value. That is the proportion of variance of returns explained by the selected asset classes. The R-squared value is equal to one minus the proportion of unexplained variance. It is important to note that this value indicates only the extent to which a specific model fits the data at hand. To ensure the usefulness of the model, it should have the ability to explain performance out-of-sample.

The R-squared value in relation to returns-based style analysis, quantifies the degree to which the benchmark portfolio can explain the long-term behaviour of the mutual fund. Conversely, the amount of variation of returns unexplained by the regression can be interpreted as the return due to stock selection of the manager. Lucas and Riepe (1996) state that the R-squared measure becomes a self-auditing feature of style analysis. The higher the percentage value of the R-squared, the better and more consistently the benchmark portfolio is able to explain the long-term return behaviour of the fund. Conversely, a low or moderate

R-squared may be the result of many factors, only one of which is security selection. To determine the source of a low R-squared, it is essential that the R-squared be viewed in context.

2.5 Evidence on Style Analysis and Stock Picking Ability

Sharpe (1992) applied the RBSA technique to 395 mutual funds including growth funds, growth and income funds, utility funds, small stock funds, high quality bond funds, convertible bond funds and balanced funds. The analysis was performed from January 1985 to December 1989.

To note though, is that when looking at funds that concentrate their holdings in one industry (i.e. utility fund), style accounts for an unusually small part of variance of returns. Utility funds displayed an R-squared of 59.3%. In addition, specifically with utility funds given the nature of the underlying investment, although funds are invested in common stock the returns display features attributable to stocks and bonds. This occurs due to companies with “sticky” revenues due to the regulatory process. This highlights the fact that style analysis provides measures that reflect how returns act, rather than reflecting what the funds actually include. Quoting Swinkels and Van Der Sluis (2006), “Sharpe’s famous Duck theorem applies here: ‘If it walks like a duck and talks like a duck for all important purposes, it is a duck.’” (p.7).

The results indicate that the returns-based style decomposition method effectively explains the performances of U.S. mutual funds with out-of-sample R-squared of above 80%. This is based on monthly updates of the style exposures estimated over the prior 60 months. All the funds displayed styles approximately in line with their mandate, however certain additional exposures were picked up with some of the funds. For example with Small Stock Funds the largest exposure - as you would expect - is small stocks, however there does seem to be some exposure to larger cap growth stocks. This could be due to the fund either

purchasing large cap stocks, or due to a preference for medium cap stocks which display growth characteristics.

The goal, however with RBSA is to represent the behaviour of the fund, not determine its precise composition. A typical Growth Equity Fund displayed an R-squared of 89.9%. In a typical Growth and Income fund 90.9 % of returns were attributable to style. Small Stock Funds displayed an R-squared of 87.6%, slightly lower than the other funds, however the nature of liquidity in this sector could have played a role in this. Balanced funds displayed an R-squared of 89%. High Quality Bond Funds displayed an R-squared of 88.1% and Convertible Bond Funds an R-squared of 88.8%. What is interesting to note is that the returns of the High Quality Bond Funds, as you would expect, act like a combination of the underlying fixed income portfolios, whereas the returns of the Convertible Bond Funds, act as a combination of returns to stocks and bonds. This intuitively makes sense as convertible bonds display characteristics of both bonds and stocks.

In addition, the stock selection returns of the funds under analysis are negative, on average, and statistically insignificant over the out-of-sample period. Sharpe (1992) concludes that the returns of the U.S. mutual funds are mainly driven by the performance of their underlying asset classes and investment styles rather than the manager's stock picking skills.

Fung and Hsieh (1998) replicate Sharpe's study on a larger sample of 2525 mutual funds and use nine broadly defined asset classes to describe returns associated with mutual funds, as opposed to Sharpe's 12. In addition, the model is extended to analyse hedge funds, adding 5 dominant hedge fund styles. However, two of these are highly correlated with the broadly defined asset classes and as such only 3, which are dynamic trading strategies, are added to the model. Thus a 12 factor model is constructed to perform style analysis on mutual and hedge funds. With regard to mutual funds, they find that 73% of the mutual funds have an R-squared above 0.80 and 56% have an R-squared higher than 0.90. The mutual fund returns are highly correlated with the underlying asset classes. Their findings support those

of Sharpe (1992) with inferences that mutual fund performance is mainly a result of exposure to the underlying asset classes. Consequently they find that “*where*” funds invest is much more important than “*how*” funds invest.

Hsieh and Hodnett (2011) looked at whether active managers of global equity portfolios can deliver outperformance on a style adjusted basis. They followed the methodology of Sharpe (1992) and constructed a four factor style model to analyse global funds. Their style benchmarks were proxies for size, value and momentum, as well as an additional factor to capture systematic market risk. Hsieh and Hodnett (2011) perform a weighted least squares (WLS) regression when calculating the weights of the styles. The regression allocates a weight to each month in the rolling 36 month window equivalent to $2^{1/36}$ times the weight assigned to its predecessor from the previous month, starting with the weight of 1 in the first month. Using the WLS approach, greater emphasis is placed on more recent returns, relative to the earlier returns, when estimating the best fit.

Twelve funds’ returns data between January 1996 and December 2008 is analysed. It is found that 6 funds earn average returns that are above their style benchmarks but this is reduced to only four when looked at on a risk adjusted basis. However, when returns are regressed against their style benchmark returns they exhibit a high R-squared and significant style coefficient. The intercept term is statistically insignificant supporting previous work that funds aren’t able to consistently earn positive selection returns.

Extending on their prior research, Hsieh, Hodnett and Van Rensburg (2012) look at whether six global equity funds, domiciled in South Africa, can outperform their respective style benchmarks. It is concluded that there is limited contribution from selection return and that the style benchmark serves as an unbiased estimate of the performance of the fund. Additionally, when compared to their prior work, they find that global funds domiciled in South Africa perform worse on a risk adjusted basis when compared to internationally domiciled global funds.

In a South African context, Yu (2008) adopts the return decomposition methodology of Sharpe (1992). The return attributions of South African unit trusts are analysed over the period from 2001 to 2006. The factors adapted by Yu (2008) include the JSE Resource Index, the JSE Industrial Index, the JSE Financial Index, as well as three style proxies. A lagged eleven month momentum proxy, an undervalued residual proxy and the equally weighted top 100 size proxy were all constructed. The results show that the sector and style proxies successfully track the performances of the South African unit trusts under examination. The out of sample regression yields significant R-squared values and selection returns that are statistically insignificant. These findings support the evidence that the stock picking decisions of South African active managers do not meaningfully contribute to their inherent investment style returns.

2.6 Style Benchmark in Traditional Performance Models

Holmes and Faff (2008), incorporate custom style benchmarks into traditional performance models, as a way of measuring style risk adjusted performance of Australian Multi Sector managed funds. They examine the selection, market timing and volatility timing performance of the managers. Rolling and static custom benchmarks are developed using the Australian DataStream Market Index (Australian Equity), UBS Composite All Maturities Index (Australian Fixed Interest), MSCI World EX Australian Index (International Equity), ASX Property Trust Index (Property), WD Citigroup G& All Maturities Index (International Fixed Interest) and Reserve Bank of Australia 90 day BAB Index (Cash) as the underlying indices.

The custom benchmarks are incorporated into the Jensen model, Treynor-Mazuy and cubic regression model to assess performance. Holmes and Faff (2008) conclude that, as the custom style benchmark represents the best linear combination of the underlying style indices, this benchmark best replicates the style of the fund's returns series. As a result, the derived index should act as an appropriate benchmark against which to measure the added value of a fund manager.

Their findings indicate that managers of Australian Multi Sector managed funds are destroyers of value with respect to selection, market timing and volatility timing. In the majority of cases in their study, they find that an investment in the style weighted index would produce superior returns, compared to being invested in the actual fund.

2.7 Style Analysis and Portfolio Return Decomposition

Brinson *et al.* (1986) established a framework which requires the specific inputs stated above in order to decompose a fund's returns. Espendal (2011) generalises this framework so that RBSA can be used to estimate Policy and Actual Asset Class weights. Using predefined asset classes with associated indices, together with the estimation of the unit trusts actual weights and policy weights in these predefined assets, excess return can be decomposed into security selection and market timing.

The decomposition implies that excess return is equivalent to the difference between the mutual fund's actual return and the benchmark return, Quadrant IV – Quadrant I. Moreover, the calculations for market timing and security selection, Quadrant II - Quadrant I and Quadrant III-Quadrant I respectively, are the same as Brinson *et al* (1986). However, in this generalised form, the effect of the "others" component is zero. This is because it is assumed that the complete history of all asset classes is known and available.

This assumption is based on the fact that all the policy and actual weights of all the predefined asset classes, together with the passive and actual returns to those asset classes are known. Therefore, excess return is equal to the sum of the return due to market timing and security selection. Consequently, the sum of the benchmark return, security selection and market timing is the same as the fund's actual return. Another way to calculate market timing, by construction, is Quadrant IV- Quadrant III. Likewise, security selection can be calculated as Quadrant IV – Quadrant II. As a result, Espendal (2011) states that only Quadrants IV, II and I need to be quantified in order to measure the determinants of managerial performance.

Espendal (2011) employs a two-step process, in order to estimate two sets of weights that closely resemble the policy and actual weights of a fund. The policy weights relate to the long-term proportions placed in the different classes, while the actual weights relate to the

mutual fund's proportions placed in each class at the start of a period. Using RBSA, it is acknowledged that weights calculated by this method no longer represent proportions, but rather mimic the behaviour of a mutual fund in the period. Given that the weights estimated reflect the funds' short-term and long-term behaviour, it is assumed that they are good proxies for the actual and policy weights. This assumption is the basis for using RBSA to estimate the actual and policy weights of a fund.

To estimate the long-term policy weights a ten year/120 month rolling period is used. Twenty four months is found to be the optimal time length that describes short term movement for Norwegian mutual funds. This is calculated by selecting the time length that minimises the mean square prediction error. The long-term weights for period T are calculated using periods $T-120$ to $T-1$. This is done to ensure that the benchmark is identified in advance of T . Similarly, the short term weights are calculated for period T using periods $T-24$ to $T-1$. Espendal (2011) notes that one weakness of this method is that using RBSA to estimate the 'policy weights' implies that the policy weights are time varying, something which they are not.

Espendal (2011) found that on a whole, mutual funds in the study underperformed their style benchmark. This underperformance was, however, not statistically different from zero. When taking benchmark costs into account, this performance changes to positive but still not statistically different from zero. On decomposing the excess return, it was found that the fund managers in the study, displayed positive security selection and negative monthly market timing, both were statistically significant at the one percent level.

Fowler, Grieves and Singleton (2010) conduct a similar study of New Zealand unit trusts. They conducted their study on 99 unit trusts over a seven and a half year period, January 1999 to July 2007. RBSA is used to estimate long term benchmark and short term active weights in the underlying asset classes. To construct the long term benchmark weights, they estimated style weights over the entire period under examination, to come up with set

constant long-term asset weights. On average it is found that New Zealand unit trust managers had a positive market timing effect while exhibiting negative security selection returns.

3. Data

This study is conducted on Unit Trusts classified within the Domestic General Equity Unit Trust classification. It is conducted over a ten year period from 01/01/2003 to 31/12/2012. As such, only Unit Trusts which were classified as General Equity Unit Trusts with a ten year history were used. Total Return Index is used as the measure of Unit Trust performance. Total Returns equates to the actual rate of return on an asset over a given evaluation period.

There are two predominant categories of returns and the Total Return Index encompasses both of these. The first is the income which includes dividends, interest and distributions realised over this period of time. The second is capital appreciation which represents the change in the market price of the asset. Total portfolio returns have been used successfully by a variety of investment managers and institutional professionals. It is currently being used to attribute performance contributions in actual portfolios, thus it has been decided to use total return index data (Brinson et. al, 1986).

Monthly total return data for a total of 23 General Equity Unit trusts was obtained from DataStream. It was chosen as the database for obtaining this information as it contains accurate quantitative data specifically including Total Return Indices. It thus posed functional advantages in collecting the relevant returns for the General Equity Unit Trusts over the sample period. Monthly returns and standard deviations for each unit trust from January 2003 to December 2012 can be found in table 3-1. Monthly returns and standard deviations for each unit trust, for a subsection of time periods applicable to this study can be found in appendix A and appendix B.

The monthly rates of return were calculated using equation 1:

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}} \quad (1)$$

Where

R_{it} the monthly rate of return for Unit Trust of Index i in time t

P_{it} the monthly Price of Unit Trust or Index i in time t

P_{it-1} the monthly Price of Unit Trust or Index i in time $t-1$

Table 3-1 Monthly Returns and Standard Deviations of the 23 Unit Trusts

Returns range January 2003-December 2012

	ABSA General Equity	Allan Gray	Analytics Managed FoF	Community Growth
Monthly Return	1.46%	1.52%	1.40%	1.35%
Monthly Std Deviation	4.26%	4.56%	4.46%	4.51%
	Coronation Top 20	FNB Growth	Foord	Investec Equity
Monthly Return	1.71%	1.43%	1.58%	1.48%
Monthly Std Deviation	4.67%	4.49%	4.23%	4.44%
	Investec Growth	Investec Value	Investment Solutions FoF	Marriott Dividend
Monthly Return	1.44%	1.49%	1.31%	1.49%
Monthly Std Deviation	4.94%	4.86%	4.15%	3.74%
	Momentum Multi FoF	Nedgroup Investments Quant	Nedgroup Investments Raimaker	Old Mutual High Yield
Monthly Return	1.28%	1.44%	1.56%	1.34%
Monthly Std Deviation	4.05%	4.39%	4.23%	4.75%
	Prudential	PSG Alphen Equity FoF	Sanlam Value	SIM General Equity
Monthly Return	1.66%	1.30%	1.63%	1.49%
Monthly Std Deviation	4.22%	3.99%	4.74%	4.60%
	STANLIB Index	STANLIB Value	SYMmetry General FoF	
Monthly Return	1.34%	1.52%	1.21%	
Monthly Std Deviation	5.07%	4.45%	4.36%	

ASISA guidelines state that unit trusts classified in the general equity category are allowed to invest in South African Listed Equity. Additionally, they have allowances to have a maximum of 25% invested in cash and 25% invested in offshore in equities. In order to represent these factors the MSCI World and Short Term Fixed Interest Index (STEFI) benchmark returns are used. These are appropriate benchmarks as they are investible. The style factors are Value and Momentum Indices which are passive rules based portfolios that are investible. Size was not factored into this investigation as there is no appropriate passive small cap index that can be invested in.

Monthly total return data for the selected underlying passive benchmarks for value, momentum, world, market, sector and cash indices are obtained from the Salient Quantitative Investment Management (Pty) Ltd. These represent the pre-specified style proxies. The value and momentum indices are tradable indices constructed from the top 60 shares on the Johannesburg Stock Exchange according to market capitalisation. The market and sector indices are also tradable indices representing the JSE All Share Index Top Forty shares measured by market Capitalisation (ALSI 40).

According to Van Rensburg (2002) when accounting for market risk, he finds that two individual factors as opposed to one general market factor better describes this risk. The two factors are the Resource Index (RESI 10) and a combination of the Financial and Industrial index (FINDI 30). As such, the two options for market risk stated above are contrasted in this study and results to both are analysed. Below in table 3-2 is a correlation matrix together with the descriptive statistics of the underlying indices used in this study.

Table 3-3 shows the correlation matrix calculated when the returns of the underlying indices relative to the ALSI 40 returns are used. Each monthly relative return is equal to the index return minus the ALSI 40 return.

Table 3-2 Index Correlations, Returns and Standard Deviations

Statistics calculated using monthly returns from January 2003 – December 2012

	ALSI40 Return	FINDI 30 Return	RESI 10 Return	Value Return	Momentum Return	STEFI Return	MSCI World Equity Return
ALSI40	1	0.80	0.92	0.75	0.81	-0.21	0.56
FINDI		1.00	0.50	0.89	0.76	-0.23	0.42
Resi			1.00	0.51	0.66	-0.15	0.54
Value				1.00	0.74	-0.11	0.35
Momentum					1.00	-0.20	0.35
STEFI						1.00	-0.24
MSCI World Equity							1.00
Monthly Return	1.16%	1.47%	0.55%	1.81%	1.74%	0.66%	0.40%
Annual Return	13.97%	17.63%	6.58%	21.68%	20.89%	7.98%	4.76%
Monthly Std Dev	5.20%	4.65%	7.42%	4.65%	5.76%	0.18%	4.16%
Annual Std Dev	18.03%	16.09%	25.69%	16.10%	19.96%	0.63%	14.43%

Table 3-3 Correlation matrix of factor returns in excess of the ALSI 40

Factor returns less the ALSI 40 are used in this matrix over the period January 2003 – December 2012

	FINDI 30 Return	RESI 10 Return	Value Return	Momentum Return	STEFI Return	MSCI World Equity Return
FINDI 30	1.00	-0.98	0.79	0.35	0.47	0.25
RESI 10		1.00	-0.75	-0.38	-0.47	-0.26
Value			1.00	0.36	0.49	0.22
Momentum				1.00	0.15	-0.07
STEFI					1.00	0.63
MSCI World Equity						1.00

4. Methodology

4.1 Traditional Performance Regressions

Adapting the work of Von Wielligh and Smit (2000), different APT models and benchmarks are employed to investigate unit trust performance in South Africa. Only the single factor and two-factor models from Von Wielligh and Smit (2000) are used as they found that their 3 factor model did not add any significant explanatory power. In addition to the two models stated above, this study develops two additional models, within the APT framework, incorporating style factors for value and momentum. The two original models from Von Wielligh and Smit (2000) are expanded to incorporate these two style factors.

The first model of performance measurement is the single factor market model regression, specified as:

$$r_{i,t} = \alpha_i + \beta_i r_{M,t} + e_{i,t} \quad (2)$$

Where:

$r_{i,t}$ is the monthly excess return of unit trust i in time t . Where excess return is raw return less risk free rate

$r_{M,t}$ is the monthly excess return to the market proxy in time t

α_i is the regression constant that is not explained by Unit Trusts i 's exposure to the market proxy

β_i is the sensitivity of fund i 's return to movements in the market. Indicates the level of 'systematic risk'

A larger positive and statistically significant alpha would indicate superior performance relative to the other unit trusts in this study.

The second model employed to investigate performance is the two-factor APT model updated by Van Rensburg (2002):

$$r_{i,t} = \alpha_i + \beta_{iF}r_{iF,t} + \beta_{iR}r_{iR,t} + e_{i,t} \quad (3)$$

Where:

$r_{iF,t}$ is the monthly excess return to the Financial-Industrial 30 Index in time t

$r_{iR,t}$ is the monthly excess return to the Resources 10 Index in time t

β_{iF} is the sensitivity of fund i 's return to movements in the Financial-Industrial 30 Index.

β_{iR} is the sensitivity of fund i 's return to movements in the Resources 10 Index.

The model from Van Rensburg (2002) is an update on the two factor model used by Von Wielligh and Smit (2000). Von Wielligh and Smit (2000) used a two factor model developed in Van Rensburg and Slaney (1997). Two additional factors, the Value Index and the Momentum Index, are then added to the above models:

$$r_{i,t} = \alpha_i + \beta_i r_{M,t} + \beta_{iValue} r_{iValue,t} + \beta_{iMomentum} r_{iMomentum,t} + e_{i,t} \quad (4)$$

and

$$r_{i,t} = \alpha_i + \beta_{iF}r_{iF,t} + \beta_{iR}r_{iR,t} + \beta_{iValue}r_{iValue,t} + \beta_{iMomentum}r_{iMomentum,t} + e_{i,t} \quad (5)$$

Where:

$r_{iValue,t}$ is the monthly excess return to the Value Index in time t

$r_{iMomentum,t}$ is the monthly excess return to the Momentum Index in time t

β_{iValue} is the sensitivity of fund i 's return to movements in the Value Index.

$\beta_{iMomentum}$ is the sensitivity of fund i 's return to movements in the Momentum Index.

Performance is measured by examining the amount of alpha and the associated statistical significance. The explanatory power of the model is observed through the adjusted R-squared value.

4.2 Returns-Based Style Analysis

4.2.1 Model and constraints

Multifactor models are commonplace in investment analysis. Sharpe (1992) uses a special case of multi-factor model, called an asset class factor model to develop RBSA:

$$R_i = [b_{i1}F_1 + b_{i2}F_2 + \dots + b_{in}F_n] + e_i \quad (6)$$

Where: R_i is the return on unit trust i

F_j is the return to each benchmark index j

b_{ij} is the unit trusts i sensitivity to benchmark index j

e_i is the 'non-factor' component of return interpreted as the in-sample excess return for unit trust i that is not explained by unit trust i exposures to the returns on the benchmarks indices. I.e. it is the difference between the return on the fund (actual values) and that of a passive portfolio with the same style (fitted values).

Equation 6 will estimate the passive mix of underlying assets of each unit trust. Given that the following constraints are applied:

$$\sum_{j=1}^n b_{ij} = 1 \quad (7)$$

For each asset i

and

$$b_{ij} > 0 \quad (8)$$

An asset class factor model can be considered a special case of multifactor model, as each factor represents the return to an asset and the sensitivities are required to sum to one. The constraint placed on the regression in equation 7, turns this multifactor model into an asset class model. This leads to the return to asset i being represented as a portfolio plus a residual error. The portfolio is the sum of the terms in the bracket of equation 6, interpreted as a portfolio invested in n assets.

Equation 7 ensures that the factor weights sum to one giving the property of portfolio weights. The weights estimated when equation 7 is applied as a constraint on the regression, do not yet represent feasible asset weights, for long only funds. The weights estimated, can be positive or negative, but as long only funds cannot take short positions, any negative weights estimated are not feasible in reality. As in Sharpe's study, this paper is looking at long only funds. In order to get estimates of weights that more accurately represent the true weights equation 8 is applied as the second constraint. Equation 8 constrains the factors to having a weight greater than or equal to zero. This replicates the situation faced by unit trusts of not being allowed to take short positions. Applying Equation 8 means that quadratic programming needs to be employed to estimate the weights.

The terms in the bracket of equation 6, represent the style benchmark return of the fund. The error term, as stated above, represents the return not explained by the style benchmark. It can be interpreted as the in-sample excess return. It can also be regarded as the funds tracking error to its style benchmark. Rearranging equation 6, we can see that the excess return is the deviation between the actual unit trust returns and its style benchmark returns:

$$e_i = R_i - [b_{i1}F_1 + b_{i2}F_2 + \dots + b_{in}F_n] \quad (9)$$

The objective of RBSA is to select the set of asset class exposures which minimise the variance of the difference in equation 9. This is known as the Ordinary Least Squares (OLS). It is important to note, that the objective of such an analysis is not to minimise the average value of this difference. As a result, the method is not designed to make the unit trust look good or bad, but rather to infer as much as possible about the unit trusts exposure to variations in the returns of the chosen benchmarks indices during the period.

A set number of months fund and index returns are used in order to estimate the style weights. In empirical work, anything from 24 months to 60 months of returns data is traditionally used. To keep consistency with a later section, 4.4, 24 months of return data is used to estimate the custom style benchmark. RBSA uses the previous 24 to estimate the style exposure of the fund at a point in time. Additionally, rolling window period RBSA can be employed in order to get a time series estimation of exposures.

In order to establish an estimate of a funds exposure to the underlying indices over time, a series of rolling estimations are performed over a set number of months. For example, if 24 months is chosen as the rolling window period, a series of monthly weights are estimated using 24 month rolling quadratic programming. The regression will be run on the 24 months of return data, with the last month being excluded from the set as the latest month is included. The effect is that for each month we will have asset weight estimated from the preceding 24 months. Month T will be estimated using months $T-24$ to $T-1$. The result of the rolling regression is to estimate the funds exposures through time. The resultant style benchmark represents a passive investment, which most closely represents the style of the active unit trust.

4.2.2 Selecting RBSA factors

In determining the most appropriate multi-factor model to estimate style benchmarks for general equity unit trusts in South Africa, a number of aspects need to be considered. According to Sharpe (1992) the usefulness of an asset class factor model depends on the asset classes chosen for its implementation. While not necessary, it is desirable that the asset classes are 1) mutually exclusive, 2) exhaustive and 3) have returns that have low correlations with one another, if not, then different standard deviations. Otten and Bams (2000) state, that the appropriate choice of benchmarks is a crucial ingredient that may heavily influence the outcome of return-based style analysis.

The above requirements set out by Sharpe (1992), need to be viewed in conjunction with the practical requirement of using investible benchmarks. The implication is that the custom style benchmark can be an actual alternative and not just a notional idea. The correlation matrix (table 3-2) of the factors is examined in conjunction with their standard deviation to establish the most suitable factors for the model. In addition, Factor models on a whole are typically evaluated on the basis of their ability to explain returns to the asset in question. A way to determine this is to look at the R-squared value.

What needs to be determined is whether to use the RESI 10 and FINDI 30 as a proxy for the market or to use the TOP40. The correlation between the indices needs to be examined as well as their standard deviation. The results of the regressions performed in section 4.1, more specifically their associated R-squared values, could provide insight into which market proxy/ies is/are the most appropriate.

4.3 Performance Measurement and Attribution

4.3.1 Out of Sample Tests

To measure the performance of the unit trusts, an out of sample measurement is required to ensure statistical robustness. This is done by constructing a style benchmark to replicate the unit trusts' underlying investment style, as stated in section 4.2. For each month t the benchmark index weights for the unit trusts are estimated using returns from month $t - 24$ through $t - 1$. For each subsequent month, the allocations to the benchmark indices are adjusted monthly, based on the most recent prior estimates of the unit trusts' benchmark weights, according to the rolling window period as mentioned above.

The return to the resultant style benchmark is calculated for month t using equation 10. This is the return to the style benchmark, in the month subsequent to the period over which the benchmark was estimated. The returns to the unit trust in time t are compared to the style benchmark portfolio based on fund style weights at $t-1$, and underlying returns at time t . The difference between the funds return and the style benchmark return is defined as the unit trusts excess return for month t in equation (11):

$$\tilde{r}_{i,style,t} = [\tilde{b}_{i,1,t}F_{1,t} + \tilde{b}_{i,2,t}F_{2,t} + \dots + \tilde{b}_{i,n,t}F_{n,t}] \quad (10)$$

Where:

$\tilde{r}_{i,style,t}$ represents the out-of-sample style benchmark return for unit trust i in month t

$\tilde{b}_{i,j,t}$ represents the respective out-of-sample style exposure for each style estimated for unit trust i in month t computed using return data from the month $t - 24$ through month $t - 1$ based on equation 2.

$F_{j,t}$ represents the returns' to each benchmark index j in month t

$$\tilde{\varepsilon}_{i,t} = r_{i,t} - \tilde{r}_{i,style,t} \quad (11)$$

Where:

$\tilde{r}_{i,style,t}$ Represents the out-of-sample style benchmark return for unit trust i in month t

$r_{i,t}$ Is the return to unit trust i in time t

$e_{i,t}$ Represents the out of sample excess return for unit trust i over and above the style benchmark in time t

4.3.2 Traditional performance models using RBSA Custom Benchmark

RBSA is used to estimate a unit trust custom style benchmark against which the unit trusts performance can be measured. As stated before, a RBSA style benchmark is an appropriate benchmark as it meets the four objectives set out by Sharpe 1992. Namely that it is a viable alternative, not easily beaten, low in cost and known before the fact. Once estimated, this custom style benchmark can then be used within traditional performance models. Following the methodology of Holmes and Faff (2008), adapting the Jensen and the Treynor-Mazuy models by substituting the unit trusts custom benchmark for the market proxy, selection and market timing performance, adjusted for style risk, can be isolated.

Once the benchmarks have been established, they are used as a proxy for the market in conducting standard return based performance model regressions.

The Jensen Model:

$$r_{i,t} = \alpha_i + \beta_i r_{iC,t} + e_{i,t} \quad (12)$$

The Treynor-Mazuy Model:

$$r_{i,t} = \alpha_i + \beta_i r_{iC,t} + \gamma_i r_{iC,t}^2 + e_{i,t} \quad (13)$$

Where:

$r_{i,t}$ is equal to the excess return Unit Trust i in time t . Where excess return is raw return less risk free rate

$r_{iC,t}$ is unit trust i 's customised style benchmark return in time t

α_i is the regression constant that is not explained by fund i 's customised style benchmark

β_i is the sensitivity of fund i 's return to movements in the style benchmark. Level of 'systematic risk'

γ_i is a measure of unit trust i 's market timing ability in relation to its customised benchmark

$e_{i,t}$ is the random error of the regression that is not explained by the unit trusts exposure to the custom style benchmark

The individual unit trust's selection performance is measured by the sign and significance of the alpha term in each equation. Market timing is inferred from the adapted Treynor-Mazuy model, positive (negative) market timing ability is indicated by the sign (positive (negative)) of the coefficient of the quadratic term. Similarly, statistical significance is inferred via the associated t-stat.

4.4 Using RBSA in Two Step approach for Excess Return decomposition

4.4.1 Calculating Quadrants

As an alternative method to examine selection and market timing performance on a style risk-adjusted basis, the generalised Return Decomposition developed by Espendal (2011) using style benchmarks, is implemented in a South African context and on the selected unit trusts.

In order to decompose the excess returns into returns attributable to security selection and returns attributable to market timing, long-term policy weights and actual weights are required. Using RBSA, the style weights are not interpreted as proportions allocated to the underlying assets, but rather represent the weights that mimic the behaviour of the fund in that period.

Assuming that the weights that represent the unit trusts long and short term behaviour are a good proxy for the long-term policy weights and short term actual weights, RBSA can be used to estimate these. As a result, the policy style weights are defined as a funds exposure to particular indices that mimic the funds behaviour over the long-run. While a funds actual style weights are defined as the funds exposures to underlying asset classes that mimic the funds behaviour over the short-term. These actual style weights and policy style weights act as estimates of actual weights and policy weights to be used in the generalised Brinson decomposition.

The long term policy style weights are estimated using 60 months return data. Policy style weights are estimated monthly, for the period January 2008 to December 2012. The policy weights for January 2008 are estimated using the prior 60 months returns. This implies that return data from January 2003 to December 2007 is used in order to calculate the style weights.

The short term actual style weights are estimated using 24 months return data. This time period is used to capture the short term tactical allocations of the managers. The short term actual style weights are used as a proxy for the actual weights in the generalised Brinson Decomposition. The actual style weights for January 2008 are estimated using the previous 24 months return data. This implies that return data from January 2006 to December 2007 is used in order to calculate the style weights.

4.4.2 Return Decomposition

Once the actual-style and policy-style weights have been established, returns to the four quadrants are needed in order to decompose the excess return into return from market timing and security selection. Recall from Equation 6, that the return to a unit trust is equal to the sum of the asset class exposures multiplied by the return to those asset classes plus a residual error which is interpreted as excess return. We can further decompose returns into the policy style benchmark returns plus returns to security selection return and a market timing return. This is expressed in equation 14:

$$R_{it} = [bp_{i1}F_{1t} + bp_{i2}F_{2t} + \dots + bp_{in}F_{nt}] + s_{mt} + t_{mt} \quad (14)$$

Where:

- R_{it} is the return to unit trust i in period t
- F_{jt} is the passive return to each benchmark index j in period t
- bp_{ij} is the unit trusts i policy style weight to benchmark index j
- s_{mt} is the excess return in period t associated to security selection.
- t_{mt} is the excess return in period t associated to market timing.

Quadrant I represents the policy style benchmark return, which is equivalent to a custom style benchmark estimated using 60 months. In order to calculate this return, the weights of all asset classes need to be specified in advance. Then, the return is the sum of the product of the pre-specified policy style weights and passive returns to those weights. This is equal to the term in the brackets of equation 14.

Quadrant II represents the returns to policy benchmark plus market timing. It is defined as the actual style weights and the passive returns to those weights. Timing is strategic under or overweighting of an actual style weight relative to its normal weight, for purposes of return enhancement or risk reduction. In equation 15, Quadrant II is represented by the term in the brackets.

$$R_{it} = [ba_{i1t}F_{1t} + ba_{i2t}F_{2t} + \dots + ba_{int}F_{nt}] + s_{mt} \quad (15)$$

Where:

ba_{ijt} is the unit trusts i actual style weight to benchmark index j in period t

The combination of equation 14 and 15 gives an expression that is the mathematical definition of market timing, Equation 16:

$$t_{mt} = \sum_{i=1}^n (ba_{ijt} - bp_{ij}) \times F_{jt} \quad (16)$$

It is easy to see from equation 16 that market timing is a result of strategic over or underweighting of an asset class relative to its policy weight.

Quadrant III represents returns to the Policy Benchmark and Security Selection. It is defined as the policy style weights and the actual returns to the style of the unit trust. This represents the actual style returns of the unit trust in excess of those styles passive benchmark return. However, because security selection is unknown, we are able to solve for it without actually defining all the inputs for its equation. From equations 14 and 15, we have two equations with two unknowns. By simultaneously solving for the unknowns we are able to solve for the estimates of security selection and market timing.

Quadrant IV represents the actual return to the total fund for the period. This is defined as the actual portfolio asset class weights and actual asset class returns. A breakdown of the quadrants can be seen in figure 4-1below:

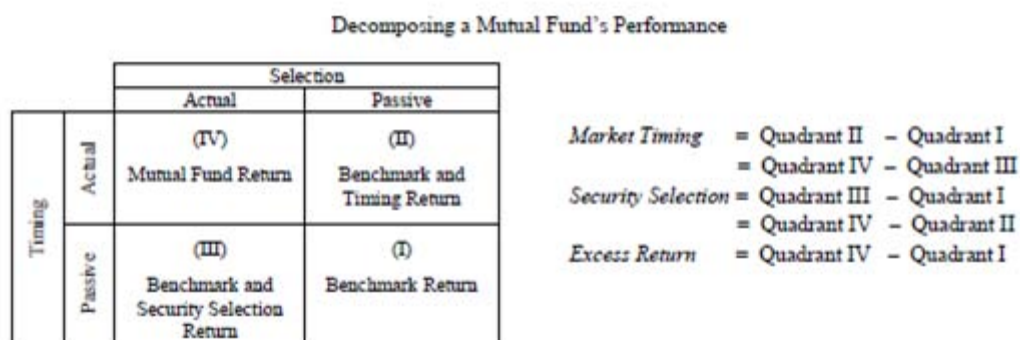


Figure 4-1 Return Decomposition Quadrants (Espendal 2011)

Monthly excess return is decomposed into return attributable to security selection and market timing. In assessing the overall performance of a unit trust, to test whether the excess return, security selection return and market timing return are statistically significant, a Students t-test is performed on the mean difference. This is done in order to try and infer whether the return, in each case, is statistically different from zero. The formula for the t-statistic is:

$$t = (r_i - \mu) / \left(\frac{s}{\sqrt{n}} \right) \quad (17)$$

Where:

- t is the t-statistic
- r_i is the monthly mean total alpha return
- μ is equal to zero, the null hypothesis
- s is the monthly total alpha return standard deviation
- n the number of observations

5. Limitations

The indices used in this study display certain weaknesses when viewed in the context of the requirements of Sharp (1992). The correlations of certain indices are fairly high, even once the most appropriate indices are selected. There is some overlap between the indices, being that they are not mutually exclusive. Given South Africa's relatively small investment universe this limitation would be very difficult to overcome. One style proxy, namely size, is also excluded, as there is no tradable passive index which replicates this style in South Africa, over the period of examination. These limitations show the issues with balancing between having a practical model, which has the ability to be a viable investment alternative and having a model which is true to theory.

Due to the input requirements for RBSA, together with this study, focusing on the practical passive investment recreation of style benchmarks, length of total return data could be viewed as a limitation. Monthly total return data is available for the Value and Momentum indices from 1 January 2003. As such, this study was limited to examining only returns starting from this point. The sample selection size was limited to unit trusts classified under the General Equity Classification, with returns dating back to 1 January 2003. This reduced the number of funds which could be examined.

Survivorship bias is the upward bias of the sample return data, by the exclusion of unit trusts which no longer exist. There could have been unit trusts that fell within the constraints of this study ie General Equity Unit Trusts with return data from 1 January 2003, which have been excluded from the study as they were no longer classified as active on 31 Dec 2012. The unit trusts would have closed, mainly due to poor performance and as a result the sample of unit trusts selected for this study would be bias towards the best performing unit trust, with the worst performing now defunct. Survivorship bias would not have a great effect on this study as inferences are not drawn for the overall population; rather an empirical study of each unit trust is conducted.

6. Results

6.1 Traditional Performance Regression

Table 6-1 and 6-2 below show the results of the multiple regression analysis using the four multifactor models outlined in section 4.1. The analysis is performed with the excess returns of each unit trust as the dependent variable. The estimated alphas and each unit trust's sensitivity to the underlying factors can be observed. The t-statistic, indicating the significance of the alpha and coefficients, is found under each variable. Additionally, to measure the explanatory power of each regression model, the associated R-squared value is listed.

Table 6-1 General Equity Unit Trusts Performance Regression Output

Outputs from the four multi-factor regressions using returns from January 2003 – December 2012

		ABSA General Equity	Allan Gray	Analytics Managed FoF	Community Growth	Coronation Top 20	FNB Growth	Foord	Investec Equity	Investec Growth	Investec Value	Investment Solutions FoF
1 Factor Model	Alpha	0.439	0.503	0.351	0.327	0.673	0.415	0.556	0.434	0.355	0.559	0.308
	t-Stat	2.103	2.063	1.760	1.433	2.883	1.771	2.860	2.205	1.723	1.645	1.450
	ALSI40	0.696	0.714	0.751	0.726	0.754	0.713	0.708	0.750	0.847	0.610	0.665
	t-Stat	17.575	15.402	19.827	16.758	17.006	15.998	19.174	20.036	21.635	9.432	16.462
	Adj R-sq	0.721	0.665	0.767	0.702	0.708	0.682	0.755	0.771	0.797	0.425	0.694
2 Factor Model	Alpha	0.314	0.364	0.202	0.208	0.483	0.190	0.399	0.348	0.237	0.147	0.133
	t-Stat	1.624	1.622	1.198	0.974	2.448	0.993	2.460	1.840	1.289	0.586	0.738
	FINDI	0.584	0.610	0.646	0.593	0.697	0.715	0.629	0.570	0.668	0.878	0.624
	t-Stat	12.445	11.180	15.757	11.442	14.564	15.347	15.973	12.411	14.963	14.397	14.268
	RESI	0.209	0.213	0.222	0.228	0.195	0.149	0.197	0.257	0.283	-0.010	0.166
	t-Stat	7.074	6.190	8.603	6.981	6.468	5.088	7.952	8.878	10.049	-0.259	6.036
Adj R-sq	0.768	0.724	0.838	0.746	0.797	0.793	0.835	0.795	0.843	0.696	0.787	
3 Factor Model	Alpha	0.048	0.093	-0.028	0.041	0.244	-0.065	0.144	0.095	-0.034	-0.127	-0.080
	t-Stat	0.274	0.431	-0.170	0.186	1.315	-0.344	0.962	0.591	-0.196	-0.491	-0.442
	ALSI40	0.311	0.345	0.413	0.450	0.415	0.257	0.335	0.352	0.451	0.043	0.316
	t-Stat	5.178	4.699	7.346	6.012	6.550	4.017	6.563	6.444	7.655	0.492	5.137
	Moment	0.187	0.095	0.079	0.119	-0.033	0.180	0.103	0.342	0.223	0.012	0.089
	t-Stat	3.517	1.461	1.590	1.795	-0.592	3.188	2.300	7.086	4.302	0.151	1.638
	Value	0.323	0.422	0.397	0.251	0.549	0.437	0.417	0.134	0.291	0.826	0.400
	t-Stat	5.520	5.928	7.267	3.447	8.927	7.033	8.420	2.519	5.087	9.666	6.690
Adj R-sq	0.816	0.759	0.853	0.744	0.829	0.812	0.866	0.860	0.868	0.695	0.797	
4 Factor Model	Alpha	0.076	0.132	0.029	0.104	0.298	-0.020	0.188	0.135	0.026	-0.061	-0.028
	t-Stat	0.424	0.609	0.180	0.477	1.604	-0.107	1.260	0.832	0.149	-0.253	-0.158
	FINDI	0.209	0.218	0.355	0.437	0.356	0.382	0.277	0.279	0.347	0.493	0.356
	t-Stat	2.441	2.113	4.563	4.202	4.021	4.375	3.897	3.615	4.249	4.271	4.200
	RESI	0.137	0.164	0.185	0.190	0.181	0.086	0.150	0.154	0.208	-0.026	0.130
	t-Stat	4.450	4.408	6.627	5.092	5.706	2.756	5.861	5.545	7.089	-0.615	4.265
	Moment	0.197	0.098	0.075	0.114	-0.034	0.170	0.102	0.346	0.222	-0.038	0.079
	t-Stat	3.691	1.529	1.548	1.757	-0.615	3.130	2.309	7.212	4.369	-0.534	1.507
	Value	0.278	0.381	0.282	0.089	0.433	0.251	0.331	0.052	0.193	0.489	0.251
	t-Stat	3.364	3.826	3.757	0.889	5.082	2.979	4.824	0.705	2.456	4.396	3.079
Adj R-sq	0.812	0.759	0.858	0.751	0.832	0.823	0.869	0.859	0.872	0.735	0.805	

Table 6-2 General Equity Unit Trusts Performance Regression Output

Outputs from the four multi-factor regressions using returns from January 2003 – December 2012

		Marriott Dividend Growth Fund	Momentum Multi Focus FoF	Nedgroup Invest Quant	Nedgroup Invest Rainmaker	Old Mutual High Yield	Prudential	PSG Alphen Equity FoF	Sanlam Value Fund	SIM General Equity Fund	STANLIB Index	STANLIB Value	SymmeTR Y Equity FoF
1 Factor Model	Alpha	0.643	0.256	0.413	0.557	0.403	0.649	0.288	0.658	0.461	0.218	0.532	0.184
	t-Stat	2.227	1.53818082	1.890	2.515	1.215	3.018	1.576	2.194	2.002	1.339	2.053	0.886
	ALSI40	0.402	0.700	0.713	0.671	0.600	0.678	0.670	0.665	0.744	0.913	0.665	0.721
	t-Stat	7.322	22.107	17.178	15.944	9.538	16.585	19.296	11.666	17.015	29.455	13.503	18.278
	Adj R-sq	0.307	0.804	0.712	0.680	0.431	0.697	0.757	0.532	0.708	0.879	0.604	0.737
2 Factor Model	Alpha	0.239	0.085	0.226	0.401	0.001	0.457	0.105	0.319	0.260	0.281	0.317	0.035
	t-Stat	1.239	0.693	1.246	2.029	0.006	2.551	0.744	1.381	1.355	1.641	1.400	0.193
	FINDI	0.741	0.641	0.668	0.604	0.859	0.655	0.637	0.824	0.704	0.489	0.673	0.627
	t-Stat	15.834	21.519	15.188	12.595	14.376	15.061	18.528	14.687	15.101	11.789	12.230	14.383
	RESI	-0.099	0.182	0.179	0.180	-0.010	0.158	0.161	0.053	0.182	0.427	0.136	0.209
	t-Stat	-3.356	9.688	6.470	5.968	-0.278	5.765	7.430	1.511	6.179	16.310	3.918	7.601
Adj R-sq	0.700	0.897	0.807	0.753	0.695	0.797	0.859	0.730	0.803	0.871	0.706	0.809	
3 Factor Model	Alpha	-0.011	-0.170	-0.068	0.105	-0.321	0.181	-0.149	-0.035	-0.022	0.115	0.015	-0.249
	t-Stat	-0.056	-1.658	-0.421	0.592	-1.329	1.102	-1.193	-0.163	-0.121	0.689	0.070	-1.542
	ALSI40	-0.169	0.287	0.278	0.229	-0.027	0.225	0.258	0.022	0.308	0.825	0.151	0.332
	t-Stat	-2.441	8.186	5.044	3.776	-0.332	4.033	6.044	0.308	5.056	14.448	2.099	6.043
	Momentu	0.098	0.182	0.116	0.206	0.100	0.197	0.155	0.214	0.118	0.011	0.259	0.098
	t-Stat	1.603	5.882	2.386	3.861	1.375	3.996	4.117	3.337	2.198	0.223	4.082	2.018
	Value	0.718	0.371	0.491	0.381	0.800	0.410	0.406	0.668	0.491	0.116	0.418	0.447
	t-Stat	10.696	10.896	9.159	6.477	9.998	7.544	9.796	9.457	8.296	2.097	5.987	8.366
Adj R-sq	0.686	0.931	0.854	0.810	0.721	0.838	0.895	0.781	0.838	0.883	0.758	0.853	
4 Factor Model	Alpha	0.022	-0.128	-0.030	0.133	-0.279	0.217	-0.112	-0.008	0.020	0.172	0.042	-0.211
	t-Stat	0.121	-1.290	-0.187	0.740	-1.209	1.330	-0.908	-0.039	0.114	0.991	0.202	-1.299
	FINDI	0.365	0.306	0.238	0.177	0.372	0.274	0.287	0.288	0.304	0.308	0.246	0.213
	t-Stat	4.224	6.485	3.084	2.073	3.382	3.529	4.884	2.906	3.568	3.725	2.451	2.754
	RESI	-0.136	0.117	0.124	0.102	-0.057	0.087	0.102	-0.029	0.128	0.402	0.047	0.157
	t-Stat	-4.378	6.920	4.463	3.332	-1.444	3.112	4.815	-0.804	4.170	13.555	1.303	5.672
	Momentu	0.052	0.177	0.114	0.208	0.062	0.191	0.151	0.195	0.116	0.052	0.252	0.101
	t-Stat	0.972	6.027	2.375	3.911	0.906	3.962	4.142	3.165	2.189	1.005	4.040	2.108
	Value	0.402	0.248	0.413	0.331	0.526	0.290	0.288	0.472	0.377	0.172	0.294	0.405
	t-Stat	4.822	5.462	5.552	4.017	4.963	3.872	5.081	4.946	4.593	2.156	3.033	5.444
Adj R-sq	0.751	0.937	0.856	0.809	0.749	0.842	0.900	0.796	0.840	0.876	0.762	0.854	

All of the unit trusts under examination displayed positive alpha when they were regressed against the ALSI 40 as the market proxy. Out of the 23 unit trusts, eleven had alpha's that were statistically significant at the 95% level. When the two-factor model of Van Rensburg (2002) is used, all of the unit trusts displayed positive alpha. However, when using this two factor model, only four of the unit trusts had statistically significant alpha at the 95% level. The adjusted R-squared of each unit trust increased, with the exception of the STANLIB Index fund.

The results from the unconstrained two factor regression indicate that three unit trusts, Investec Value, Marriott Dividend Growth and Old Mutual High Yield have negative

sensitivity to the Resources Index. All of the unit trusts, with the exception of the Stanlib Index Unit Trust, have significantly higher positive sensitivity to the FINDI 30 than the RESI 10.

When adding the two additional style factors to each of the market models above, the alphas drop significantly. Twelve and Eight of the unit trusts display negative alpha once the style factors have been added to the ALSI 40 and the RESI 10 and FINDI 30 models respectively. No unit trusts display statistically significant alpha, positive or negative, at the 95% level. The alphas are consistently higher in the four factor regression when compared to the three factor regression.

The three factor regression output indicates that all unit trusts, with the exception of Investec Equity and Stanlib Index, have significantly higher positive sensitivity to the value factor than the momentum factor. The Investec Equity Unit Trust is the only unit trust which exhibits a higher sensitivity to the momentum factor than the value factor. The Stanlib Index Unit Trust has the most significant exposures to the ALSI 40 factor, together with relatively insignificant sensitivity to value and momentum. The Marriott Dividend Growth Fund and Old Mutual High Yield display negative sensitivity to the ALSI 40 factor. Coronation Top 20 is the only unit trust which displays a negative sensitivity to the momentum factor.

The sensitivities of the four factor regression are very similar to the prior results, with Coronation Top 20 having negative exposure to the Momentum Index and Marriott Dividend Growth, Old Mutual High Yield, Investec Value have negative sensitivity to the Resources Index. Additionally, Investec Value exhibits a negative sensitivity to momentum and Sanlam Value has a negative sensitivity to the Resources Index

6.2 Returns-Based Style Analysis

6.2.1 Model Specification

The results from section 6.1 indicate that there is not a significant difference in explanatory power when using either the three or four factor model. When selecting passive benchmarks for use in a RBSA model, one needs to look at the return characteristics of the passive benchmarks when determining which are most appropriate for use. Ideally the underlying passive indices should have low correlations with each other or, if not, then different standard deviations.

The decision in the context of this study of style factors, is which market proxy should be used to capture risks not associated to the style exposure. Looking at the correlation matrix in table 3-2, it can be seen that the most highly correlated indices are that of the Value and FINDI. Additionally, the Value Index and the FINDI have a very similar annualised standard deviation. As the RBSA optimisation has two constraints placed on it, namely that all weights should be positive and sum to one, it forces values to weights. When faced with underlying factors that are correlated, as the weights are forced, the optimisation may oscillate between two similar underlying factors.

The correlations of the ALSI with the FINDI and RESI are ignored as in this case, they are substitutes for each other. Given the considerations above, it would be most appropriate to select ALSI 40 as the market proxy in this instance. To incorporate the investable universe faced by General Equity managers in South Africa, the STEFI and the MSCI World Indices are incorporated in addition to the style based factors of Value and Momentum and the market proxy of the ALSI.

6.2.2 Unit Trust Style Exposure

RBSA provides an estimate of how returns act in relation to underlying passive indices, not what the actual fund holds. It provides one with the ability to view what effective exposures a manager is taking. This is illustrated by looking at the style maps estimated in Appendix C. A style map is the rolling estimation of a unit trusts weight in the underlying indices. As a twenty-four month period has been used to ensure consistency across methods, there is some additional 'noise' that can be seen in the style maps below. This noise refers to when the optimisation struggles to allocate the appropriate weighting to an underlying index and often jumps between two underlying indices. This becomes more prevalent with shorter time periods.

The Marriott Dividend Growth Unit Trust style map indicates that it consistently has over 20% cash holdings, moving over 40% more recently. This trend is constant, together with a combination of first momentum, then value and then back to momentum.

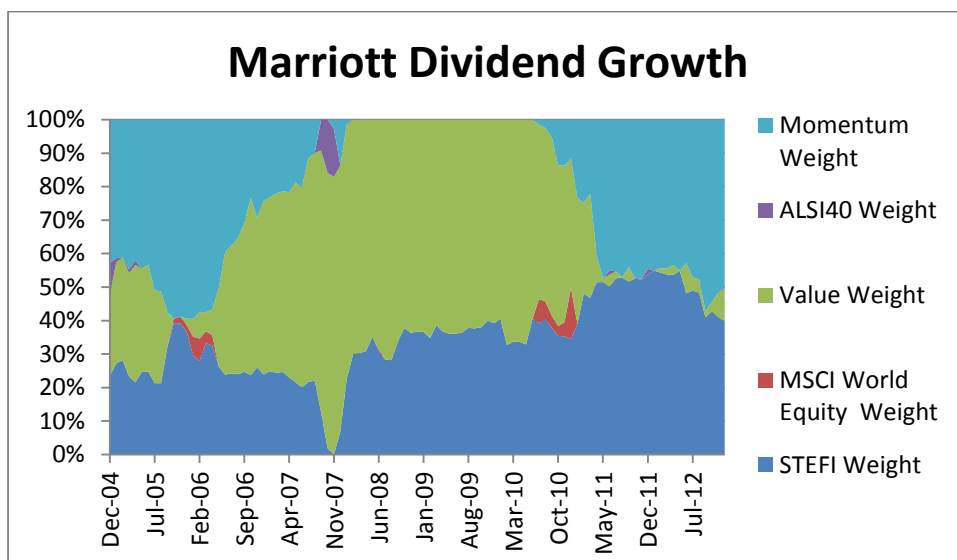


Figure 6-1 Style Map for Marriot Dividend Growth estimated using 24 month rolling window periods ranging from the beginning of January 2005 to December 2012

The Stanlib Index Unit Trust is supposed to earn a return that substantially equates to the return of the FTSE/JSE All Share Index. The factor used in the optimisation is the ALSI 40,

which is an Index comprising of the 40 largest shares by market cap. This unit trust has by far the greatest consistent exposure to the ALSI 40.

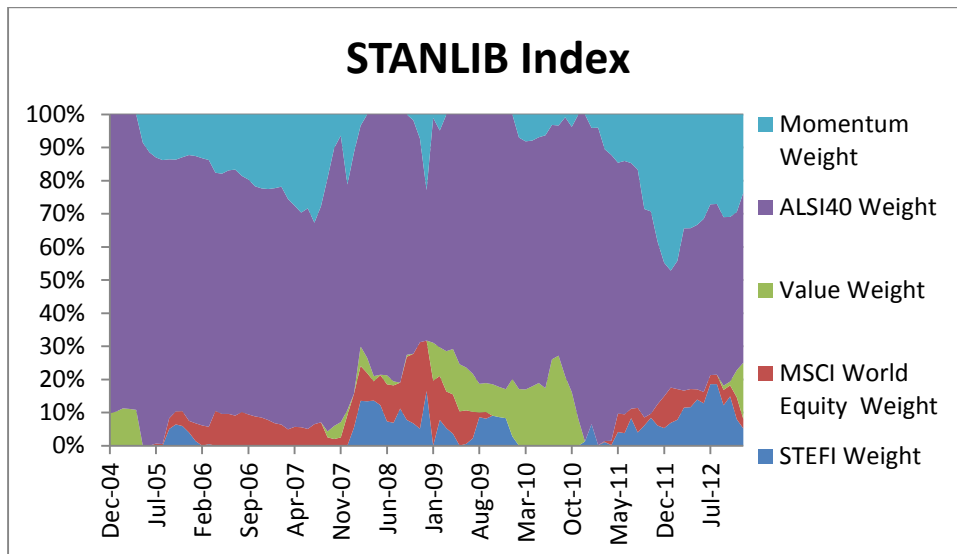


Figure 6-2 Style Map for Stanlib Index estimated using 24 month rolling window periods ranging from the beginning of January 2005 to December 2012

The Sanlam Value Fund is a Unit Trust which has a value mandate. Looking at the style map below, while for the majority of time the significant exposure is to the value factor, it can be seen that for a period of just under two years at the start of the map, the significant exposure is in fact to the momentum factor and not value.

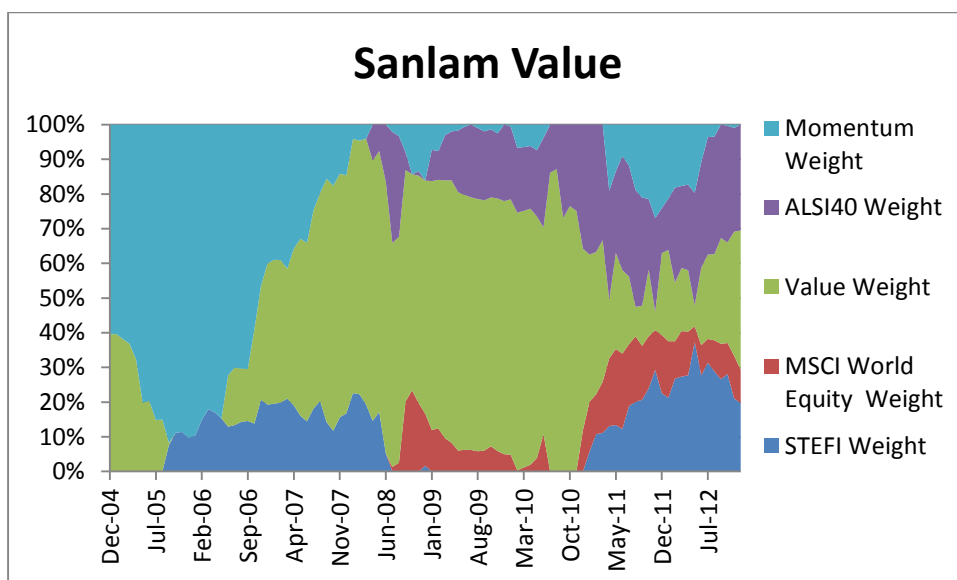


Figure 6-3 Style Map for Sanlam Value estimated using 24 month rolling window periods ranging from the beginning of January 2005 to December 2012

6.2.3 Traditional Performance measures using RBSA custom Benchmarks

Table 6-3 below provides descriptive statistics of each unit trusts custom style benchmark performance. This custom style benchmark is estimated using the above specified RBSA model for each portfolio. This benchmark is used as the 'market portfolio' in the two regressions below. It can be compared to appendix A

Table 6-3 Style Benchmark Descriptive Statistics

Style benchmarks estimated using a rolling 24 month window, with benchmark returns starting from January 2005 up until December 2012

Style Benchmark	ABSA General Equity	Allan Gray	Analytics Managed FoF	Community Growth
Monthly Return	1.26%	1.34%	1.36%	1.24%
Monthly Std Deviation	4.08%	4.16%	4.10%	4.13%
Style Benchmark	Coronation Top 20	FNB Growth	Foord	Investec Equity
Monthly Return	1.37%	1.25%	1.35%	1.20%
Monthly Std Deviation	4.14%	4.00%	4.05%	4.36%
Style Benchmark	Investec Growth	Investec Value	Investment Solutions FoF	Marriott Dividend
Monthly Return	1.42%	1.42%	1.25%	1.25%
Monthly Std Deviation	4.66%	4.66%	3.82%	3.28%
Style Benchmark	Momentum MultiFocus FoF	Nedgroup Investments Quant	Nedgroup Investments Raimaker	Old Mutual High Yield
Monthly Return	1.26%	1.49%	1.31%	1.45%
Monthly Std Deviation	3.85%	4.08%	3.92%	4.10%
Style Benchmark	Prudential	PSG Alphen Equity FoF	Sanlam Value	SIM General Equity
Monthly Return	1.30%	1.28%	1.35%	1.41%
Monthly Std Deviation	4.01%	3.77%	4.29%	4.28%
Style Benchmark	STANLIB Index	STANLIB Value	SYMmetry General Equity FoF	
Monthly Return	1.30%	1.30%	1.41%	
Monthly Std Deviation	4.67%	4.09%	4.08%	

Employing each unit trust's custom benchmark as the market portfolio, the Jensen's Alpha is generalised and an estimation of selection return or 'alpha' attributable to each unit

trust in excess of their style benchmark, is calculated. Of the 23 funds under examination, nine exhibit positive alpha with the remaining fourteen unit trusts displaying negative alpha.

In table 6-4 the resultant alpha attributable to each fund as well as the associated t-stat are listed. Only PSG displayed negative alpha that was statistically significant at the 10% level. This, however, does not mean that the alphas can't be interpreted and viewed in the light of economic significance. The Beta measures how sensitive the unit trusts returns are to its style benchmark.

Table 6-4 Output for Style Alpha

Output from regressing unit trust performance against its own style benchmark over the period January 2005 – December 2012

	ABSA General	Allan Gray	Analytics Managed	Community Growth	Coronation Top 20	FNB Growth	Foord	Investec Equity
alpha	0.1019	0.1562	-0.0669	-0.0106	0.2719	-0.1381	0.1790	-0.0089
t-stat	0.4571	0.5987	-0.3194	-0.0381	1.1918	-0.6406	0.9879	-0.0487
Beta	0.8870	0.8986	0.9429	0.8806	0.9618	0.9781	0.9676	0.9311
R 2	0.7441	0.6946	0.7924	0.6548	0.7722	0.7848	0.8389	0.8432
	Investec Growth	Investec Value	Investment Solutions	Marriott Dividend	Momentum Multi	Nedgroup Investments Quant	Nedgroup Investments Rainmaker	Old Mutual High Yield
alpha	-0.1688	-0.2932	-0.0715	0.0852	-0.1841	-0.1673	0.0155	-0.4480
t-stat	-0.7947	-1.0834	-0.3195	0.3853	-1.5170	-0.7851	0.0719	-1.6293
Beta	0.9732	1.0012	0.9115	0.9193	1.0083	0.9481	0.9246	0.9670
R 2	0.8350	0.7330	0.7288	0.6672	0.9190	0.7872	0.7585	0.6987
	Prudential	PSG	Sanlam Value	SIM General Equity	STANLIB Index	STANLIB Value	SYMMetry General	
alpha	0.2001	-0.2356	0.0011	-0.0233	0.0629	-0.0147	-0.2218	
t-stat	1.0292	-1.6504	0.0044	-0.1000	0.2937	0.0568	1.1306	
Beta	0.9016	0.9662	0.9290	0.9523	0.9622	0.9174	0.9250	
R 2	0.7934	0.878896	0.7578	0.7740	0.8291	0.6997	0.8055	

Similarly, like with the style alpha, the unit trusts customised benchmark is used as the market portfolio in the Treynor-Mazuy model for market timing. A positive Y coefficient is interpreted as the manager possessing positive market timing ability, while a negative Y coefficient is interpreted as a manager possessing negative market timing ability.

In table 6-5 the results of the Treynor-Mazuy regression are listed. Twelve funds possessed negative market timing ability, with the coefficient of the Old Mutual High Yield Unit Trust being the only statistically significant one at the 10% level. Eleven unit trusts display positive market timing ability with the Alan Gray Equity Fund and Investec Equity Unit Trusts ability being statistically significant at the 10% level. The number of positive alpha's observed using the Treynor-Mazuy style model, is reduced when compared to the style alpha model. Six unit trusts exhibit positive alpha, however all observations are statistically insignificant. This means that statistically they are not different from zero.

Table 6-5 Output for Style Treynor-Mazuy

Output from the Treynor-Mazuy model using each unit trusts custom style benchmark over the period January 2005 – December 2012

	ABSA General	Allan Gray	Analytics Managed	Community Growth	Coronation Top 20	FNB Growth	Food Foord	Investec Equity
alpha	-0.1226	-0.1542	-0.1486	-0.0080	0.1761	-0.0090	0.1917	-0.2613
tstat	-0.4631	-0.4963	-0.5846	-0.0241	0.6214	-0.0348	0.8499	-1.2283
Beta	0.9020	0.9103	0.9455	0.8805	0.9625	0.9737	0.9672	0.9542
y	0.0124	0.0167	0.0045	-0.0001	0.0053	-0.0076	-0.0007	0.0121
tstat	1.5451	1.7903	0.5722	-0.0148	0.5735	-0.8981	-0.0958	2.2175
Adj R2	0.7451	0.698434	0.7879	0.6474	0.7682	0.7820	0.8355	0.84783513
	Investec Growth	Investec Value	Investment Solutions	Marriott Dividend	Momentum Multi	Nedgroup Investments Quant	Nedgroup Investments Rainmaker	Old Mutual High Yield
alpha	-0.2080	-0.0894	-0.0277	0.0998	-0.1248	-0.0573	0.1090	-0.0672
tstat	-0.8045	-0.2689	-0.1032	0.3801	-0.8424	-0.2201	0.4197	-0.2020
Beta	0.9749	1.0025	0.9105	0.9185	1.0052	0.9513	0.9238	0.9761
y	0.0017	-0.0109	-0.0028	-0.0013	-0.0037	-0.0064	-0.0058	-0.0221
tstat	0.2687	-1.0536	-0.3018	-0.1044	-0.7004	-0.7414	-0.6505	-1.9691
Adj R2	0.8316	0.730481	0.7233	0.6672	0.9177	0.7885	0.7544	0.7045
	Prudential	PSG	SANLAM Value	SIM General Equity	STANLIB Index	STANLIB Value	SYMMetry General	
alpha	0.1297	-0.1330	-0.0149	-0.1193	-0.0975	0.0744	-0.2576	
tstat	0.5523	-0.7697	-0.0517	-0.4216	-0.3786	0.2426	-1.0873	
Beta	0.9047	0.9642	0.9290	0.9540	0.9717	0.9141	0.9249	
y	0.0041	-0.0068	0.0008	0.0049	0.0068	-0.0050	0.0021	
tstat	0.5383	-1.0537	0.0982	0.6003	1.1176	-0.5450	0.2726	
Adj R2	0.7896	0.877752	0.7526	0.7701	0.8278	0.6942	0.8014	

6.3 RBSA and Return Decomposition

RBSA is used to estimate the long term policy-style weights and the short term actual-style weights. These weights constitute determinants of a unit trusts long term and short term risk. The weights estimated are used as proxies for policy weights and actual weights in the generalised Brinson Decomposition.

6.3.1. Policy Weights

As mentioned before, policy weights are static by nature. However, the estimated policy-style weights are dynamic. This is not too much of an issue as these weights are relatively stable through time, as shown in the style map for the Analytics Managed Fund below in figure 6-4. As the style weights are relatively stable, they are suitable estimates for the funds asset allocation. The long term policy-style weights will form the long term benchmark allocation, against which tactical timing will be measured. On average, the Analytics Managed Fund acted like it had a 13% exposure to the momentum factor, 30% exposure to ALSI 40, 40% exposure to Value, 1% exposure to MSCI world, 16% exposure to STEFI. Long term Style maps for each of the unit trust's under examination can be found in Appendix D

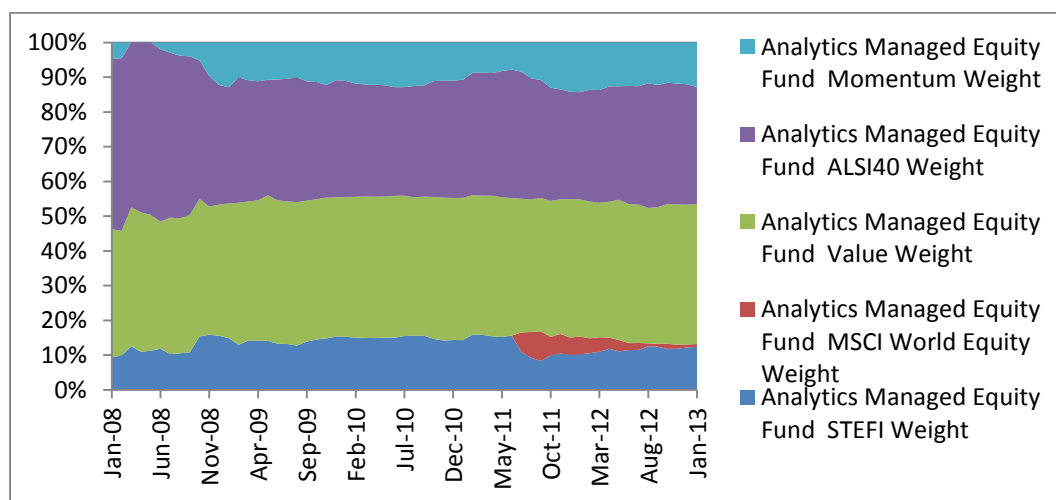


Figure 6-4 Long Term Style map for Analytics Managed FoF estimated using 60 month rolling window periods ranging from the beginning of January 2008 to December 2012

Figure 6-5 shows the estimated short term exposures for the Analytics Managed Equity Fund. These short term estimates capture the unit trusts short term allocations to the underlying style. In addition to being used for generalised return decomposition, these long and short term estimations of exposure provide insight to the risk that face the manager. When comparing figure 6-5 to figure 6-4 it can be seen how the unit trusts actual-style weights deviate from the policy-style weights over time.

Short term Style maps for each of the unit trust’s under examination can be found in Appendix E

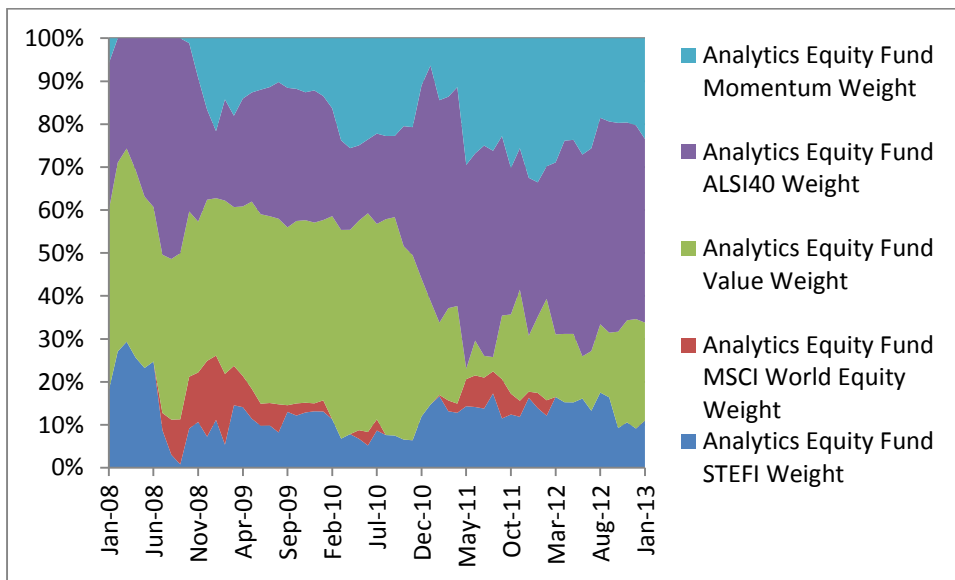


Figure 6-5 Short Term Style map for Analytics Managed FoF estimated using 24 month rolling window periods ranging from the beginning of January 2008 to December 2012

6.3.2 Return Attribution

Once the policy-style and actual-style weights have been estimated, Equations 14 and 15 are used to estimate the unit trusts return to security selection and market timing. Table 6-6 below, provides the descriptive statistics of the return decomposition for all 23 unit trusts under examination. The monthly excess return is decomposed into return to security selection and return to market timing. Given the large number of returns required to estimate the long term policy benchmark, the period of returns measured in this section are shorter than analysis in previous sections.

Only returns starting from January 2008 are analysed. These need to be considered when these results are compared to previous results. For context, review the actual monthly unit trust returns over this period in appendix B. All the returns quoted are monthly. As can be seen in table 6-6 below, five of the twenty-three unit trusts under examination had positive return in excess of their policy-style benchmark. Six unit trusts had positive selection return while four had positive market timing return.

Only one unit trust, the Coronation Top 20, was able to exhibit both positive security selection and market timing. Cumulative return decomposition graphs can be found for each unit trust in appendix F. The unit trusts which had positive excess return over and above their policy-style benchmark were the Coronation Top 20, Foord Equity Fund, Marriott Dividend Fund, Stanlib Index Fund and the Stanlib Value Fund.

The unit trusts which had positive selection return were the Coronation Top 20, Foord Equity Fund, Allan Gray Equity, ABSA General Equity, Marriott Dividend Fund, Prudential Equity. The unit trusts which had positive market timing return were the Coronation Top 20, Nedgroup Investments Quant Fund, Stanlib Index Fund and the Stanlib Value Fund.

Table 6-6 Monthly Excess Return Decomposition and Standard Deviations

Monthly excess returns over each unit trusts policy-style benchmark are decomposed into security selection and market timing. Returns from January 2008 – December 2012.

	Excess return	Security Selection	Market Timing	Excess Return	Security Selection	Market Timing	Excess Return	Security Selection	Market Timing
	ABSA General Equity			Allan Gray			Analytics Managed FoF		
Monthly Return	-0.05%	0.03%	-0.09%	-0.03%	0.04%	-0.07%	-0.13%	-0.08%	-0.04%
Monthly Std Deviation	2.08%	2.24%	0.82%	2.82%	2.86%	0.89%	1.51%	1.62%	0.57%
T-stat	-0.1998	0.1034	-0.8501	-0.0727	0.0982	-0.5891	-0.6409	-0.4023	-0.6057
	Community Growth			Coronation Top 20			FNB Growth		
Monthly Return	-0.20%	-0.09%	-0.11%	0.30%	0.26%	0.04%	-0.29%	-0.17%	-0.12%
Monthly Std Deviation	1.77%	1.91%	0.86%	2.10%	2.11%	0.54%	2.07%	2.06%	0.84%
T-stat	-0.8776	-0.3746	-1.0228	1.1099	0.9679	0.5174	-1.0830	-0.6488	-1.1064
	Foord			Investec Equity			Investec Growth		
Monthly Return	0.11%	0.20%	-0.10%	-0.17%	-0.02%	-0.16%	-0.22%	-0.20%	-0.02%
Monthly Std Deviation	1.58%	1.50%	0.67%	1.71%	1.82%	0.62%	1.82%	1.93%	0.42%
T-stat	0.5190	1.0420	-1.1257	-0.7715	-0.0696	-1.9772	-0.9390	-0.8215	-0.3423
	Investec Value			Investment Solutions FoF			Marriott Dividend		
Monthly Return	-0.74%	-0.44%	-0.30%	-0.26%	-0.07%	-0.20%	0.16%	0.28%	-0.12%
Monthly Std Deviation	2.64%	2.30%	1.16%	1.49%	1.52%	0.77%	2.32%	2.08%	0.89%
T-stat	-2.1752	-1.4944	-1.9776	-1.3722	-0.3626	-1.9814	0.5356	1.0443	-1.0287
	Momentum Multi FoF			Nedgroup Investments Quant			Nedgroup Investments Raimaker		
Monthly Return	-0.33%	-0.25%	-0.09%	-0.27%	-0.33%	0.05%	-0.17%	-0.06%	-0.12%
Monthly Std Deviation	0.99%	0.95%	0.46%	1.97%	2.09%	0.71%	2.10%	2.24%	0.76%
T-stat	-2.6111	-1.9994	-1.4891	-1.0765	-1.2327	0.5940	-0.6284	-0.1915	-1.2237
	Old Mutual High Yield			Prudential			PSG Alphen Equity FoF		
Monthly Return	-0.76%	-0.59%	-0.17%	-0.04%	0.08%	-0.12%	-0.40%	-0.25%	-0.15%
Monthly Std Deviation	2.40%	2.23%	0.99%	1.73%	1.80%	0.72%	1.18%	1.16%	0.72%
T-stat	-2.4388	-2.0369	-1.3338	-0.1622	0.3391	-1.2717	-2.5968	-1.6367	-1.6277
	Sanlam Value			SIM General Equity			STANLIB Index		
Monthly Return	-0.36%	-0.12%	-0.24%	-0.21%	-0.10%	-0.11%	0.09%	-0.01%	0.10%
Monthly Std Deviation	2.22%	2.18%	1.05%	2.36%	2.45%	0.63%	2.22%	2.39%	0.58%
T-stat	-1.2520	-0.4267	-1.7994	-0.6743	-0.3015	-1.4098	0.3234	-0.0350	1.3170
	STANLIB Value			SYMmetry General Equity FoF					
Monthly Return	0.09%	-0.08%	0.14%	-0.35%	-0.35%	-0.01%			
Monthly Std Deviation	2.22%	2.94%	1.95%	1.95%	2.06%	0.69%			
T-stat	0.3234	-0.2135	0.5427	-1.3996	-1.3071	-0.0889			

7. Interpretation of Results

When interpreting the above results, one needs to distinguish between statistical significance and actual economic significance of negative or positive performance. The majority of the t-stat's calculated above are statistically insignificant, meaning that the over- or underperformance is not statistically different from zero. However, the consistently negative or positive return performance compounded over time, leads to economical differences when looking at money invested. As such, it becomes important to view statistically insignificant results in this light, as inferences about performance can still be drawn. Given the different approaches used, when viewed in combination, these findings provide a comprehensive empirical study of manager performance, adjusted for style risk.

7.1 Traditional Performance Regression

When comparing the first two regressions, the two factor FINDI 30 RESI 10 model exhibits more explanatory power for each unit trust with exception of the Stanlib Index Unit Trust. This finding supports prior research that the FINDI 30 RESI 10 two-factor model may be more appropriate than the ALSI 40 CAPM model, in describing returns on the JSE. Given its composition and mandate, it would be expected that the single factor ALSI40 model would have higher explanatory power for the Stanlib Index Unit Trust. In this case the Stanlib Index Unit Trust acts as a control, highlighting the effect and appropriateness of using either model.

In all cases where traditional market regressions are performed in order to measure risk adjusted performance, with exception of the above mentioned Index Unit Trust, the two factor FINDI 30 RESI 10 model should be used over the single factor market model. In addition, risk adjusted performance decreases when the more appropriate two-factor model is used. If the incorrect model is used, the unit trusts performance runs the risk of being overstated.

While all of the funds still exhibit positive alpha, the magnitudes are smaller and there are only four unit trusts where this positive alpha is statistically significant at the 5% level. The unit trusts are Coronation TOP 20, Foord Equity Fund, Nedgroup Investments Rainmaker Fund and Prudential Equity Fund.

All the unit trusts with the exception of the Stanlib Index Unit Trust have a much lower sensitivity to the RESI 10 than the FINDI 30. The Stanlib Index Unit Trust tracks the All-Share Index and as such, its sensitivities indicate that it is about as sensitive to the RESI as it is the FINDI. This finding indicates that the majority of active managers down weight resources compared to the broad market index in South Africa.

The negative sensitivities of the Old Mutual High Yield Opportunities and Marriott Dividend Growth fund to the RESI 10 in the two factor regression make intuitive sense. These unit trusts, by investment objective, hold high dividend yielding shares which have the ability to grow their dividend yield going forward. The shares that they invest in are mainly the financial and Industrial shares.

Given the unit trusts managers bias to down weighting resources, coupled with the low return of resources over the period, what can be drawn from the comparison of the single factor and two-factor model is that the single factor model would over state performance given the weighting of resources in the ALSI 40. This can be seen when comparing the alphas of the single factor and two-factor regressions.

In order to incorporate style as explanatory factor, the value and momentum indices are added as independent variables to the single and two-factor models. The resultant alphas in both cases are drastically reduced. The implication of this is that once style exposure has been accounted for, the manager's performance due to stock selection does not add any significant value over and above that of the market and style factors. While not statistically

significant Coronation TOP 20, Prudential, Foord Equity, Nedgroup Investments Rainmaker and Stanlib Value unit trusts display the best performance.

When comparing the three factor model to the four factor model, on an adjusted R-squared basis, the four factor model in the majority of cases exhibits greater explanatory power. The additional explanatory power is, negligible and should not be used as a discriminating factor when selecting which model to use given the marginal differences.

The correlation between the FINDI 30 and Value Index is 0.89. Table 3-3 shows that even when looking at the correlation of returns between the FINDI 30 and Value net of ALSI 40 returns, the correlation remains high at 0.79. The high sensitivity of unit trusts, to the value factor in the three factor model can be due to most South African Managers self-proclaimed value bias's, or it could be to the fact that if the correlation between the FINDI 30 and the Value Index is very high over the period of examination. The Stanlib Index Fund, as expected, is very sensitive to the ALSI 40. Given the correlation of the Value Index and the FINDI 30 and related problems of multicollinearity, it is difficult to drawn inferences from the individual coefficients of the four factor regression.

Over the period of examination, one can conclude that once market and style risk has been accounted for, unit trust manager's ability to achieve significant positive excess returns is questionable. While not being statistically significant the positive alphas, of the select top performing unit trusts can be economically significant when annualised and compounded.

7.2 Performance against custom RBSA Benchmark

Each fund's specific style benchmark is used as the market proxy in these traditional market based performance models. The results of the performance measures are interpreted as the funds' own specific style risk adjusted performance. It can be argued that constructing a specific custom benchmark is the most appropriate way of measuring true managerial performance. Using a custom benchmark adjusts performance for the specific level of risk, market and style, the fund manager takes. The manager skill, selectivity and timing, can then be measured without the effect of exposures to well-known anomalies' being misinterpreted.

7.2.1 Style exposures

RBSA has many purposes, only one of which is measuring style adjusted performance. In reviewing a manager's performance, what is also very useful to understand and quantify is, what risk's he/she is exposed to. This is especially relevant when considering if the unit trust is an appropriate investment in a greater portfolio context. RBSA provides a method to independently verify what style exposures or risks a manager is taking.

The style map of the Marriott Dividend Fund clearly indicates that a large percentage of the funds returns act like a cash exposure. This is evidence of Sharpe's duck theorem. It is not that the fund holds that much cash, general equity unit trusts in South Africa are only allowed to hold 25 % cash, but rather that the high dividend yielding shares constant income stream act like a cash return.

What can be seen from this style map is that while the cash exposure was relatively steady, the remaining exposure fluctuated from Momentum, to Value and then back to Momentum. The Financial and Industrial shares were undervalued prior the financial crisis and during the subsequent years. Only with the global search for yield, have these high dividend yielding shares' become very popular and expensive. These Financial and Industrial

shares have moved from value style shares, to take on momentum characteristics. While the dividend streams have remained relatively constant and seem to have increased, the style of the underlying shares held by this unit trust have morphed through time. The increase in the estimated cash exposure can be explained by the bloated balance sheets of companies, not wanting to make too many investments, given the uncertain global financial environment. As a result, some of this excess cash is returned to shareholders in the form of dividends.

7.2.2 Style Alpha

The majority of unit trusts investigated in this study exhibit negative alpha when regressed against their passive style benchmark. A positive (negative) alpha can be viewed as excess return due to superior (inferior) security selection, once performance has been adjusted for style and asset risks. This can be interpreted as consistent positive or negative return to each unit trust, in excess of their own custom style benchmark. The style benchmark is designed from passive, investable indices that can form the building blocks of a viable alternative passive investment strategy. While the alphas, both negative and positive, are not statistically significant, the constant out- or under- performance measured by these alpha's can be economically significant when either the active or passive investment choice is applied.

Once performance has been adjusted for exposure to market and style risk, there are nine unit trust managers which exhibit positive alpha and fourteen which exhibit negative alpha. The results indicate that on average, the managers of the South African General Equity Unit Trusts, covered in this study, add no significant value over and above a passive investment option replicating their style exposures. Their excess returns are not statistically different from zero when measured against this custom benchmark. As both of the investment opportunities are net of costs alternative considerations may be needed when selecting which investment alternative to choose, active or passive. This evidence supports the earlier findings in section 7.1.

While relatively insignificant, what is interesting to note is that the same four funds mentioned in 7.1 are the best performers against their own custom style benchmarks. The economic significance of these consistent findings separates these four funds as the best performers from the group.

7.2.3 Treynor-Mazuy

When the custom benchmark model is incorporated in the Treynor-Mazuy performance model, the number of positive alpha's are reduced to 6, again none are statistically significant. Indicating that majority of the managers possess negative selection ability. Eleven of the managers display positive market timing ability. Only two unit trusts, Coronation Top 20 and Prudential Equity, exhibited both positive selection and market timing ability in the context of the Treynor-Mazuy model.

When reviewing the results of the above performance measurement techniques incorporating style exposure, no statistically significant conclusions can be drawn. However, this does not mean that the above methodologies add no value when analysing a manager's performance. As only general equity unit trusts are examined, there is not that much room for the fund managers to manoeuvre with regard to market timing. In addition, the majority of managers themselves do not subscribe to market timing and through their own admission are focussed stock selectors.

Across both custom style benchmark methodologies the Coronation Top 20, Prudential Equity Fund, Foord Equity, Nedgroup Investments Rainmaker Fund consistently performed the best on a style risk adjusted basis. While the results are not statistically significant, the economic implications of investing in one of these funds, with superior managers, cannot be understated. As this is an empirical study, the Unit Trusts mentioned above, over the period of examination, can be viewed as favourable indicating superior manager performance when both market and style risk is taken into account.

7.3 RBSA and Return Decomposition

A generalised form of the Brinson Decomposition is used to separate the returns in excess of each unit trust's custom style benchmark, into returns due to selection and market timing. RBSA is used to estimate each unit trusts policy- and actual-style weight. As a longer time period is used to estimate the long term policy-style weights, and in order to ensure that an out-of-sample estimate is arrived at, the analysis of excess returns only starts in January 2008. The data from January 2003 to December 2007 is used to estimate the first long term policy style weight for January 2008. This shorter evaluation period needs to be kept in mind when viewing the empirical results. Additionally, how this method differs from the previous RBSA methodology, is that excess return is defined against the long term policy-style benchmark.

Five unit trusts exhibited average returns in excess of their long term policy-style benchmark. What is worth noting is that this measure is different to the previous RBSA custom benchmark, as the long-term policy benchmark is by definition estimated using many more months. Coronation Top 20 and the Foord Equity Fund again are amongst the top performers using this measure. Collectively, in absolute terms, all of the funds had a lower average monthly return over this period of examination, as opposed to the entire period. This can be seen in appendix B.

Six managers produced positive selection return over the period, including Coronation Top 20, Foord Equity and Prudential Equity Fund. However, on the whole it can be concluded that on average, the managers evaluated destroy value with their active selection returns, once style exposure has been accounted for.

Similar findings present for market timing ability, with only four managers being able to produce positive market timing. While in this study it can be concluded that managers do not add value through market timing, the reality as stated above, is that general equity

managers do have that much scope to try and time the market. Therefore it may be slightly unfair to measure a manager using this metric. One needs to consider this when analysing the results. Regardless of the above, only one fund has both positive selection and market timing returns, namely the Coronation Top 20.

7.4 Combined Results

Using all of the above methods in conjunction, we are able to empirically and critically analyse the style risk adjusted performance of the Unit Trust Managers in this study. What does stand out is that across the three methods presented in this paper, while on average there seems to be evidence destruction of returns on a style adjusted basis, specific unit trusts exhibit favourable results across the board. Namely, and a clear out performer is the Coronation Top 20 followed by the Foord Equity Fund. Other Unit Trusts that deserve a mention are the Prudential Equity Fund, Nedgroup Investments Rainmaker Fund and the Marriott Dividend Growth Fund. This consistent performance has been measured with three different techniques, over three different time periods. It can be concluded that an investment in these unit trusts would have produced returns in excess of the style risks they are exposed to. In cases of the alternative unit trusts, an investor would have been better off selecting a passive combination of the market and style indices.

8. Conclusion

With the advancement in number and complexity of passive investment alternatives now available, like style exposure, active managers should be measured on their ability to provide returns in excess of these easily accessible passive options. If they are unable to, investors may be persuaded to select the low cost passive options to avoid paying excess fees for no risk adjusted outperformance. Style exposure has been a source of outperformance for active managers, but as passive alternatives for this exposure are now available their performance should be adjusted to reflect this option. If after adjusting for style risk, active managers can still add value, it indicates that they have superior managerial skill. Superior managerial skill in this case mainly relates to stock selection ability.

When comparing the results of the three alternative methods of measuring performance, on a style adjusted basis, we are presented with a thorough and comprehensive approach to analysing the skill of managers, taking well-known and easily replicable market anomalies into account. The unconstrained style regressions, RBSA style benchmark performance and RBSA return decomposition all came to similar conclusions. The majority of managers were not able to outperform on a style adjusted basis. However, there were exceptions which consistently outperformed on a style adjusted basis. While not statistically significant, the economic significance of the outperformance cannot be dismissed lightly. Compounded over a period of time, the consistent outperformance can make a significant difference to an initial investment. Manager performance should be viewed in light of the risks taken; RBSA allows this measurement against a custom style benchmark. It can be argued that this is the most appropriate benchmark against which to measure a unit trusts performance.

RBSA, in addition to being used to measure performance on a style adjusted basis allows for a fairly easy and quick method to analyse unit trust exposures without the holdings information. This risk exposure information is invaluable when constructing a portfolio of managers.

Given the weaknesses of each of the different models, incorporating more than one approach should definitely be considered when selecting a manager. As passive alternatives become more mainstream, liquid and diverse, fund managers should not be rewarded for bearing risks that an investor can easily have access to. It is for this reason that style-adjusted risk performance should play an integral role in analysing a manager's performance, especially when trying to isolate skill.

While this study has been a measure of relative performance, it provides investors with a clearer perspective when trying to analyse and isolate fund manager skill. Given its weaknesses and possibility for misinterpretation, style analysis should be used as a supplementary technique in addition to traditional performance methods and qualitative analysis in determining whether to select a manager. While past performance could be due to luck, the consistent returns and results suggest that out of the funds examined, the Coronation Top 20 managers possess the greatest skill.

In a South African context, RBSA would be most effectively employed analysing style adjusted performance of multi-asset funds. When an appropriate factor for size in South Africa is developed I would recommend further research incorporating it into the style models used in this paper.

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Appendix A

Unit trust monthly returns over period January 2005 – December 2012

	ABSA General Equity	Allan Gray	Analytics Managed FoF	Community Growth
Monthly Return	1.27%	1.40%	1.24%	1.13%
Monthly Std Deviation	4.20%	4.49%	4.35%	4.52%
	Coronation Top 20	FNB Growth	Foord	Investec Equity
Monthly Return	1.59%	1.08%	1.50%	1.15%
Monthly Std Deviation	4.55%	4.42%	4.27%	4.42%
	Investec Growth	Investec Value	Investment Solutions FoF	Marriott Dividend
Monthly Return	1.21%	1.06%	1.11%	1.27%
Monthly Std Deviation	4.97%	4.99%	4.09%	3.67%
	Momentum Multi FoF	Nedgroup Investments Quant	Nedgroup Investments Raimaker	Old Mutual High Yield
Monthly Return	1.08%	1.26%	1.25%	0.94%
Monthly Std Deviation	4.05%	4.36%	4.17%	4.74%
	Prudential	PSG Alphen Equity FoF	Sanlam Value	SIM General Equity
Monthly Return	1.42%	1.02%	1.28%	1.33%
Monthly Std Deviation	4.07%	3.88%	4.58%	4.64%
	STANLIB Index	STANLIB Value	SYMmetry General FoF	
Monthly Return	1.32%	1.21%	1.12%	
Monthly Std Deviation	4.95%	4.49%	4.21%	

Appendix B

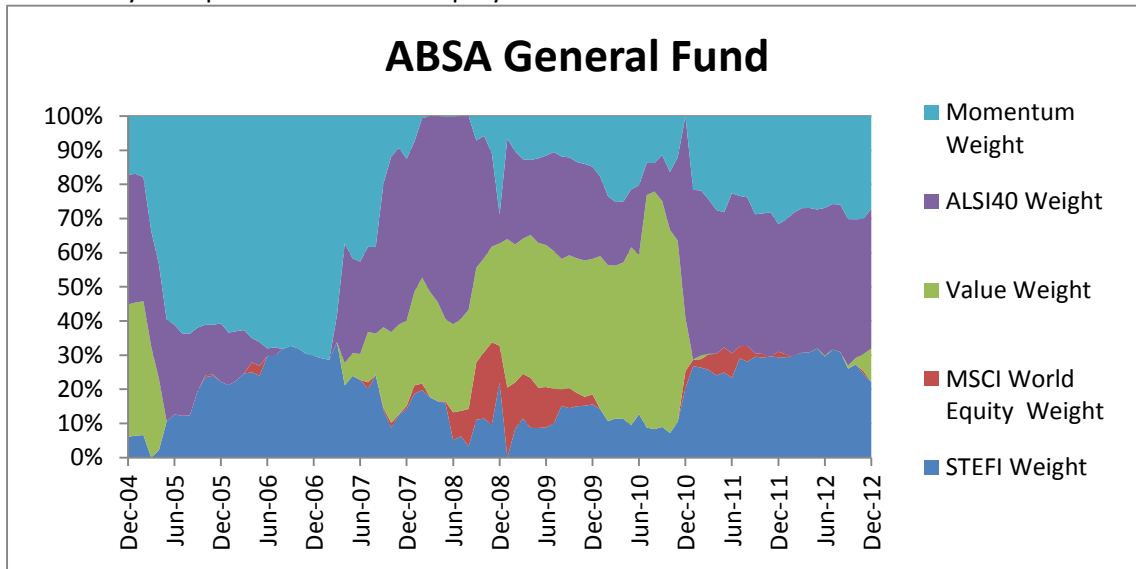
Unit trust monthly returns over period January 2008 – December 2012

	ABSA General Equity	Allan Gray	Analytics Managed FoF	Community Growth
Monthly Return	0.74%	0.74%	0.66%	0.53%
Monthly Std Deviation	4.42%	4.47%	4.49%	4.52%
	Coronation Top 20	FNB Growth	Foord	Investec Equity
Monthly Return	1.10%	0.58%	0.99%	0.50%
Monthly Std Deviation	4.74%	4.86%	4.41%	4.54%
	Investec Growth	Investec Value	Investment Solutions FoF	Marriott Dividend
Monthly Return	0.55%	0.47%	0.57%	1.13%
Monthly Std Deviation	5.17%	5.11%	4.03%	3.41%
	Momentum Multi FoF	Nedgroup Investments Quant	Nedgroup Investments Raimaker	Old Mutual High Yield
Monthly Return	0.52%	0.66%	0.68%	0.41%
Monthly Std Deviation	4.40%	4.64%	4.48%	4.82%
	Prudential	PSG Alphen Equity FoF	Sanlam Value	SIM General Equity
Monthly Return	0.79%	0.45%	0.67%	0.71%
Monthly Std Deviation	4.16%	4.03%	4.70%	5.01%
	STANLIB Index	STANLIB Value	SYMmetry General FoF	
Monthly Return	0.63%	0.44%	0.50%	
Monthly Std Deviation	5.41%	4.71%	4.37%	

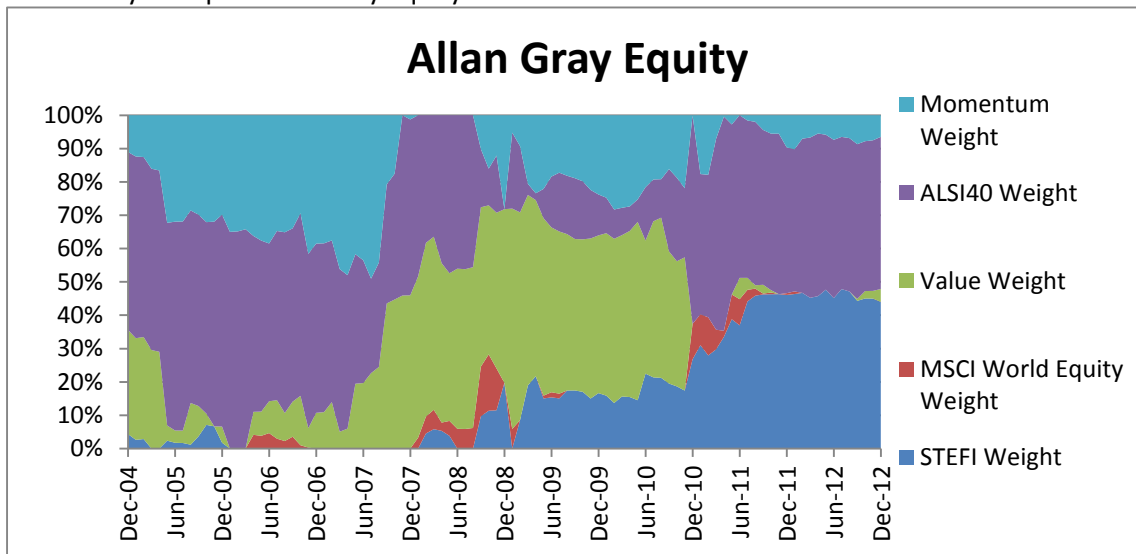
Appendix C

Style maps estimated using 24 months of data over period beginning January 2005 to end of December 2012

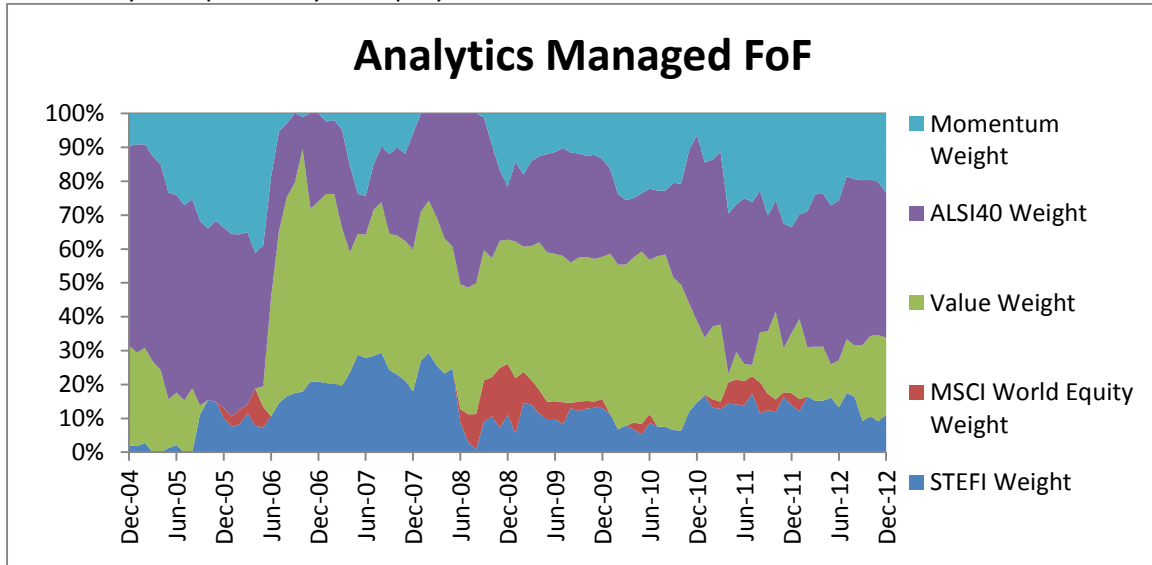
Style map of ABSA General Equity



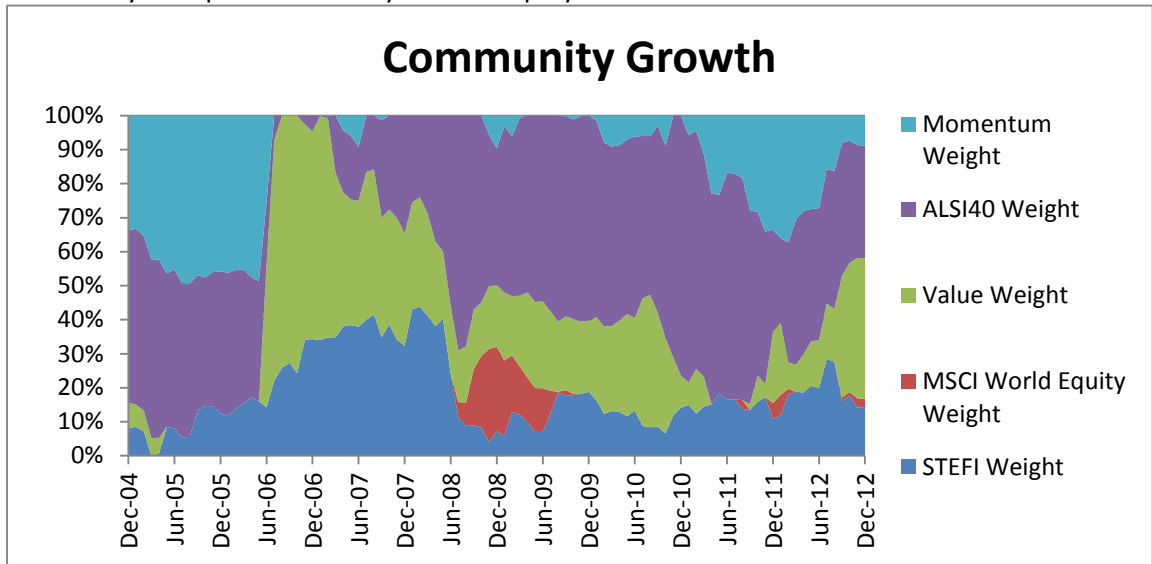
Style map of Allan Gray Equity



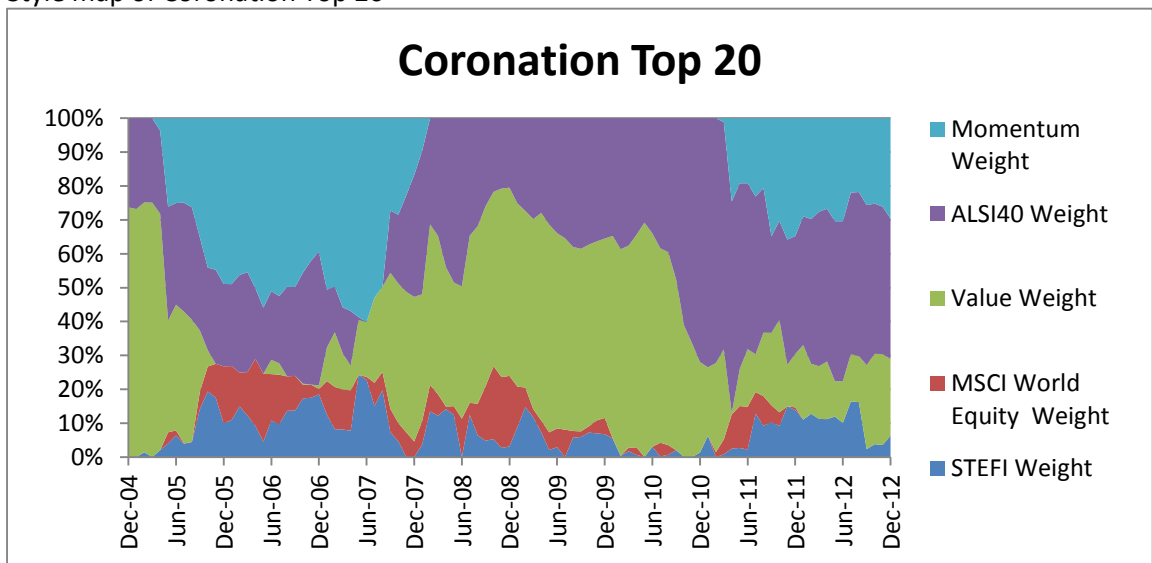
Style map of Analytics Equity



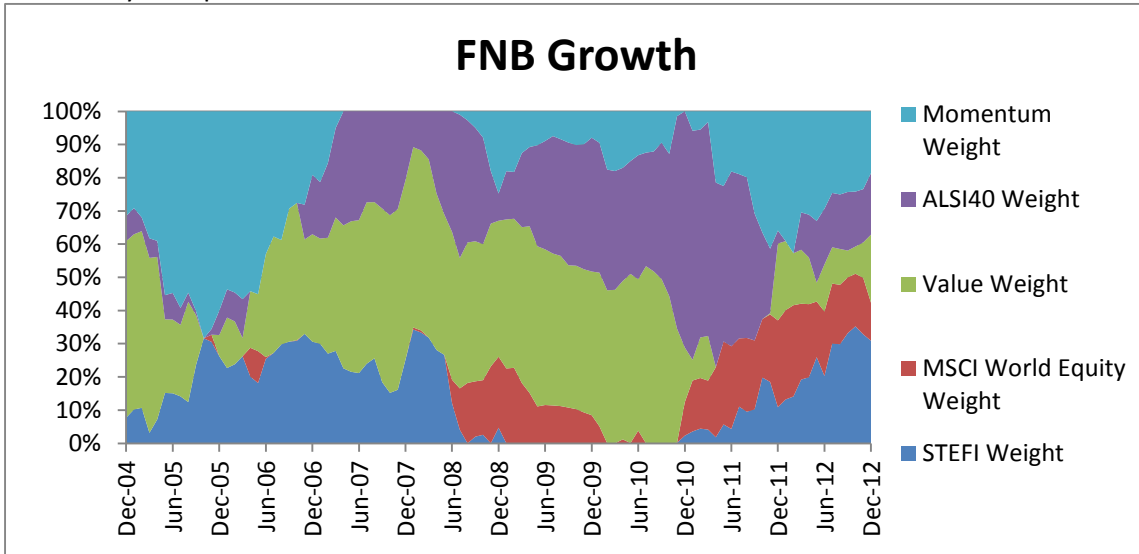
Style map of Community Growth Equity



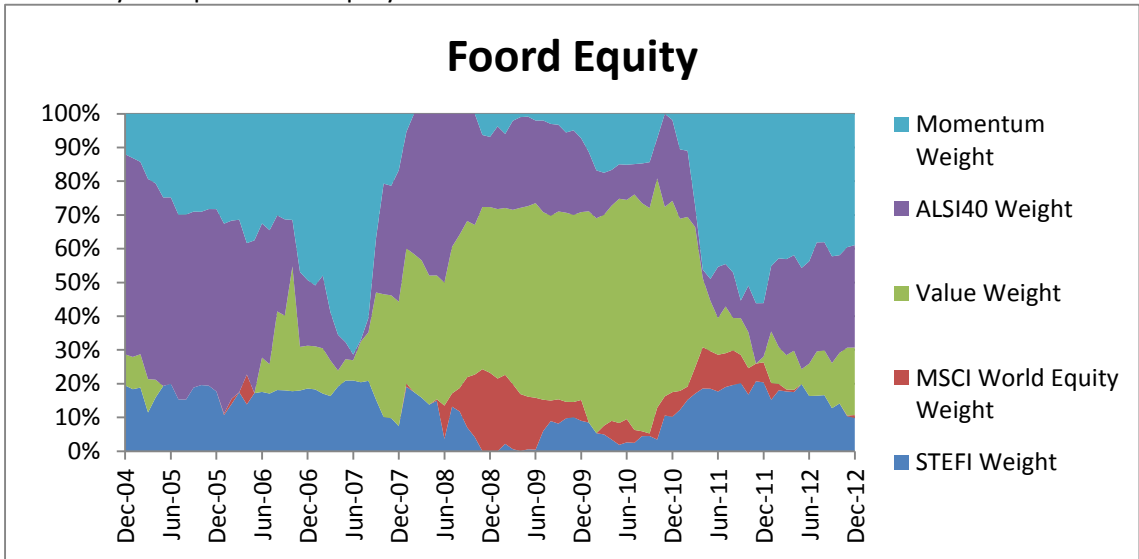
Style map of Coronation Top 20



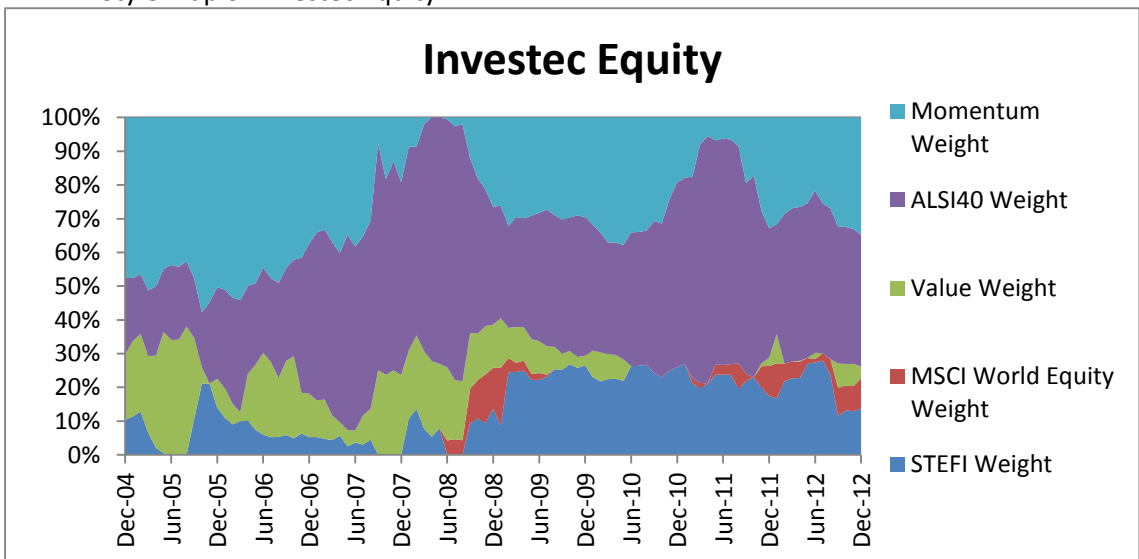
Style map of FNB Growth



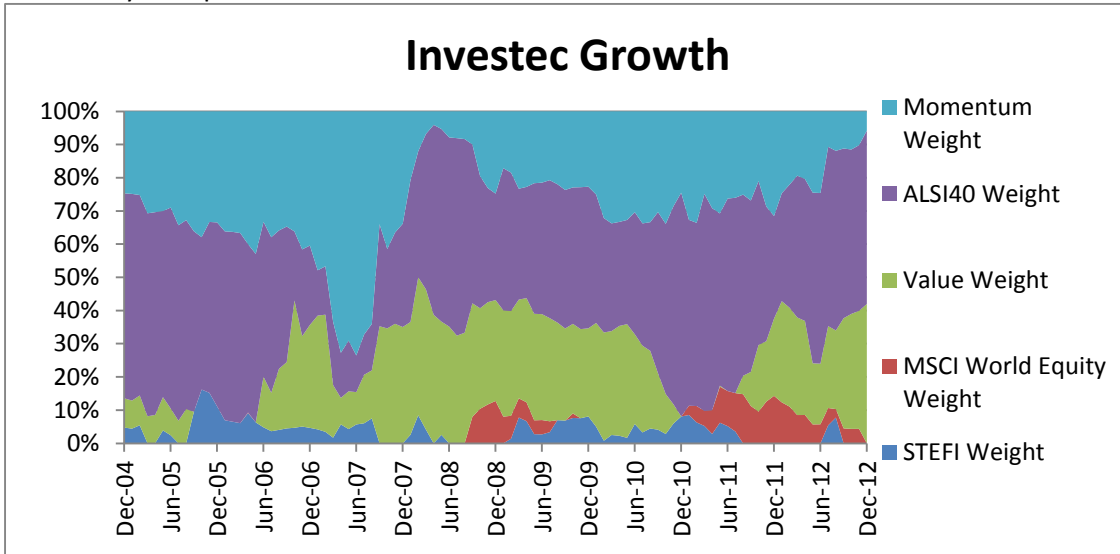
Style map of Foord Equity



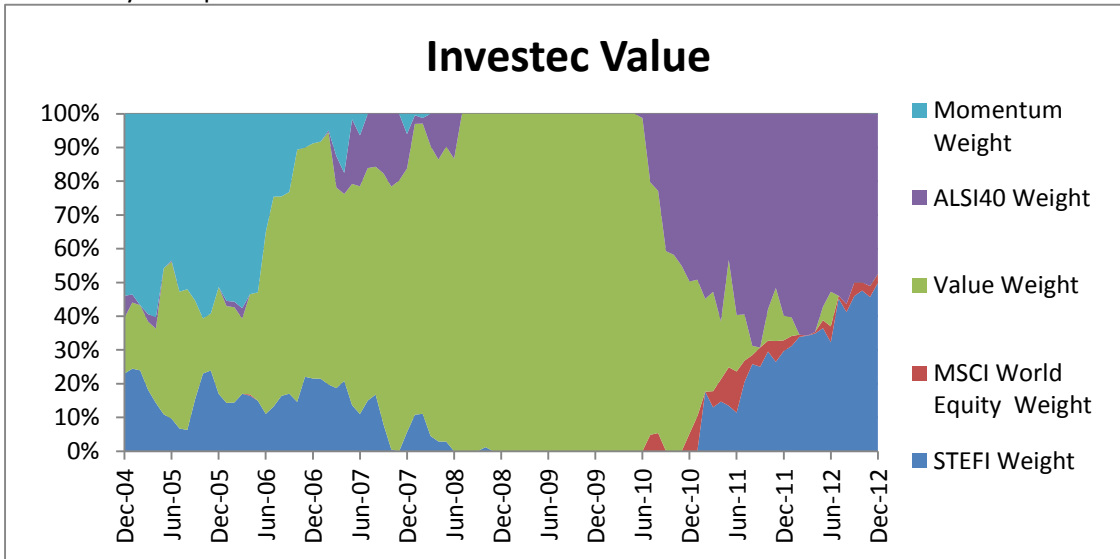
Style map of Investec Equity



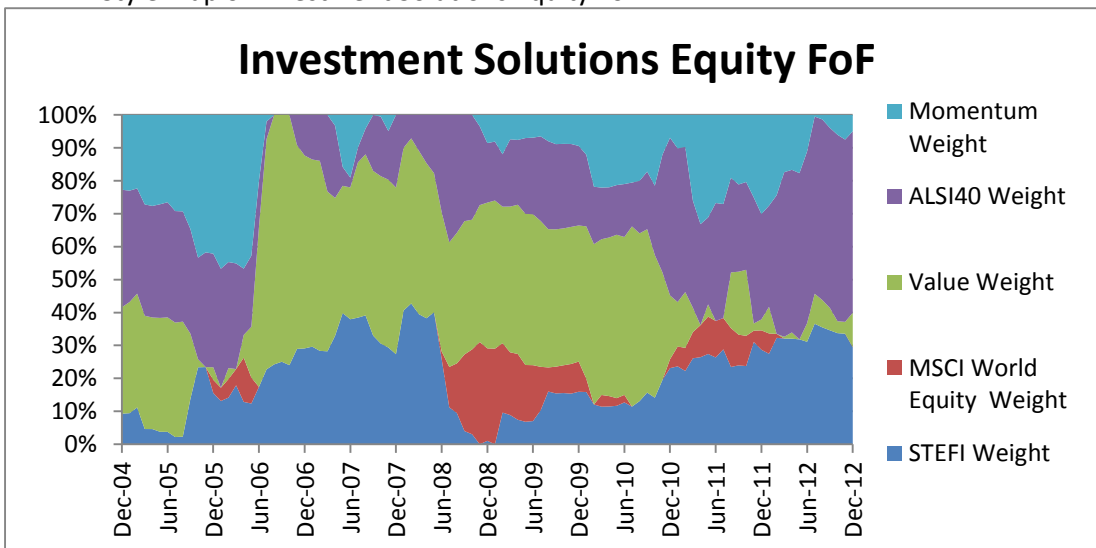
Style map of Investec Growth



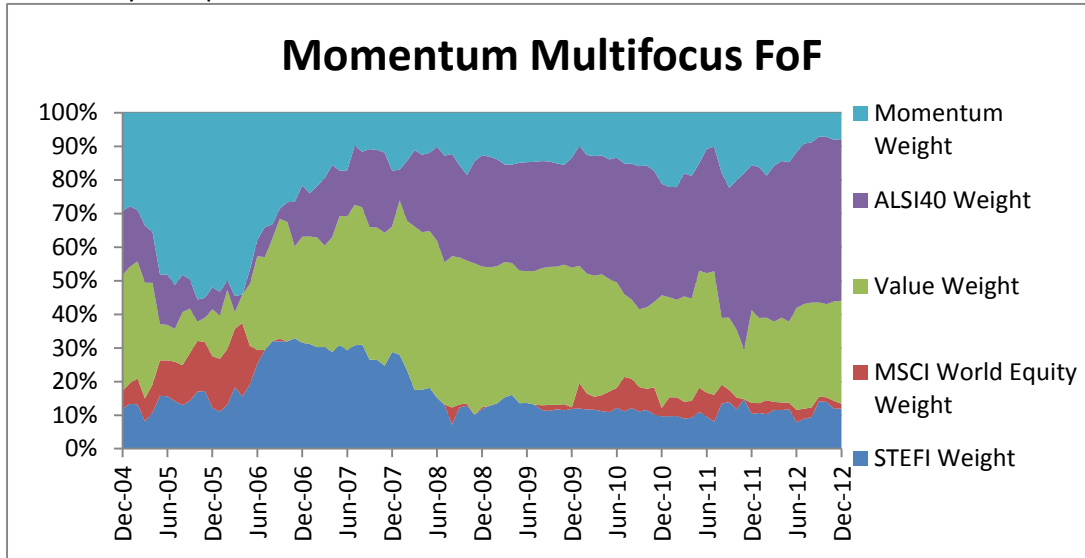
Style map of Investec Value



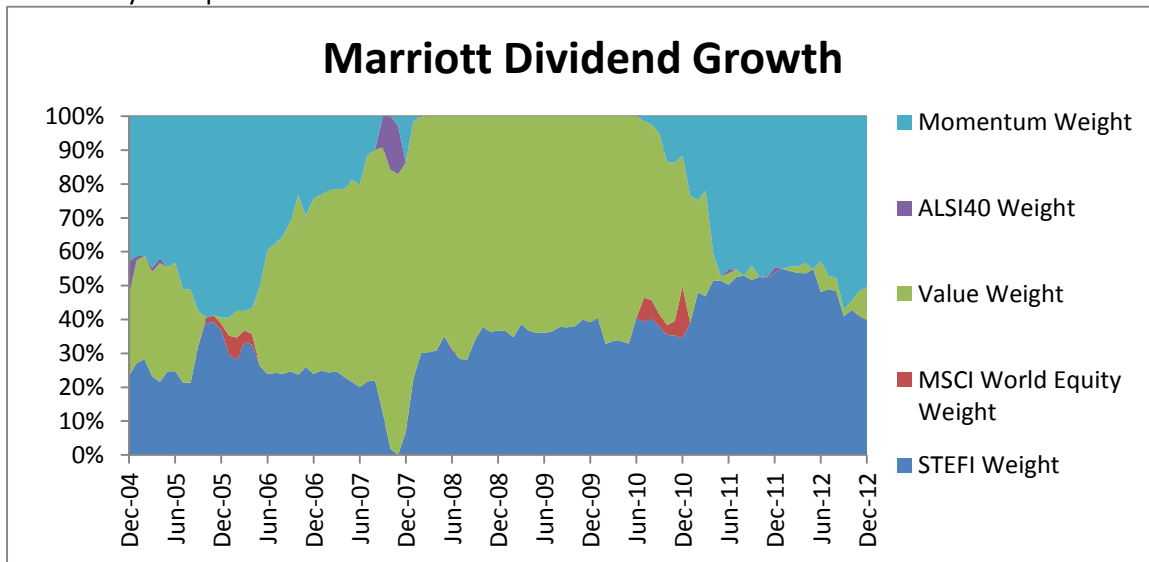
Style map of Investment Solutions Equity FoF



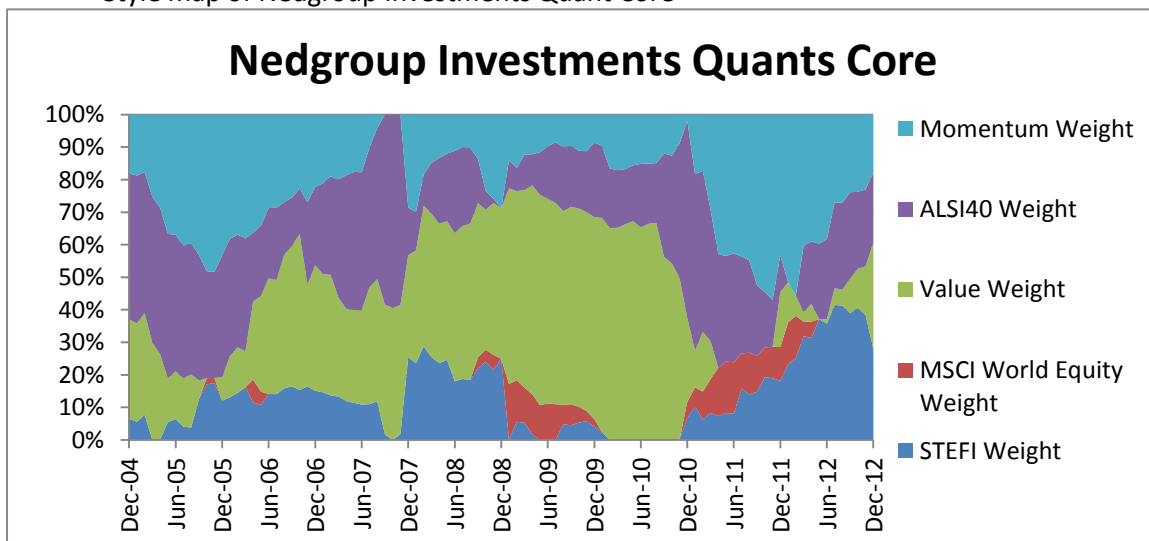
Style map of Momentum Multi Focus FoF



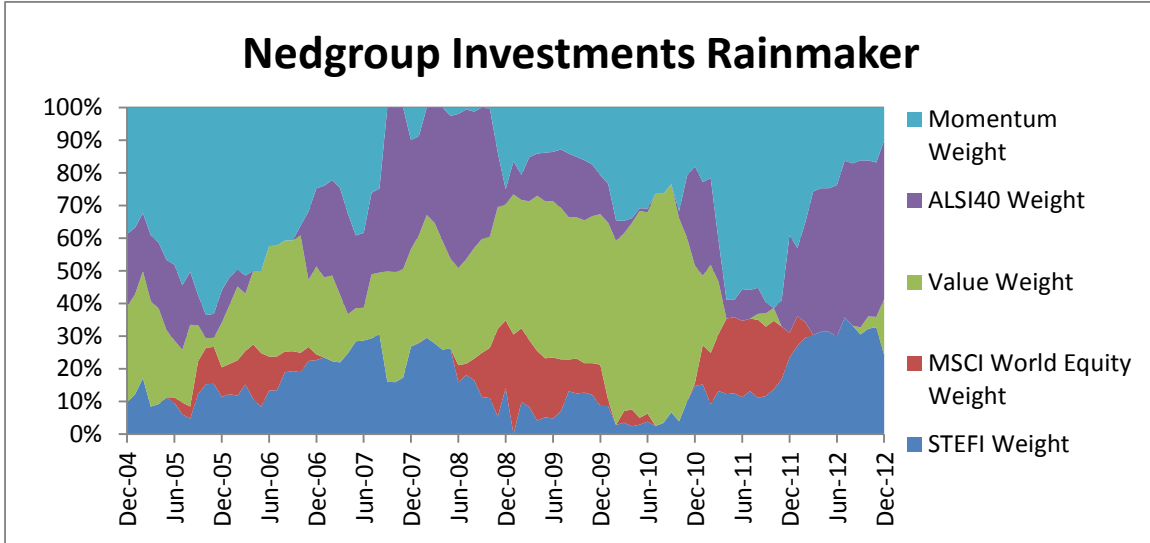
Style map of Marriott Dividend Growth



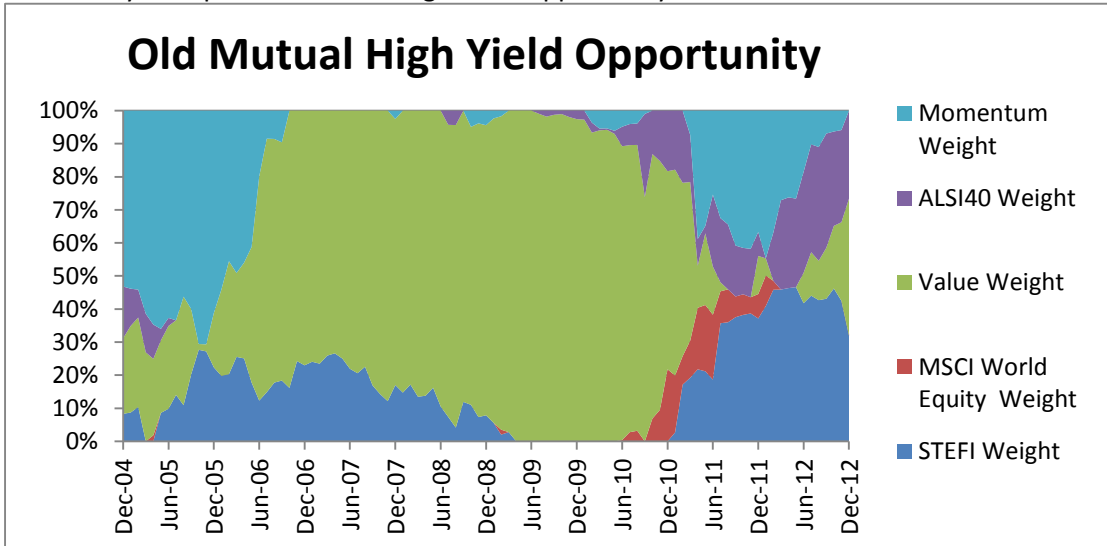
Style map of Nedgroup Investments Quant Core



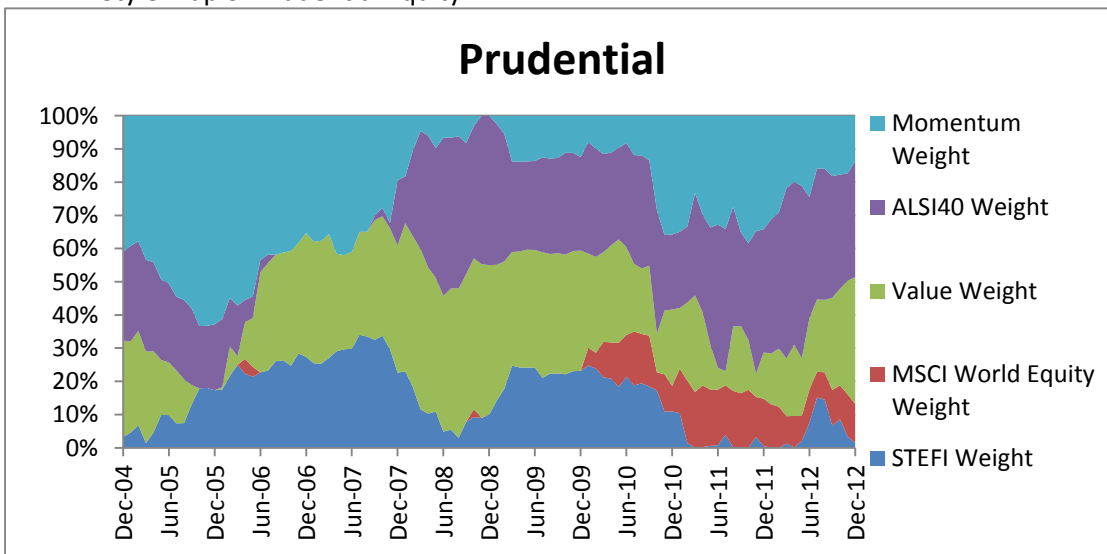
Style map of Nedgroup Investments Rainmaker



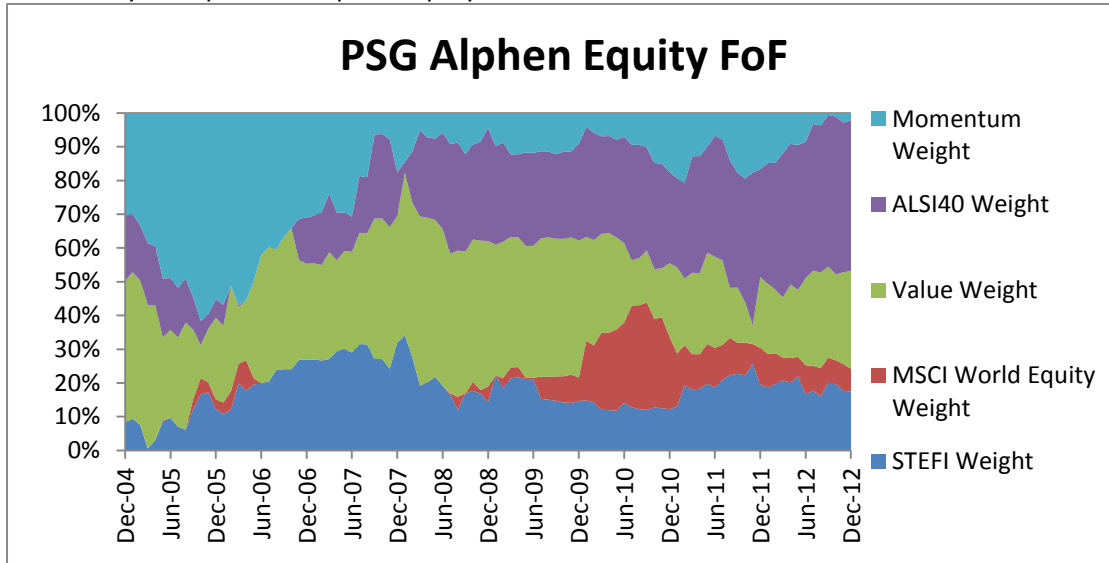
Style map of Old Mutual High Yield Opportunity



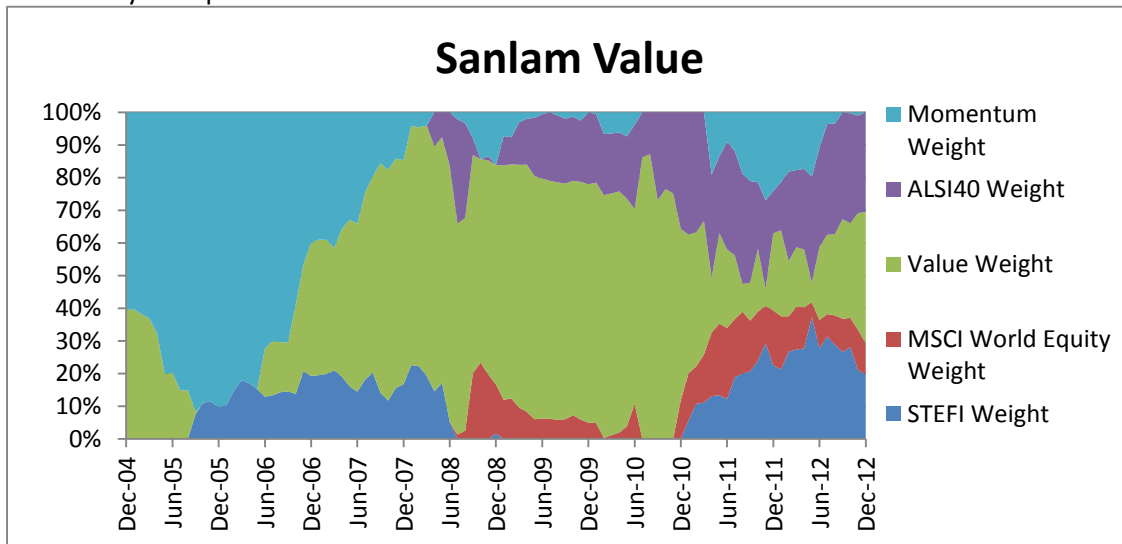
Style map of Prudential Equity



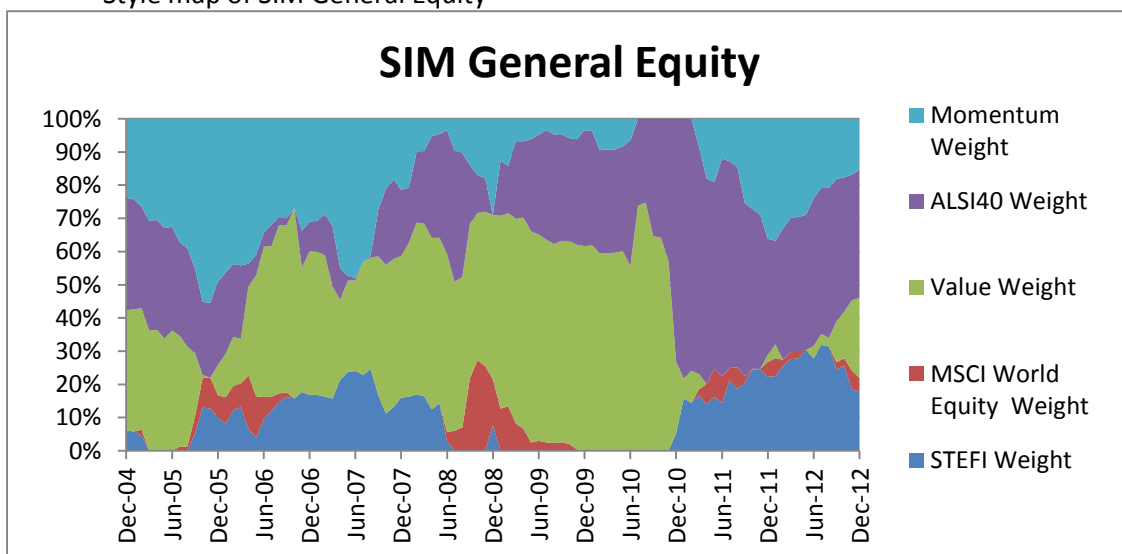
Style map of PSG Alphen Equity FoF



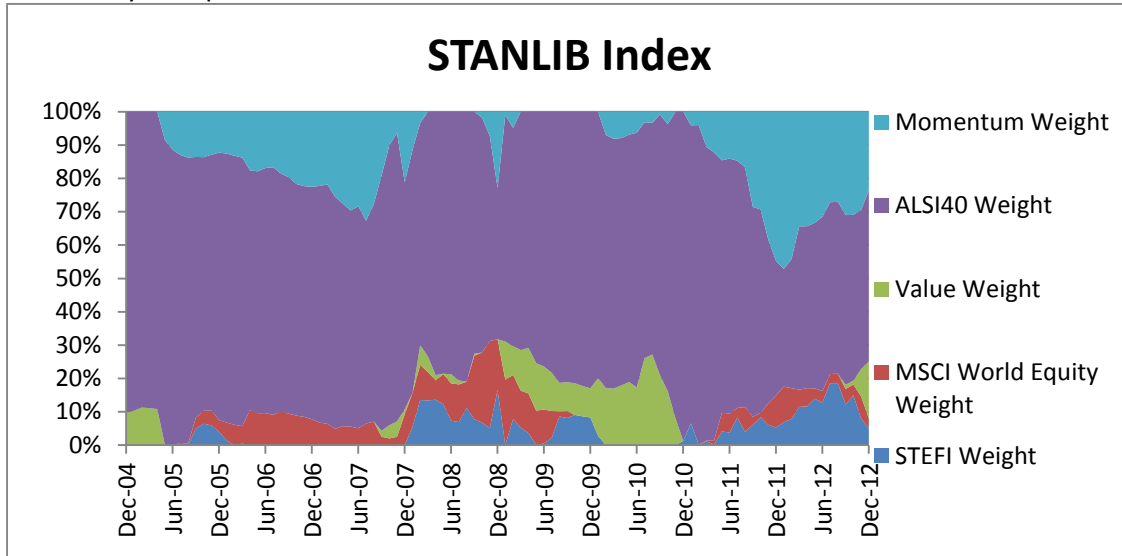
Style map of Sanlam Value



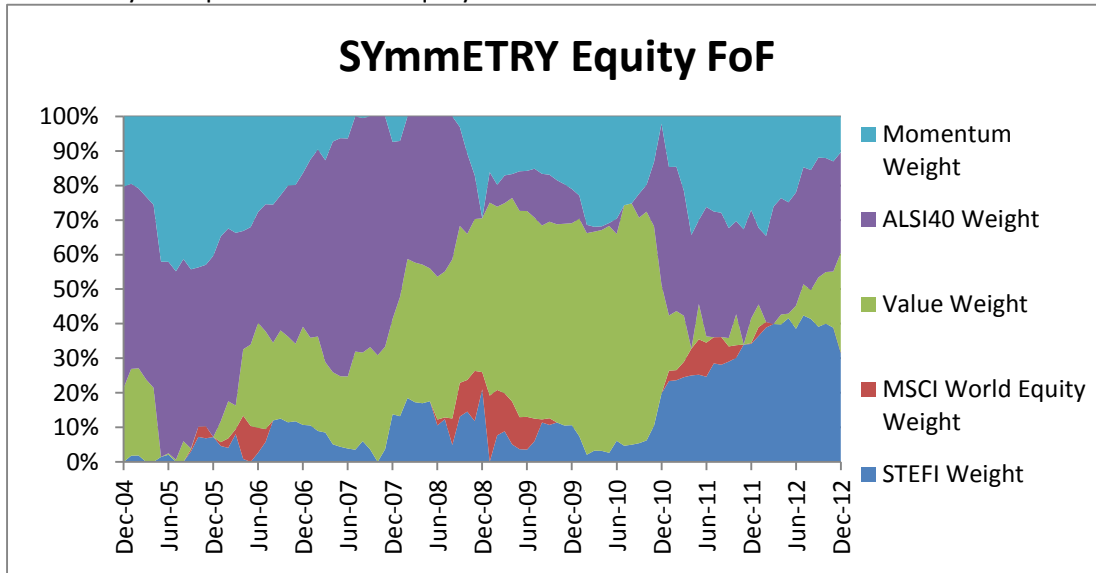
Style map of SIM General Equity



Style map of STANLIB Index Fund



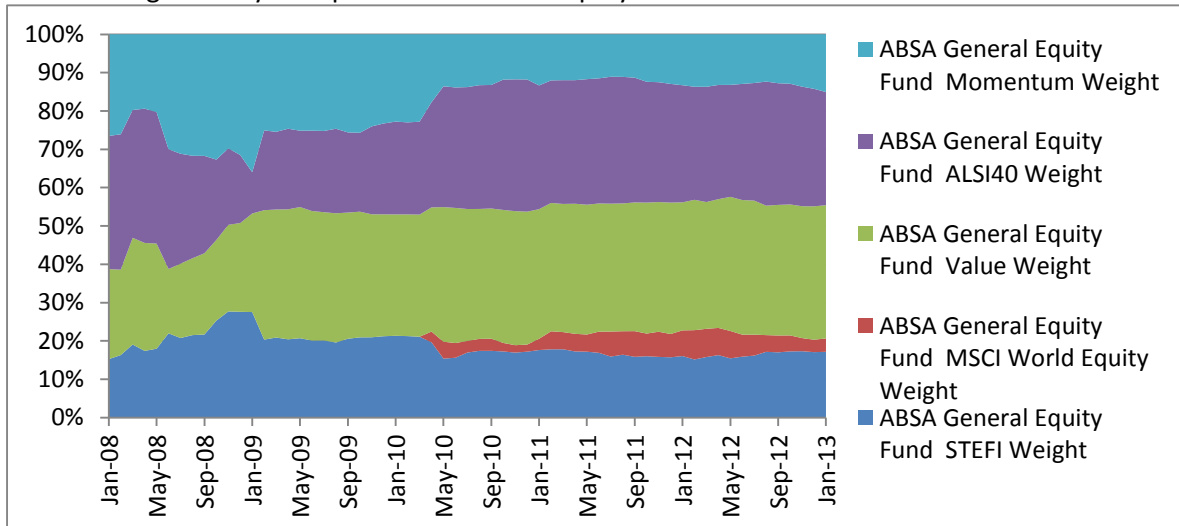
Style map of SYmmETRY Equity FoF



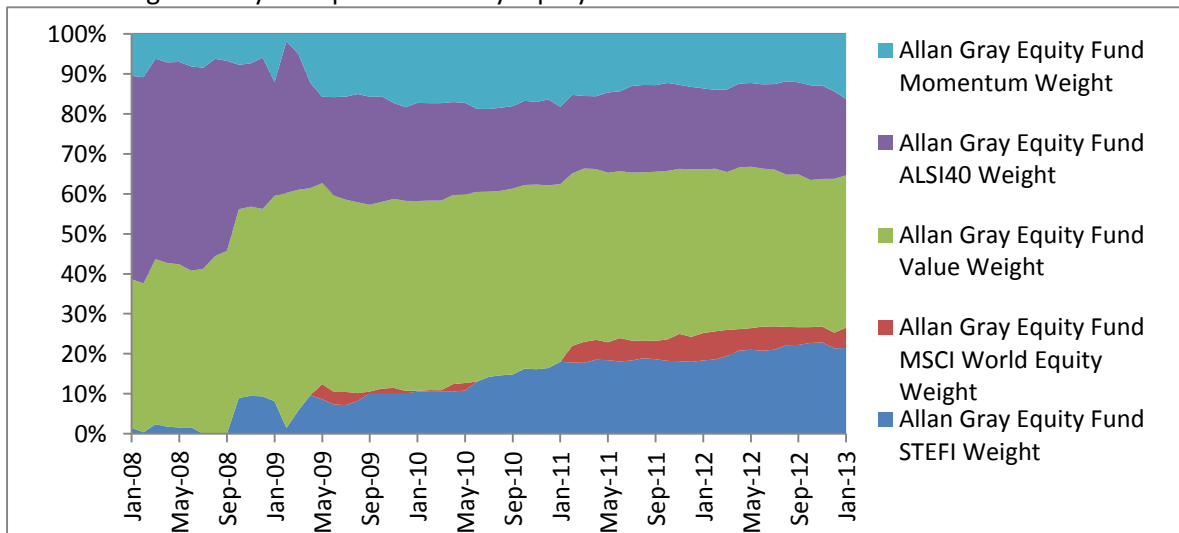
Appendix D

Long term style maps estimated using 24 months of data over period beginning January 2008 to end of December 2012

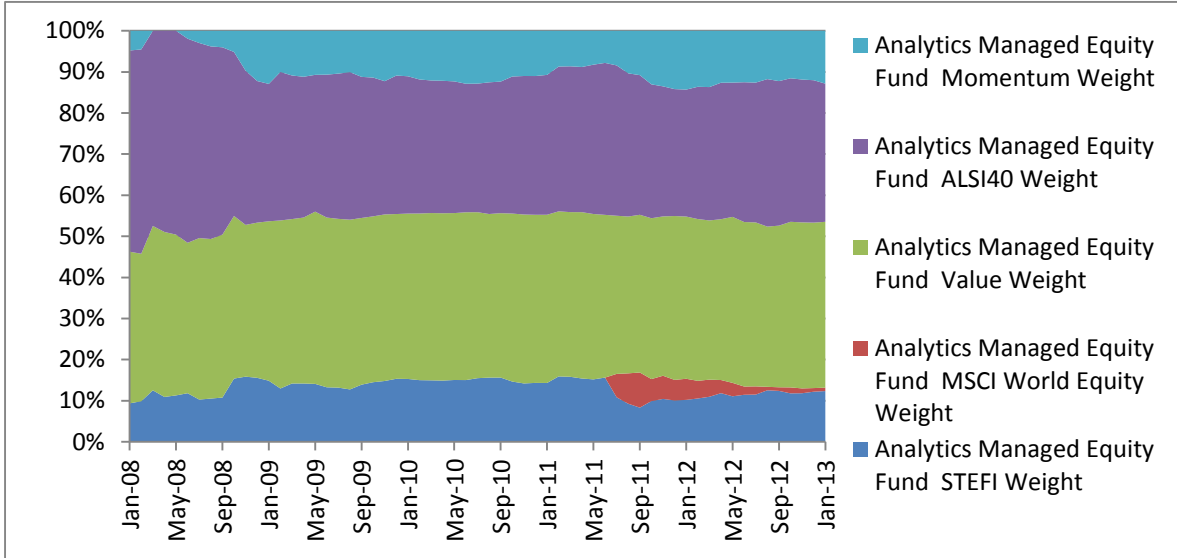
Long term style map of ABSA General Equity



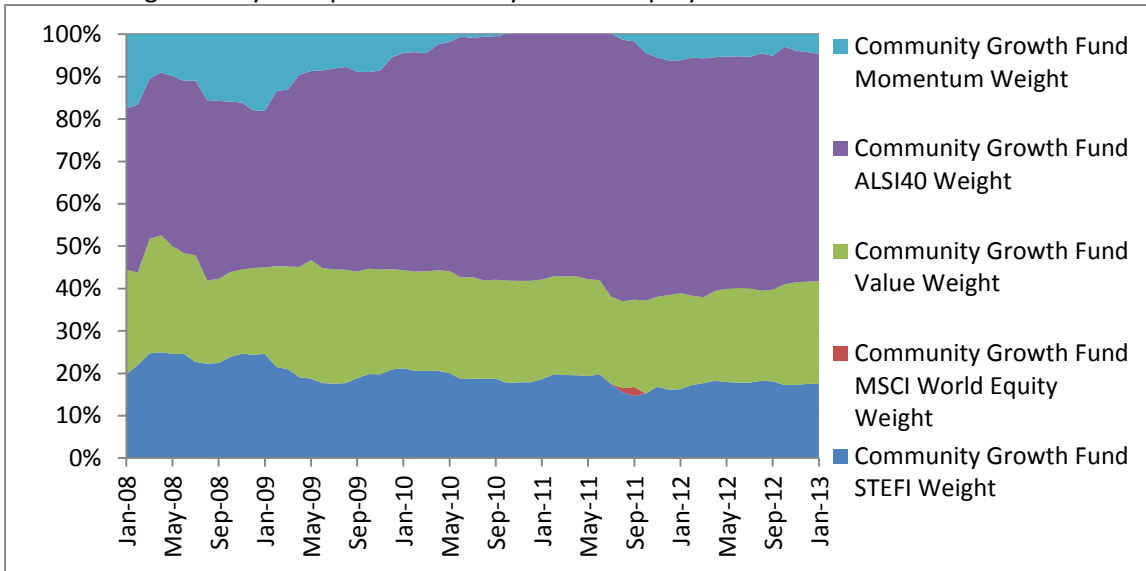
Long term style map of Allan Gray Equity



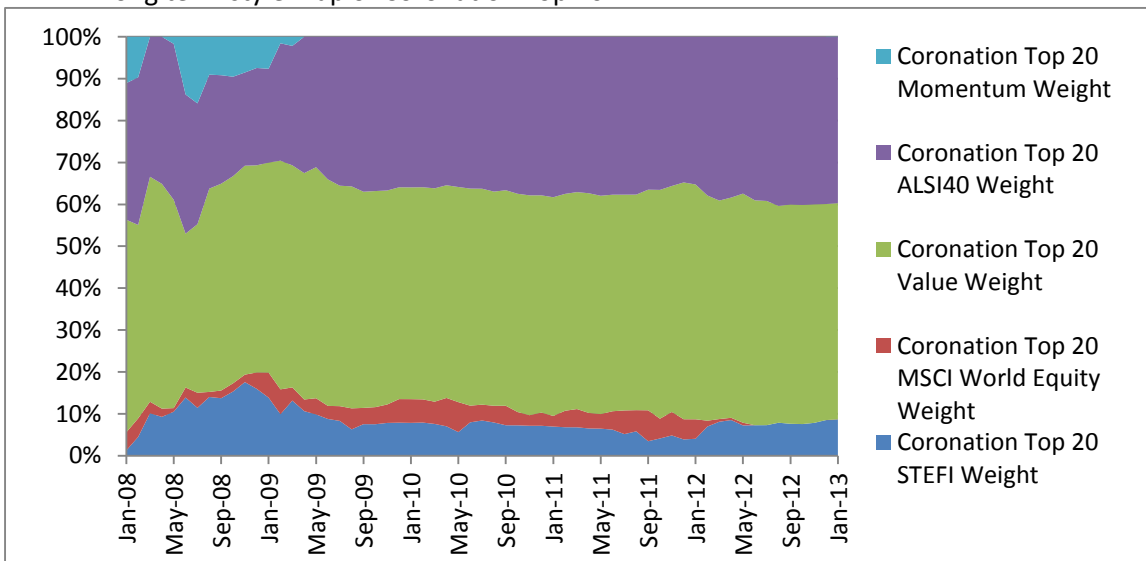
Long term style map of Analytics Equity FoF



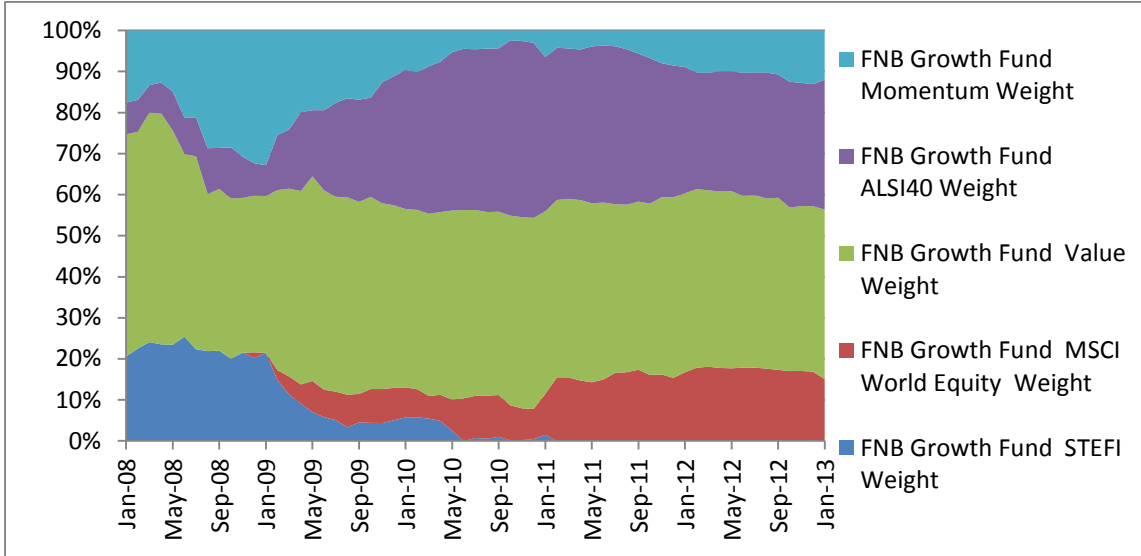
Long term style map of Community Growth Equity



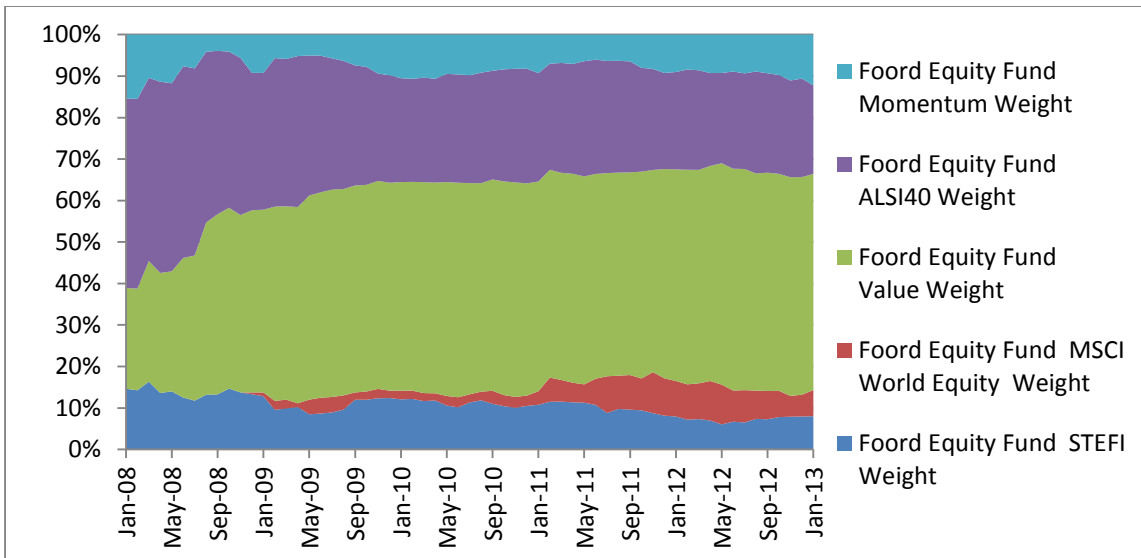
Long term style map of Coronation Top 20



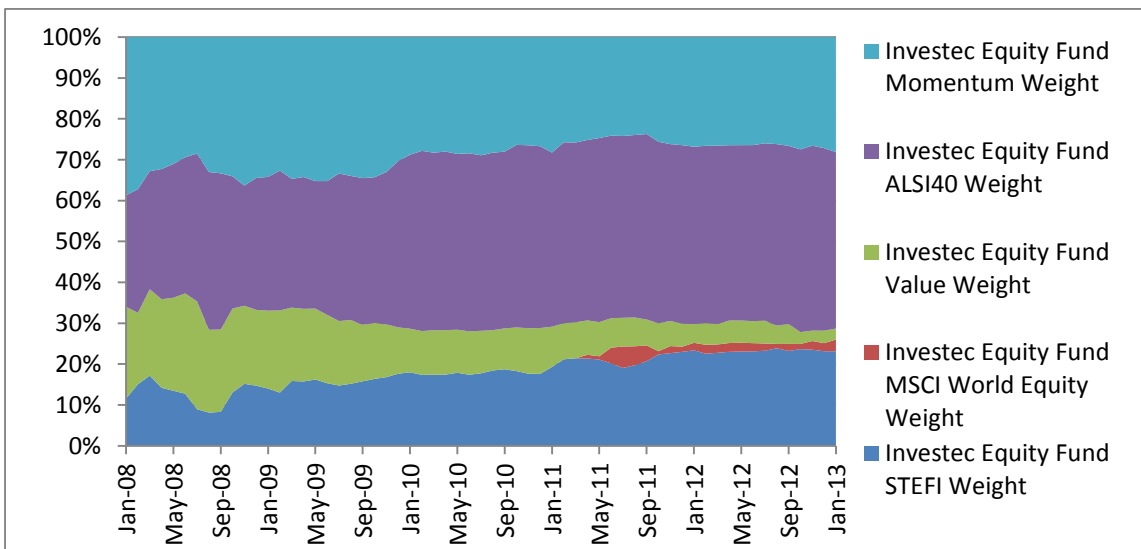
Long term style map of FNB Growth



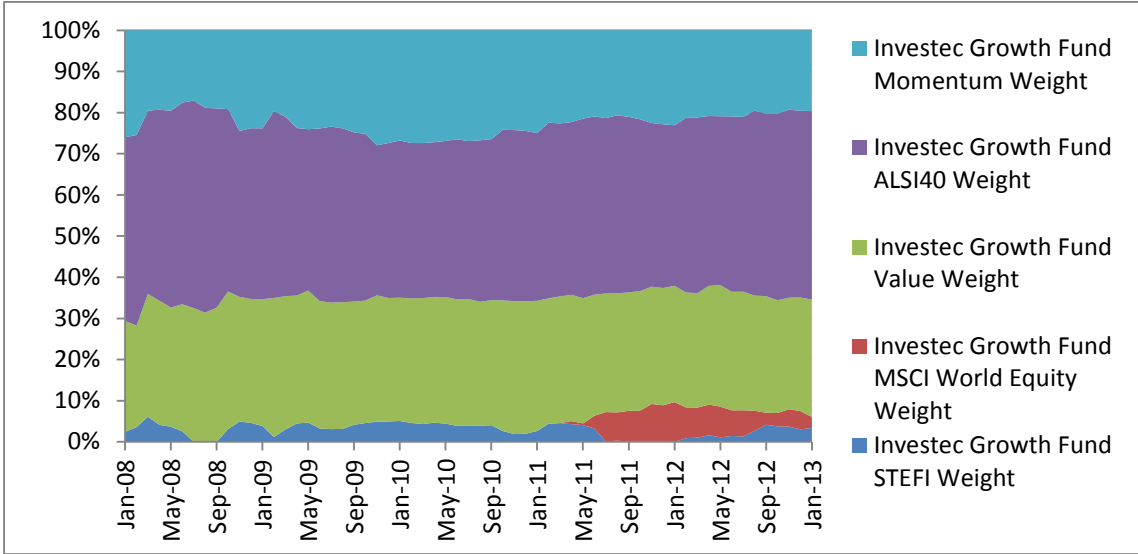
Long term style map of Foord Equity



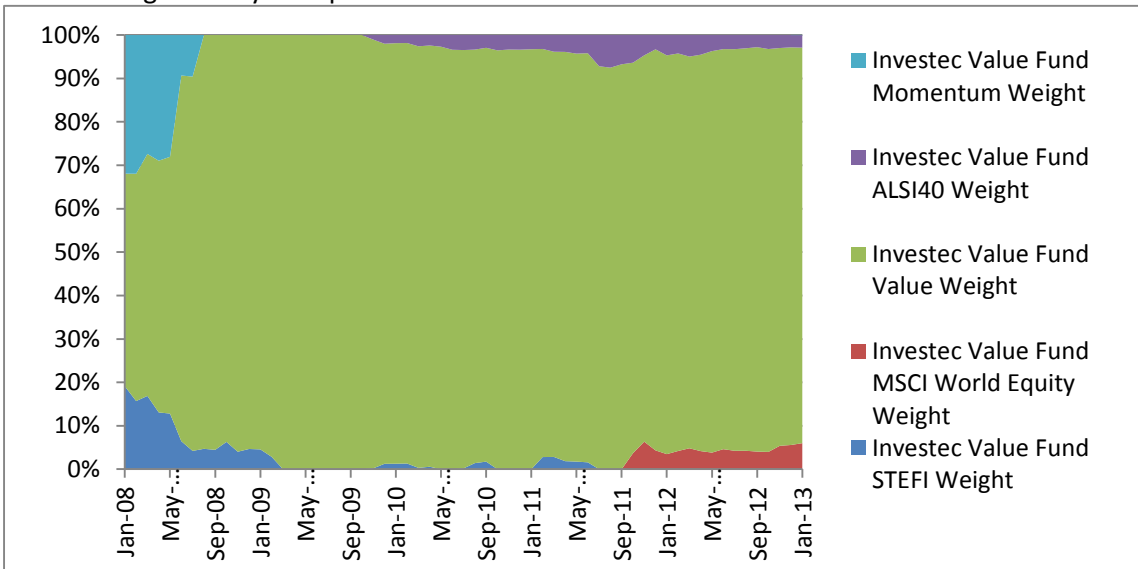
Long term style map of Investec Equity



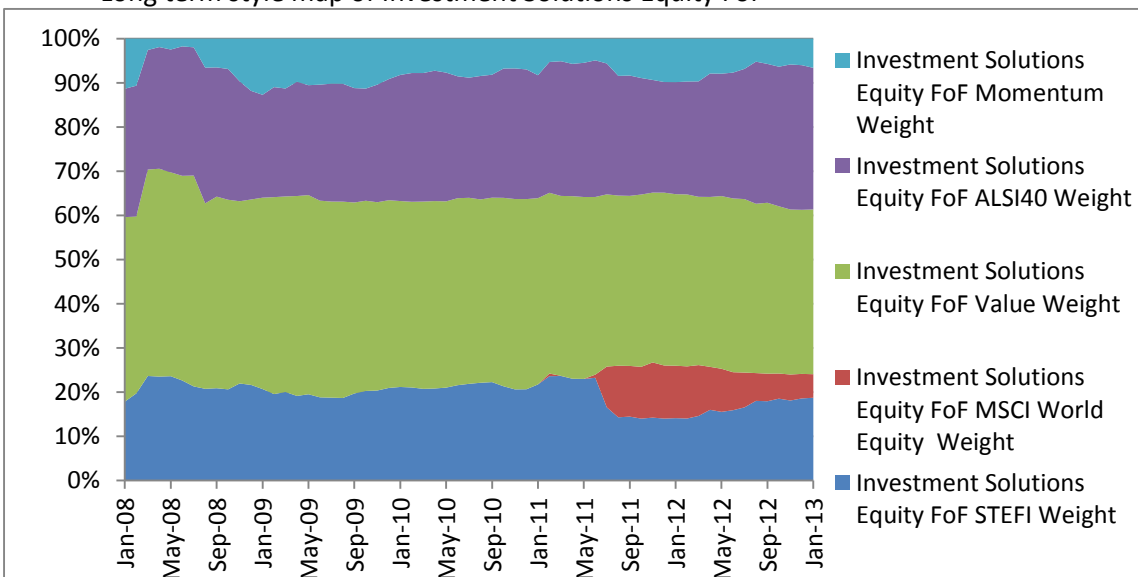
Long term style map of Investec Growth



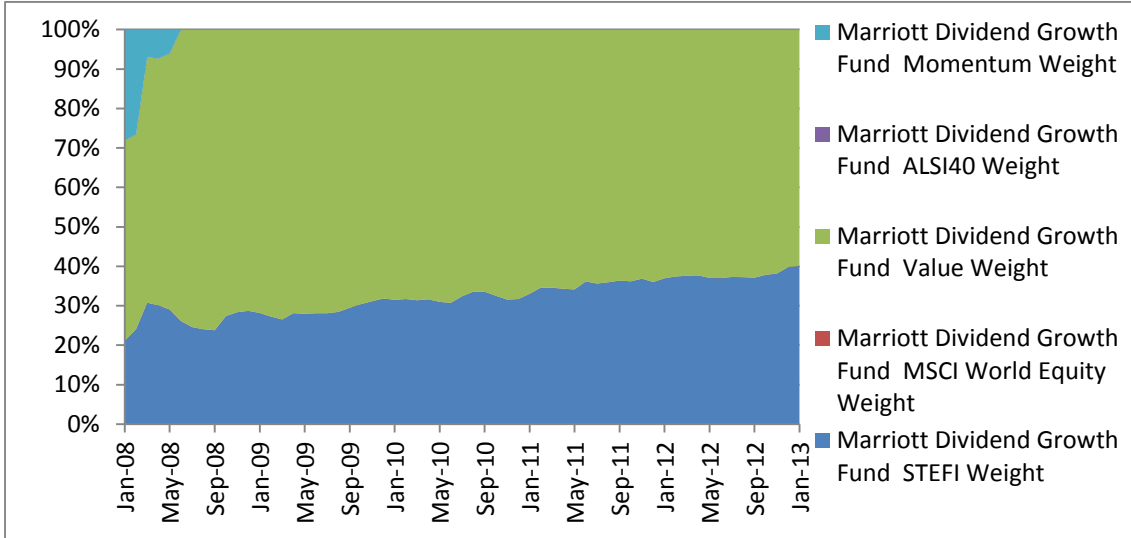
Long term style map of Investec Value



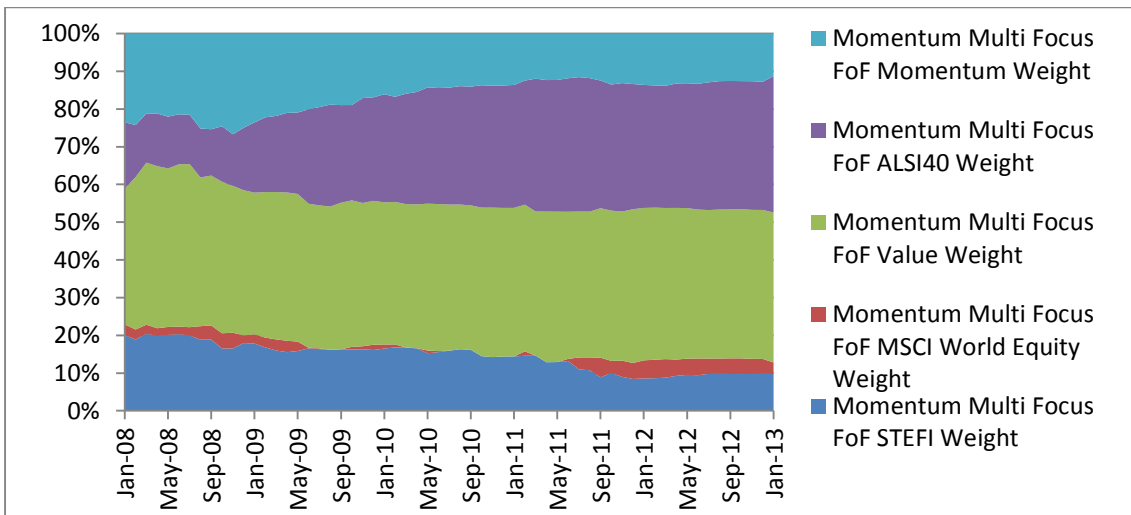
Long term style map of Investment Solutions Equity FoF



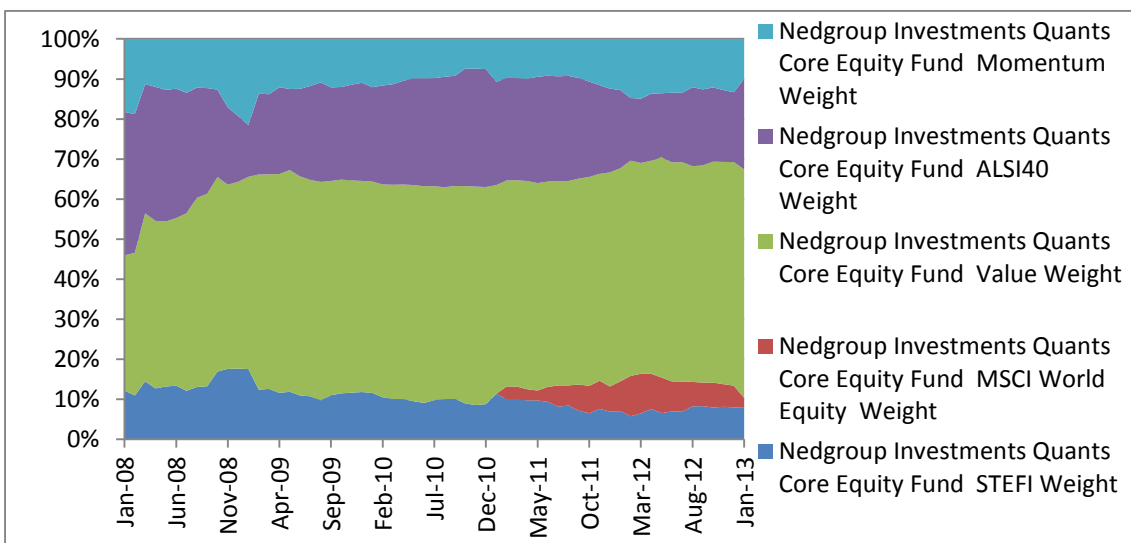
Long term style map of Marriott Dividend Growth



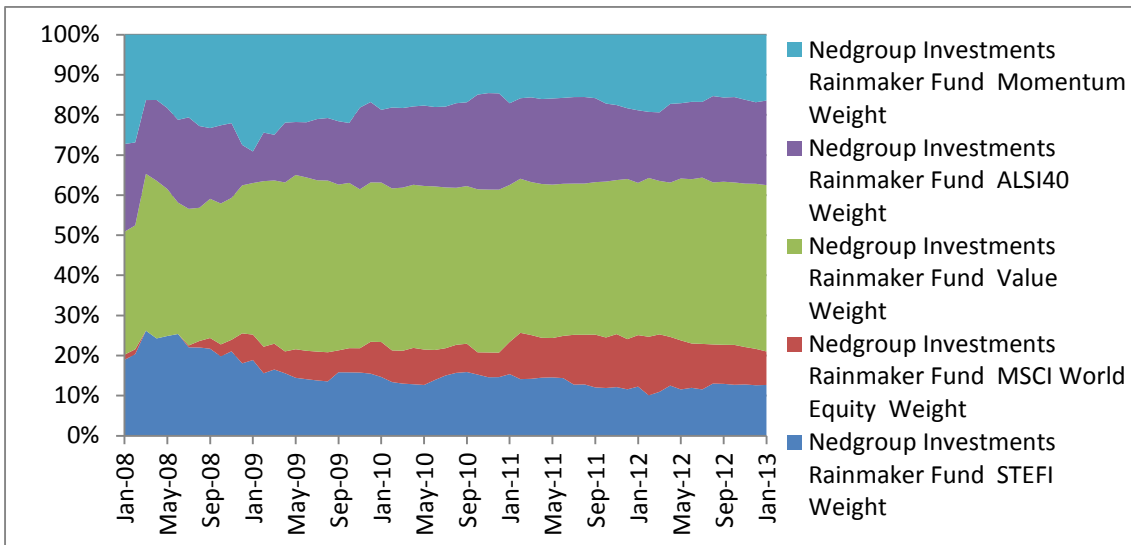
Long term style map of Momentum Multi Focus FoF



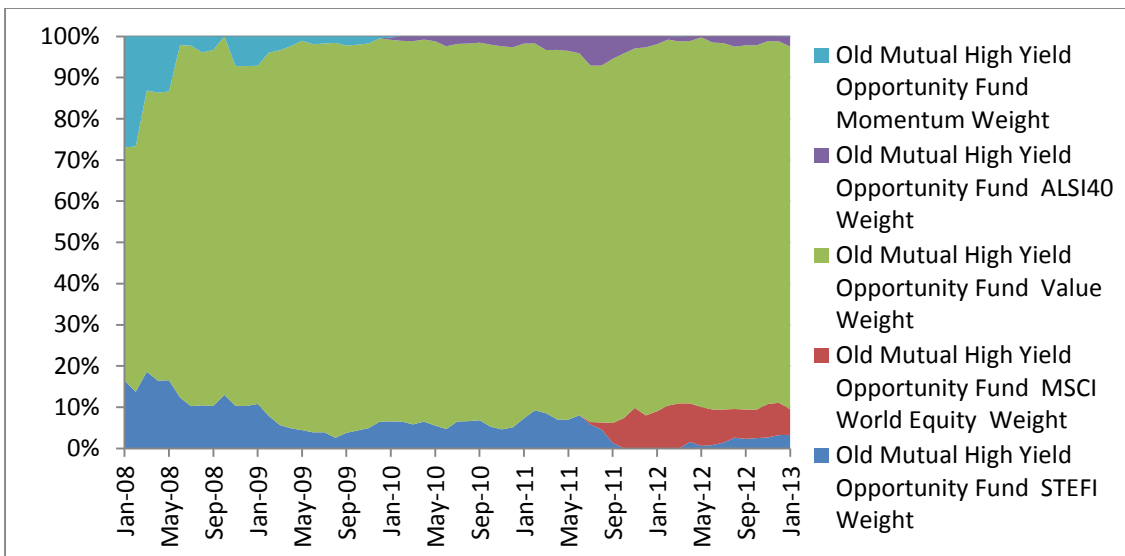
Long term style map of Nedgroup Investments Quant Core



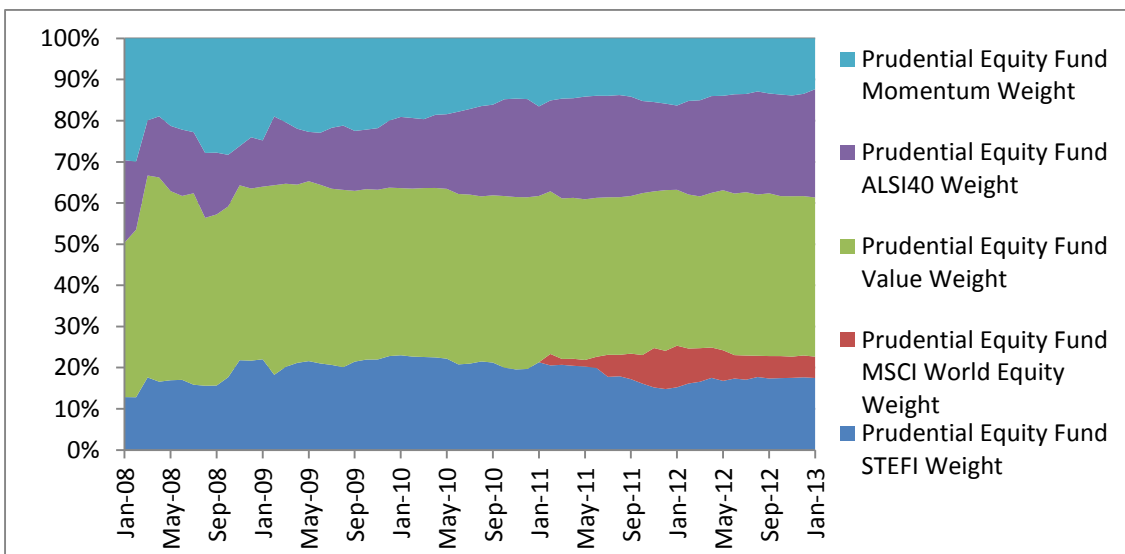
Long term style map of Nedgroup Investments Rainmaker



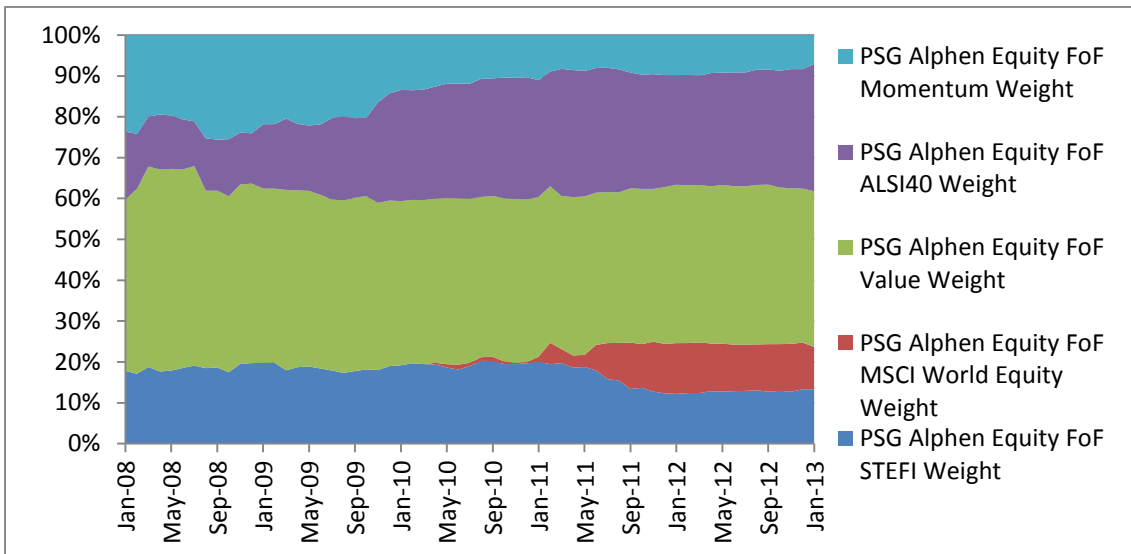
Long term style map of Old Mutual High Yield Opportunity



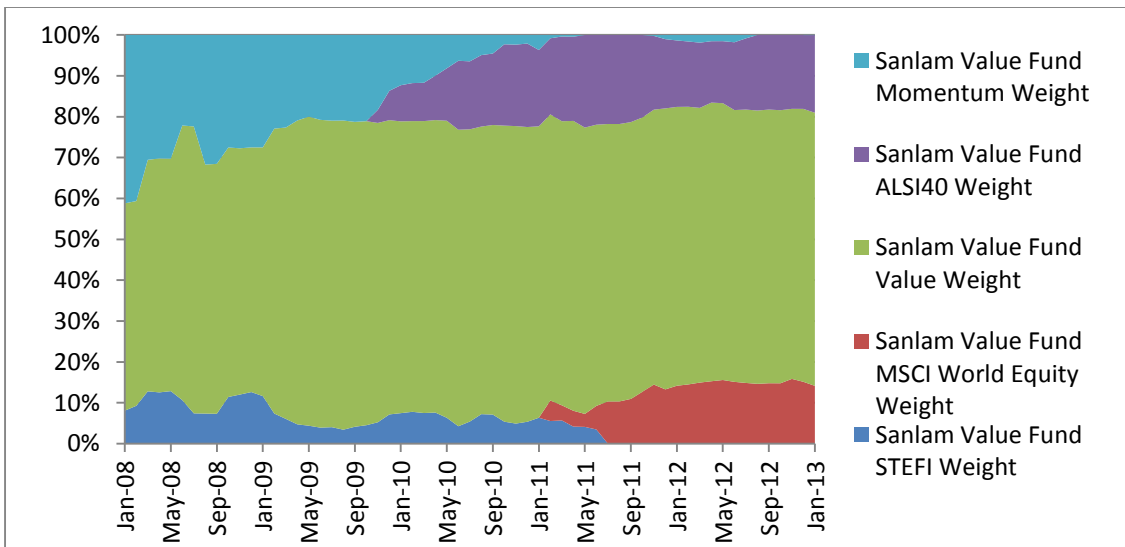
Long term style map of Prudential Equity



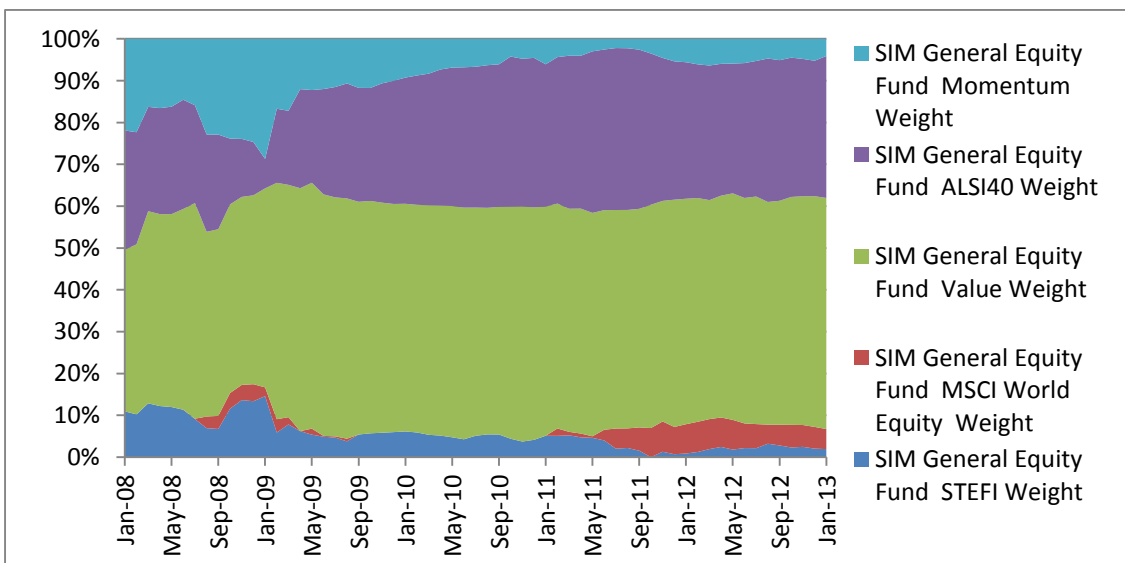
Long term style map of PSG Alphen Equity FoF



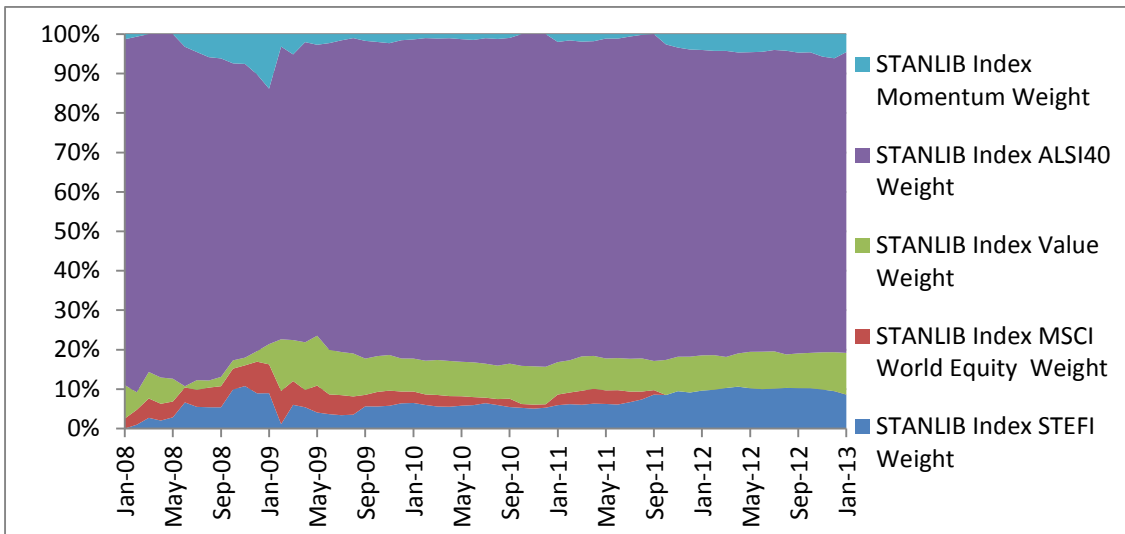
Long term style map of Sanlam Value



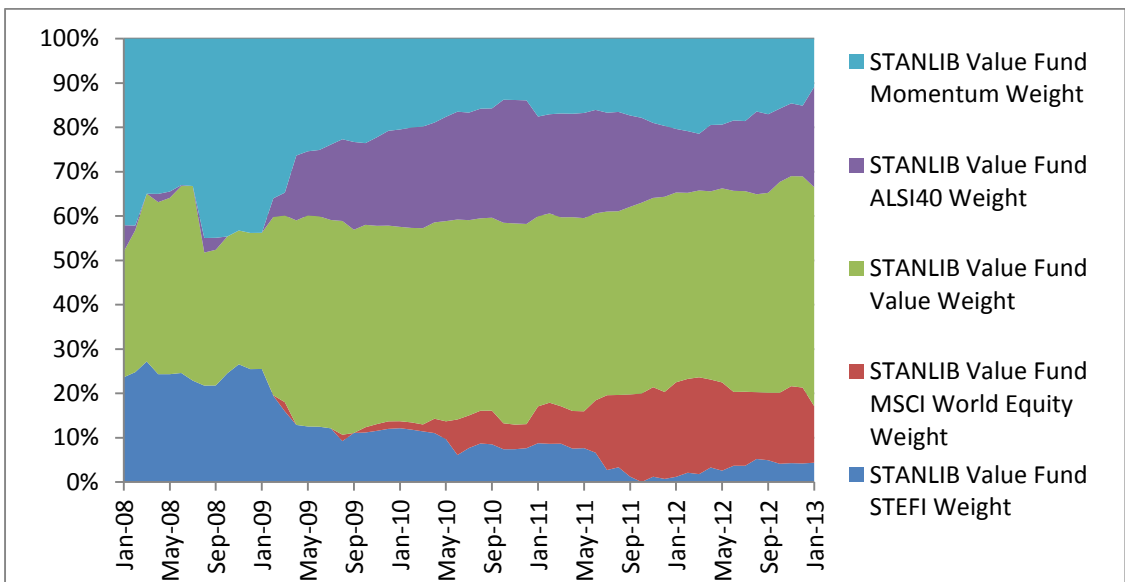
Long term style map of SIM General Equity



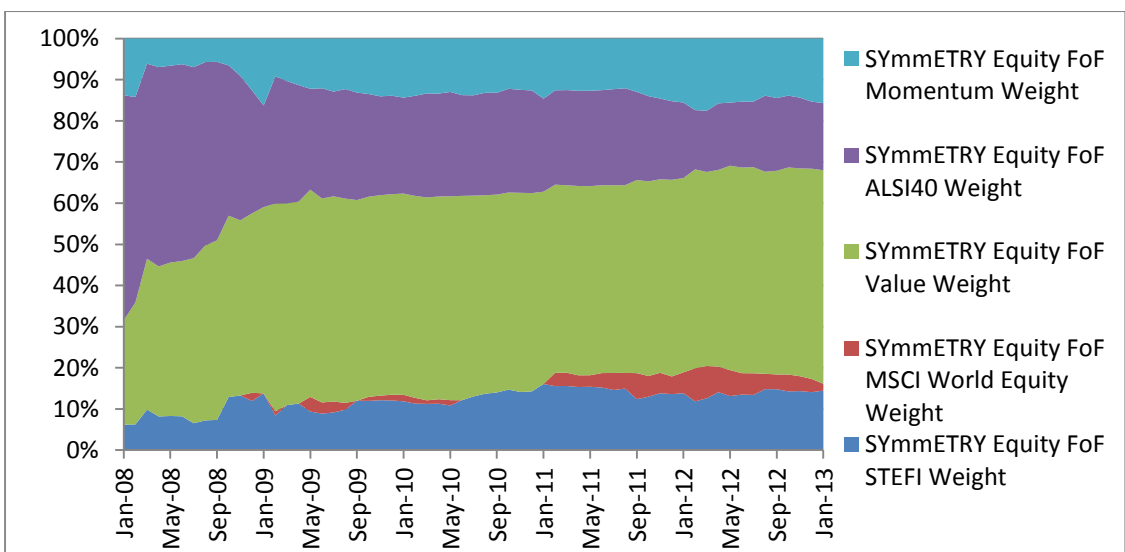
Long term style map of STANLIB Index Fund



Long term style map of STANLIB Value Fund



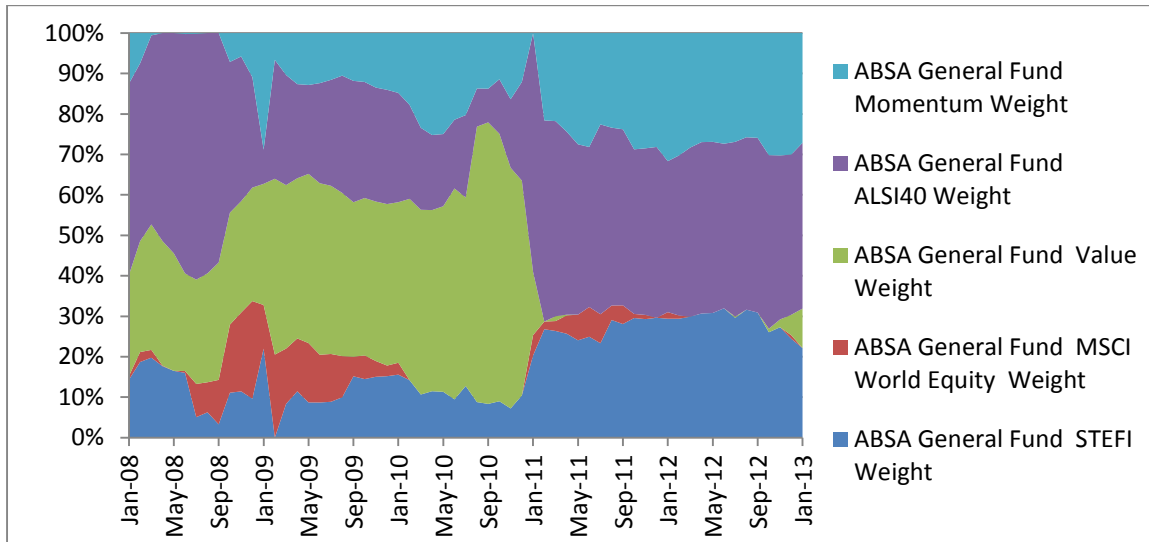
Long term style map of SYmmETRY Equity FoF



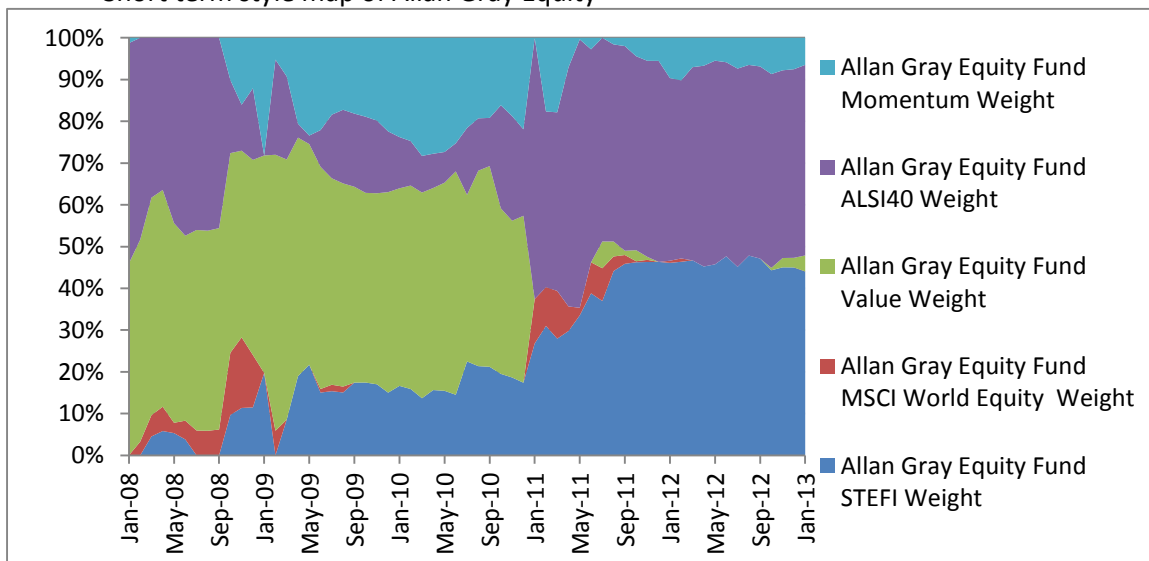
Appendix E

Short term style maps estimated using 24 months of data over period beginning January 2008 to end of December 2012

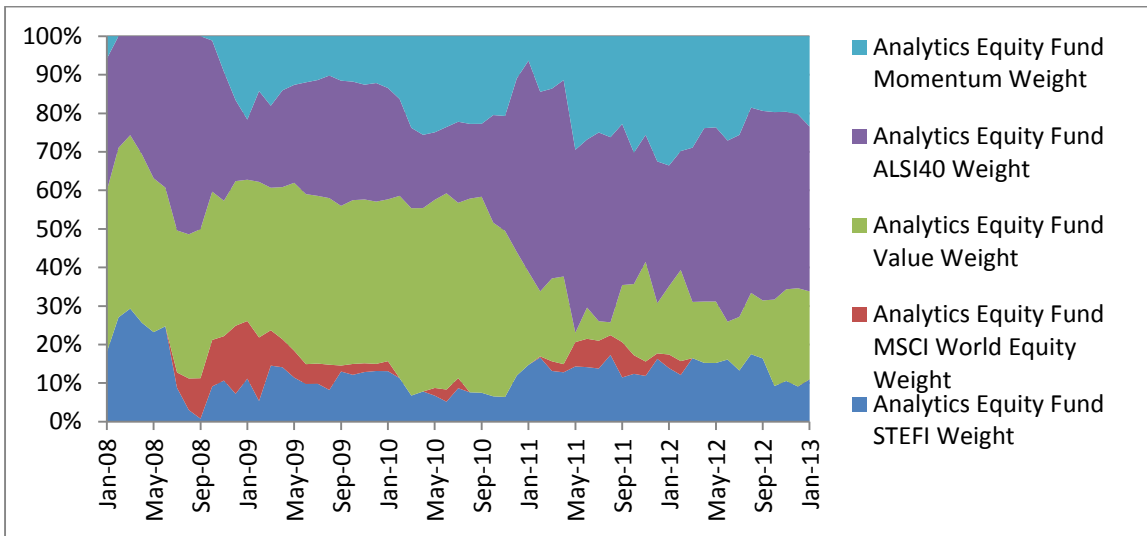
Short term style map of ABSA General Equity



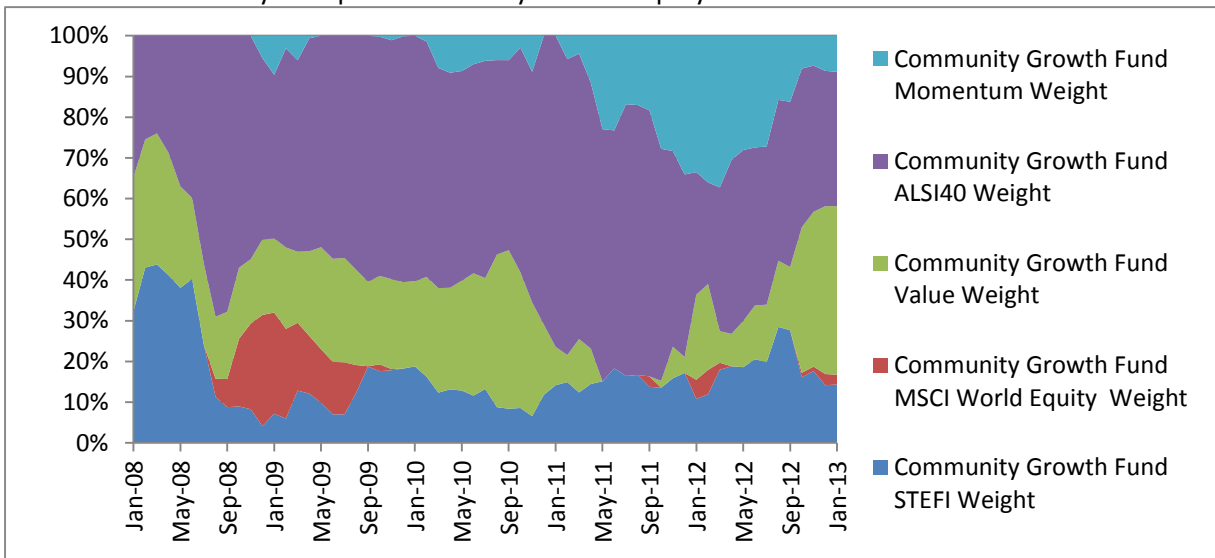
Short term style map of Allan Gray Equity



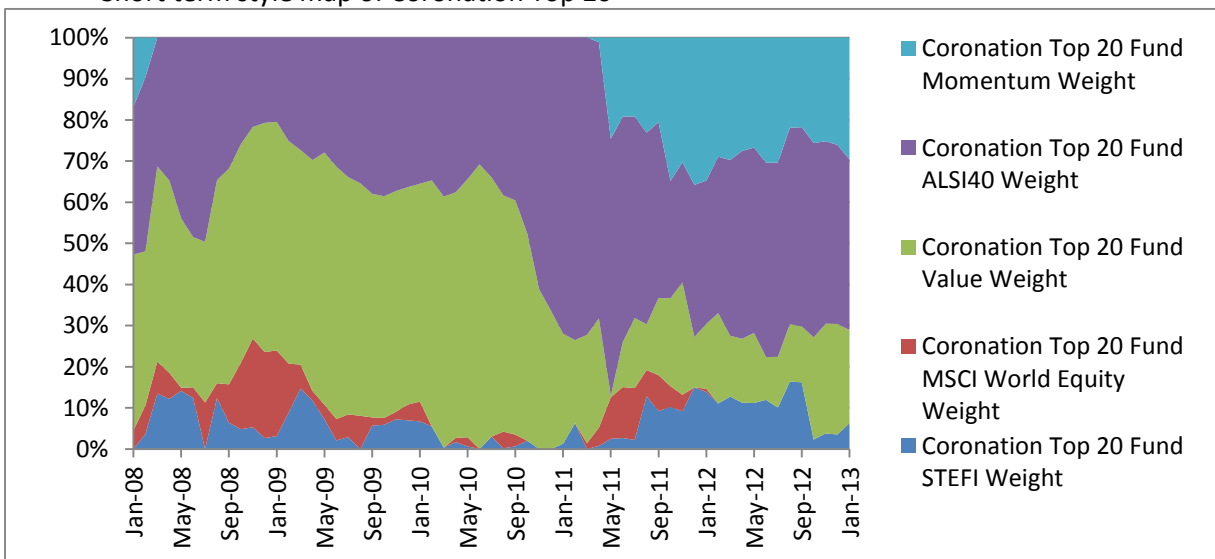
Short term style map of Analytics Equity FoF



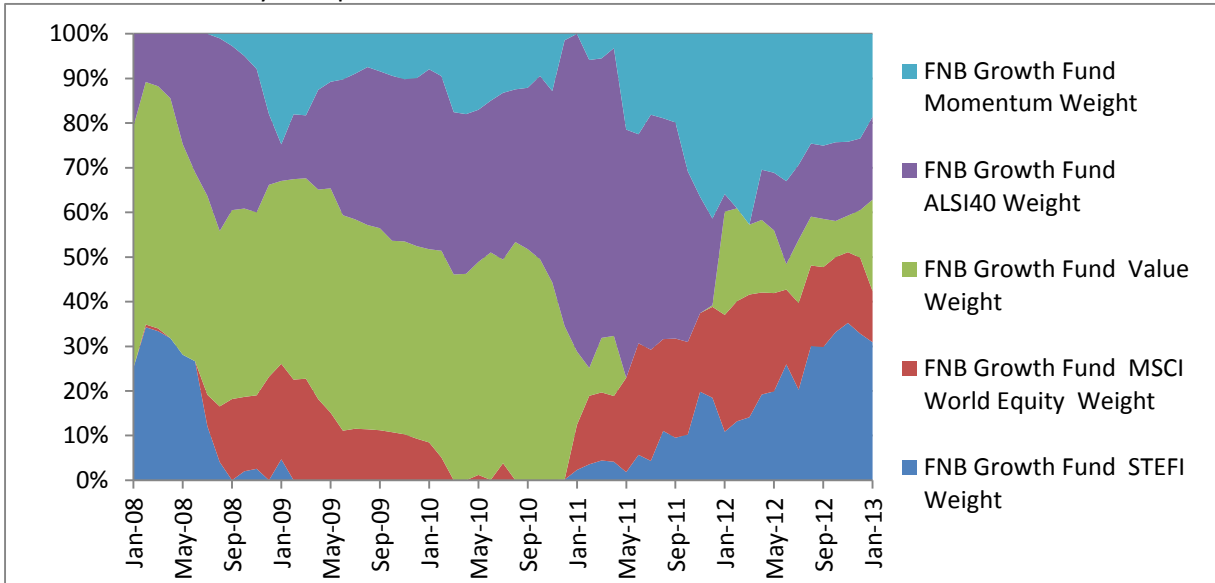
Short term style map of Community Growth Equity



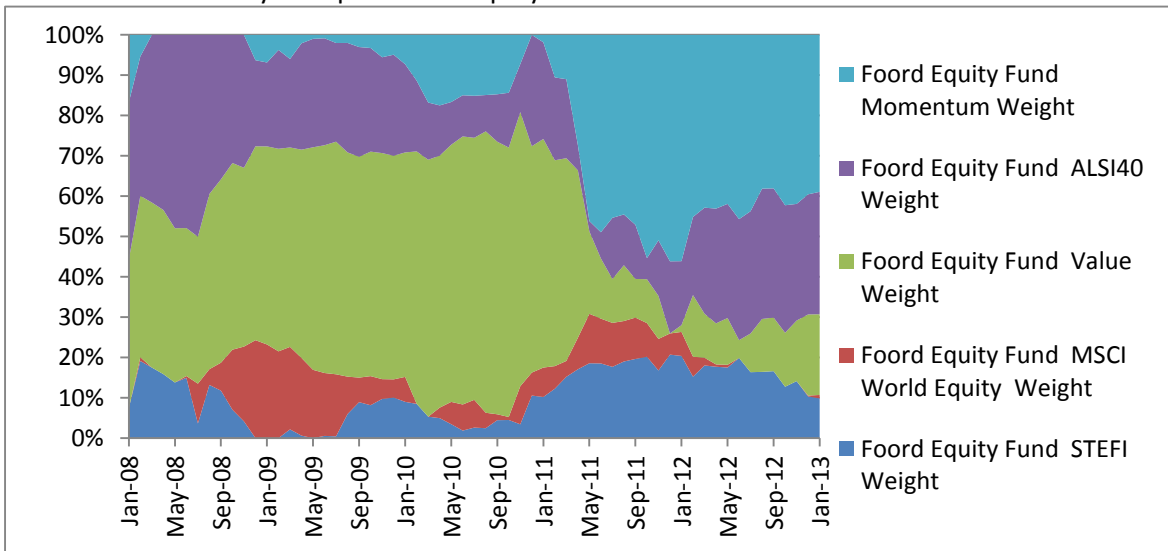
Short term style map of Coronation Top 20



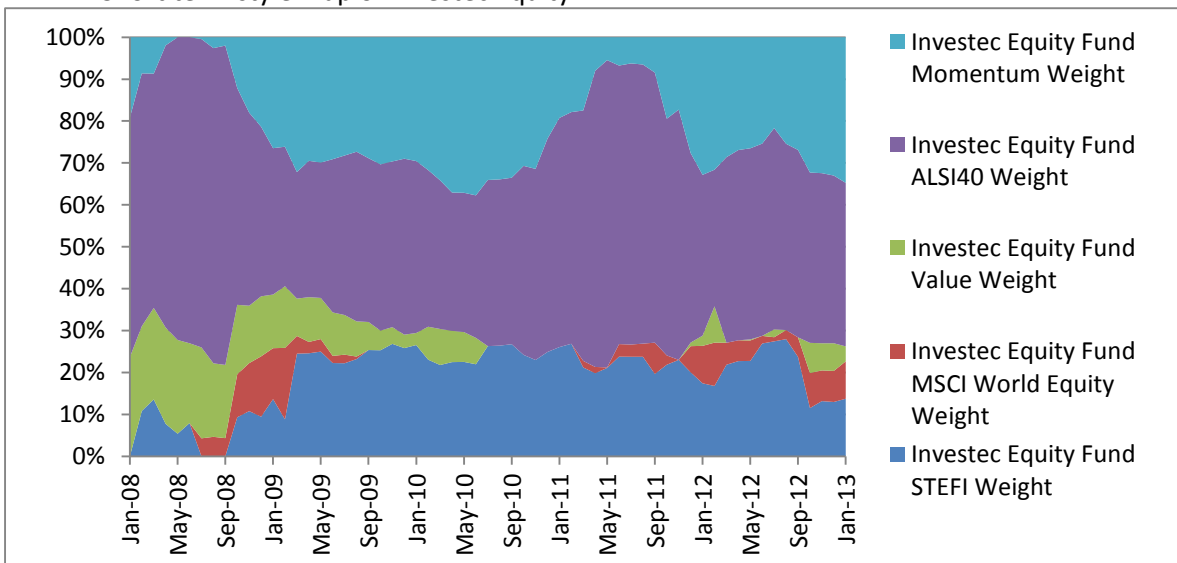
Short term style map of FNB Growth



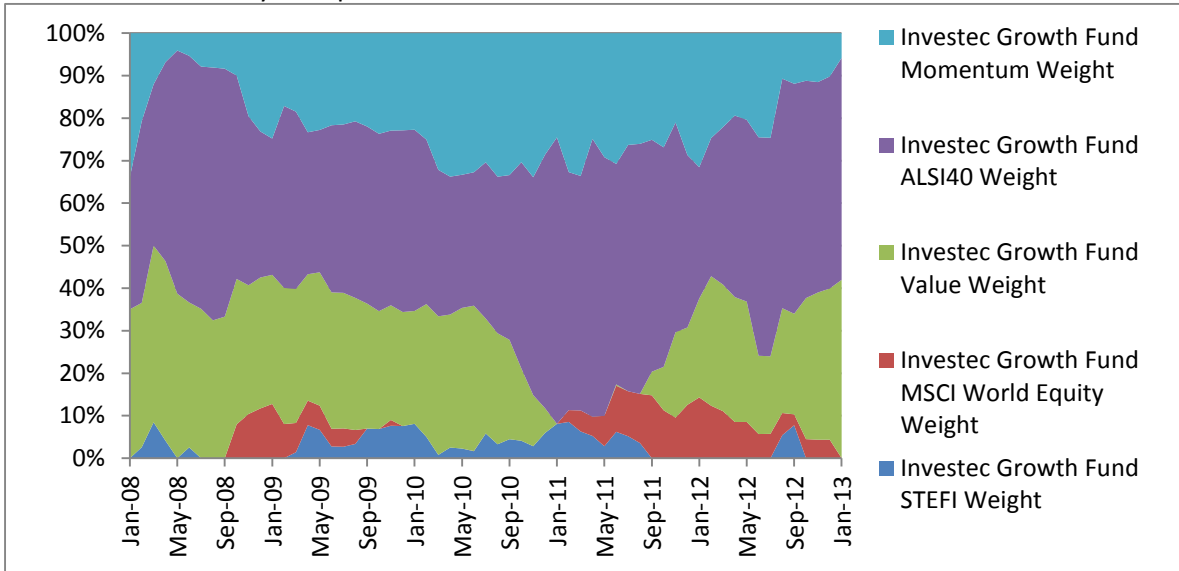
Short term style map of Foord Equity



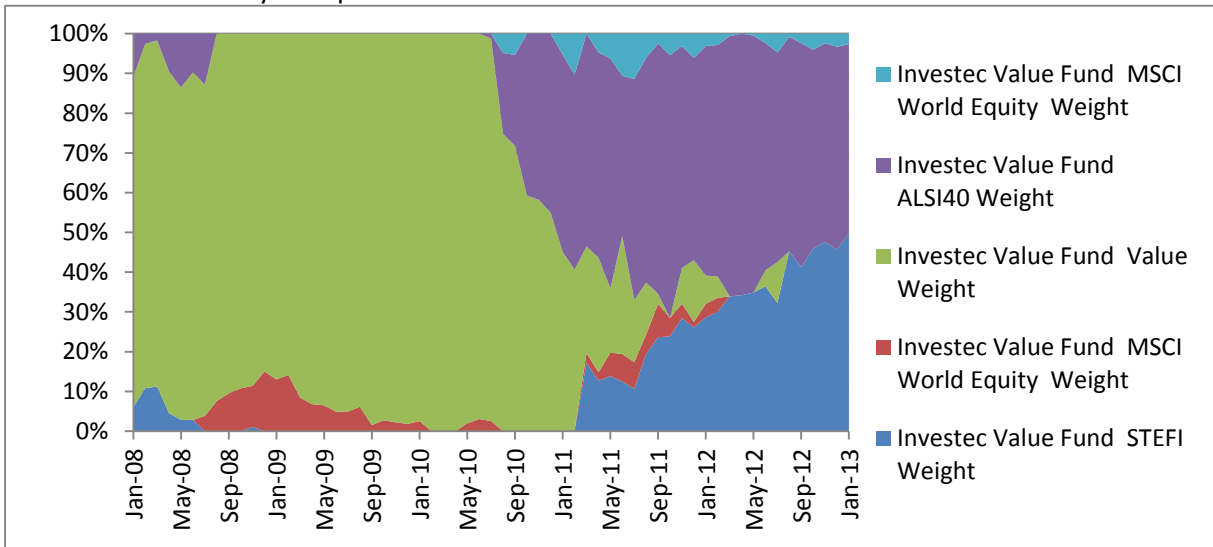
Short term style map of Investec Equity



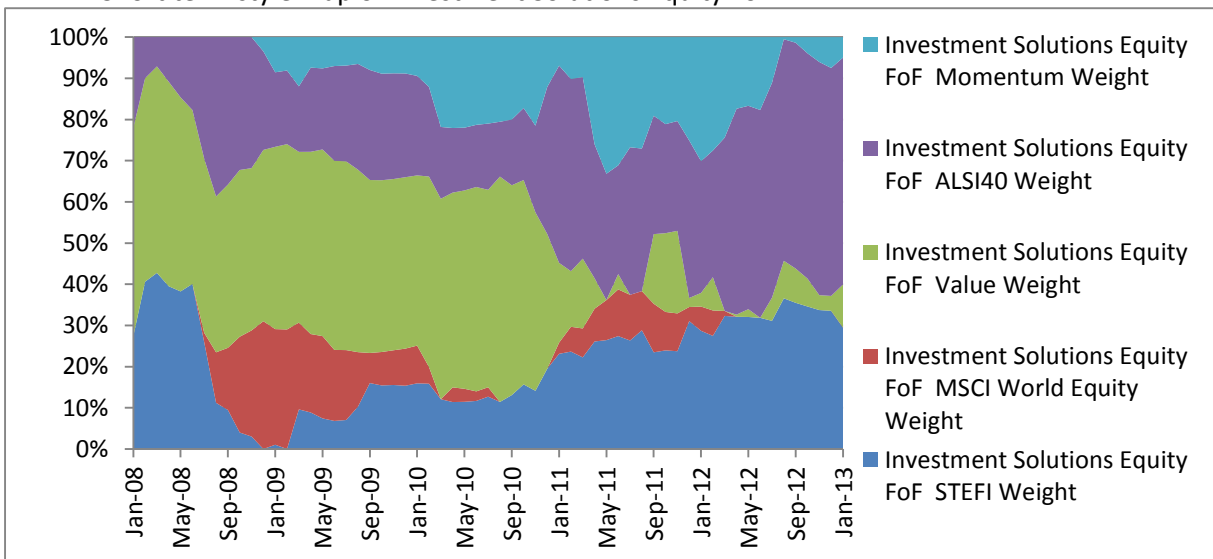
Short term style map of Investec Growth



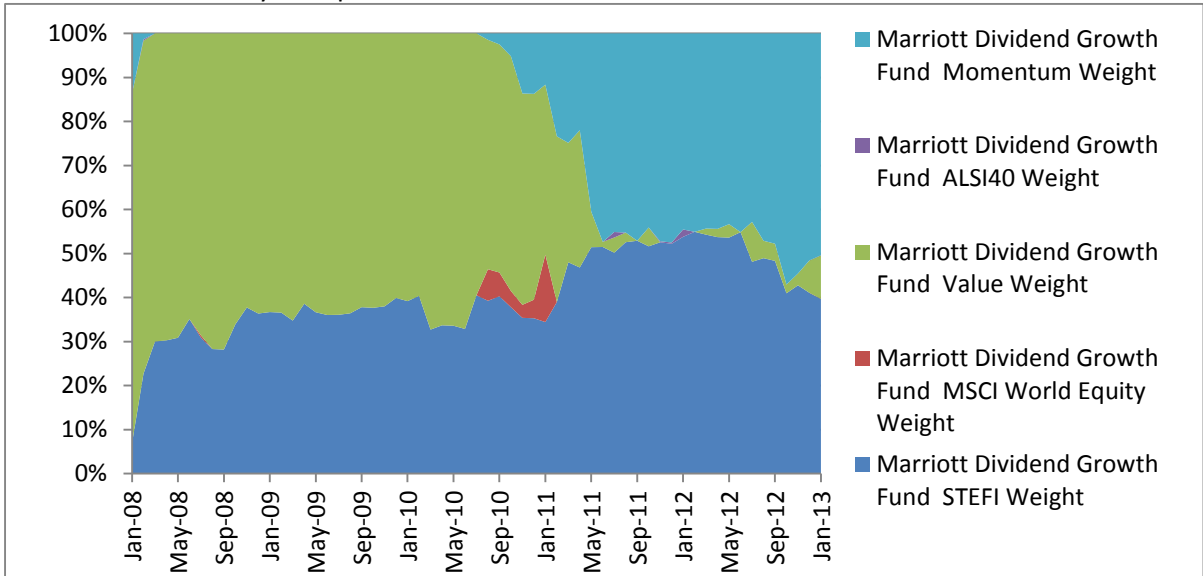
Short term style map of Investec Value



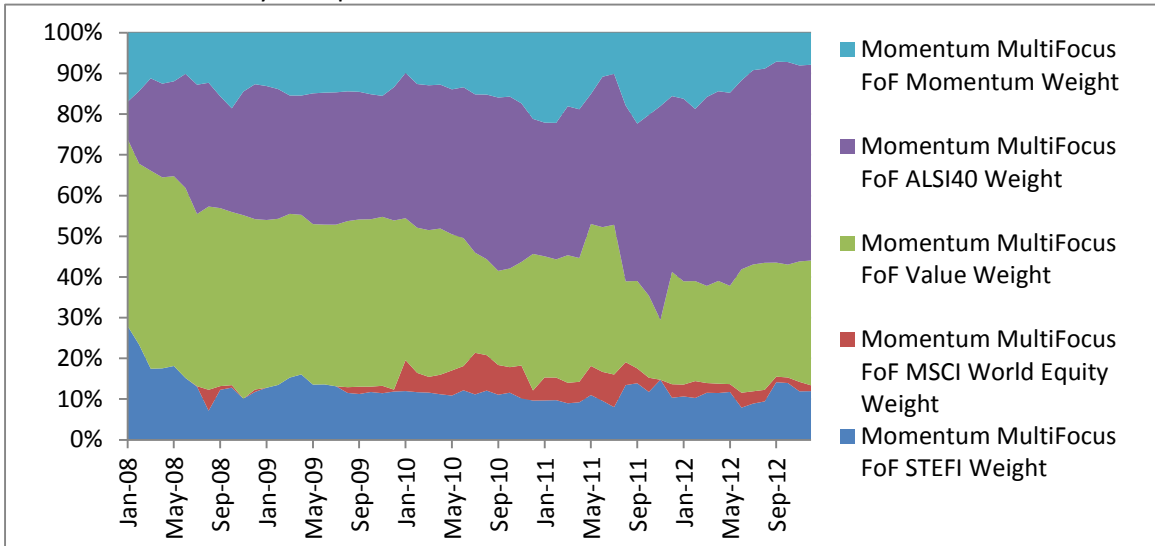
Short term style map of Investment Solutions Equity FoF



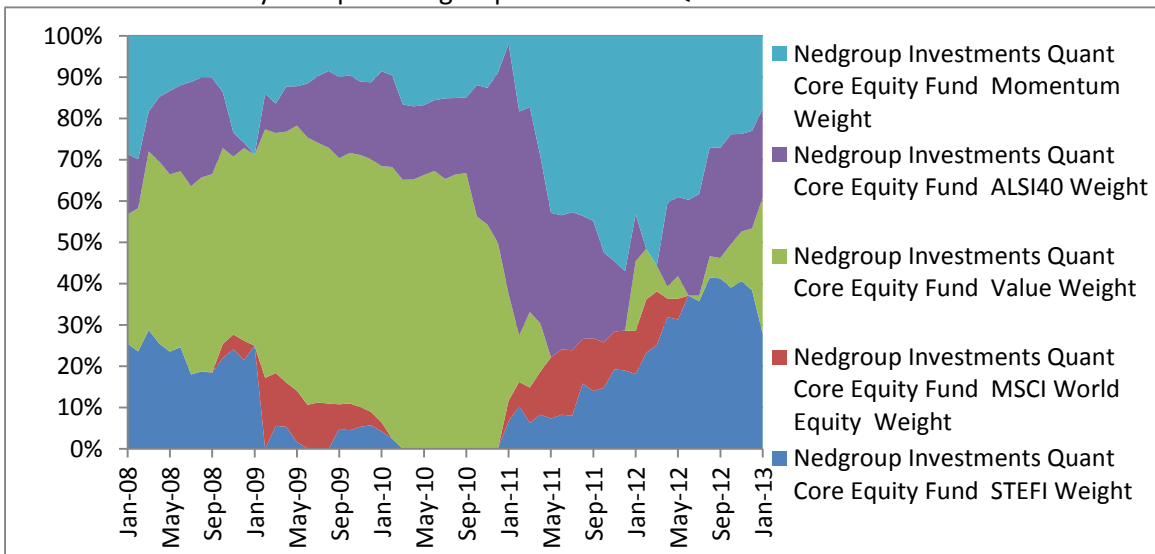
Short term style map of Marriott Dividend Growth



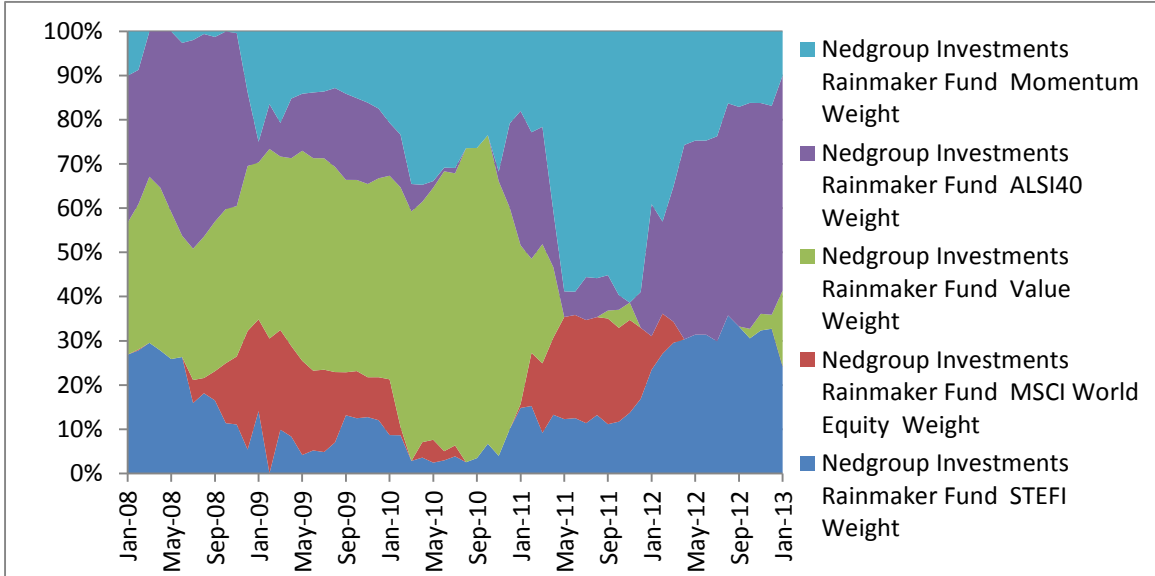
Short term style map of Momentum Multi Focus FoF



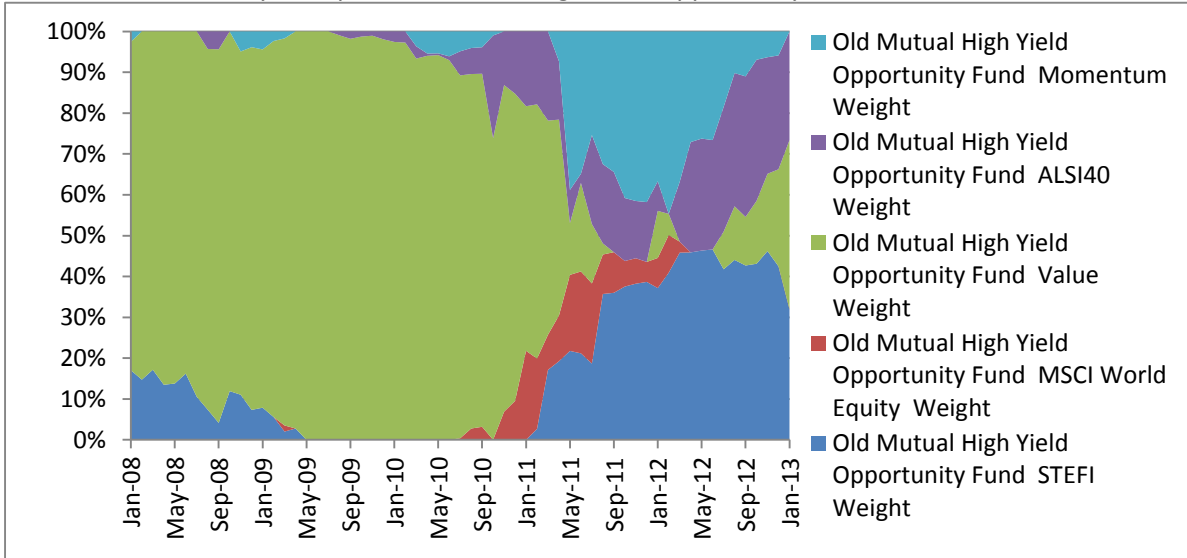
Short term style map of Nedgroup Investments Quant Core



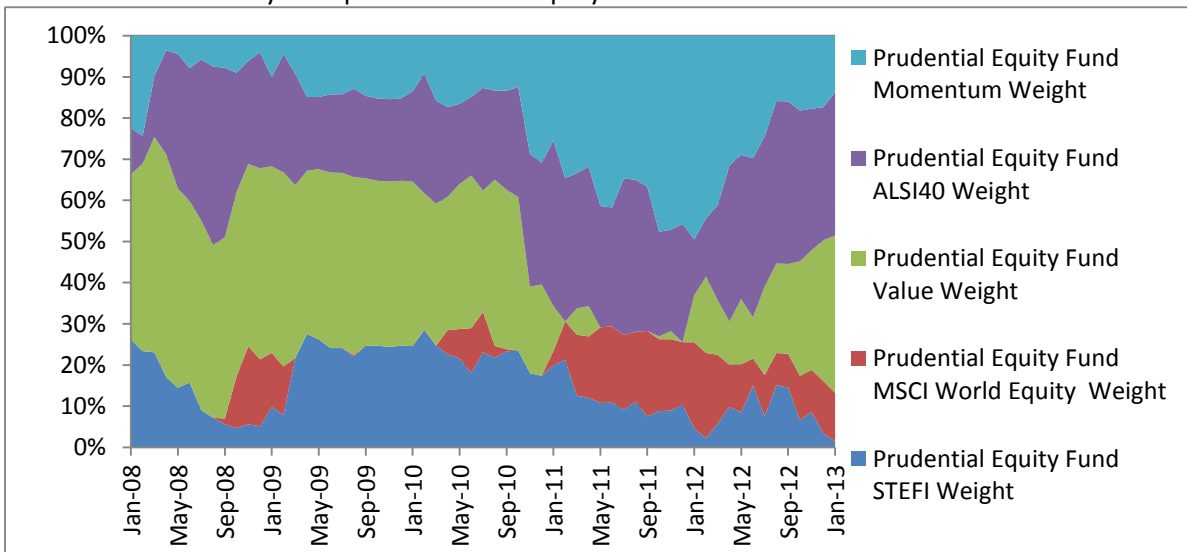
Short term style map of Nedgroup Investments Rainmaker



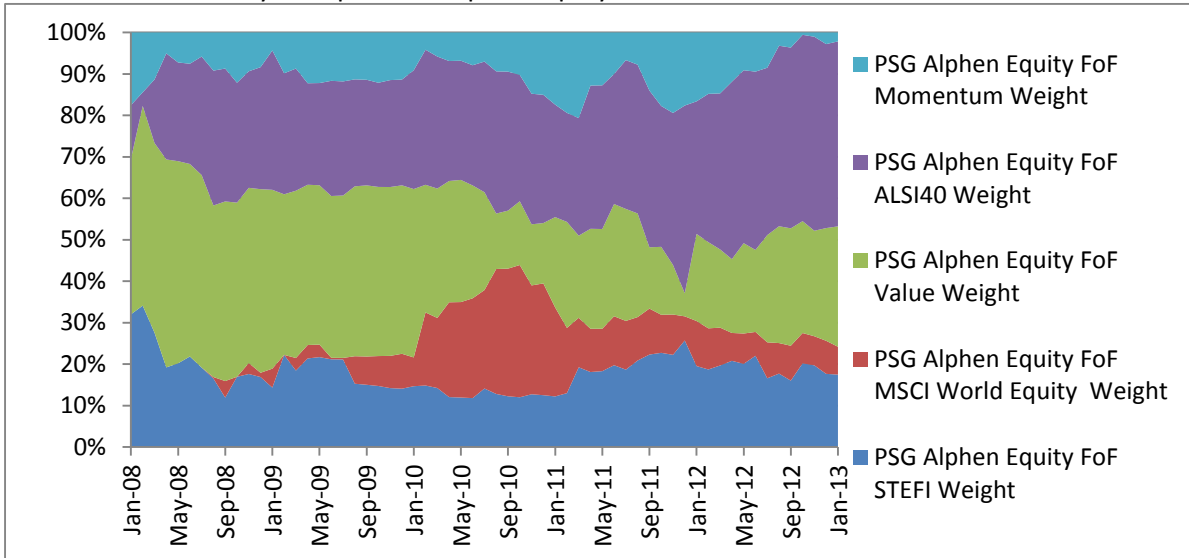
Short term style map of Old Mutual High Yield Opportunity



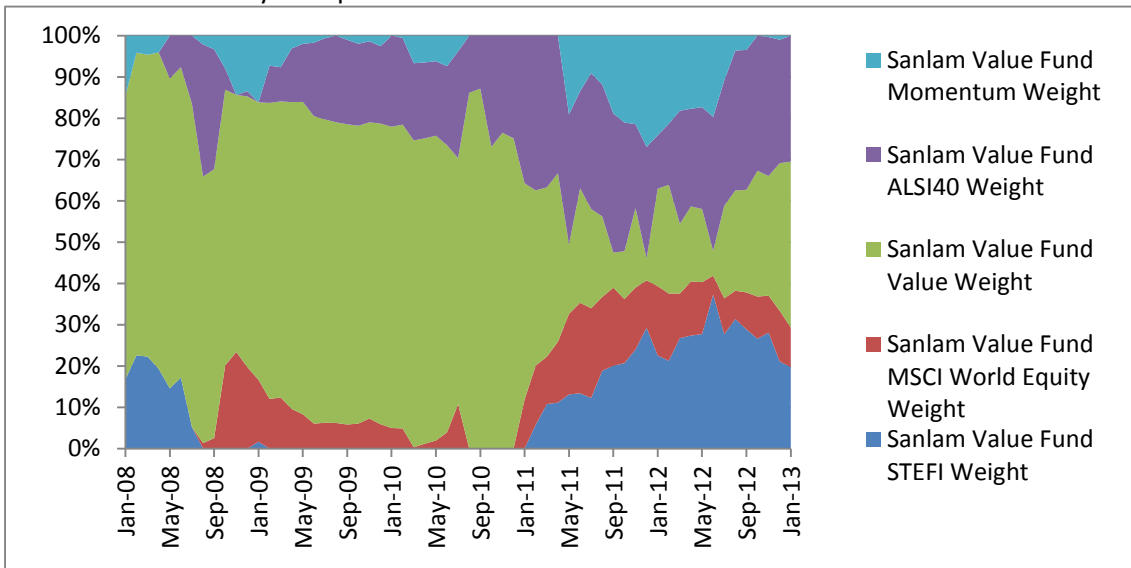
Short term style map of Prudential Equity



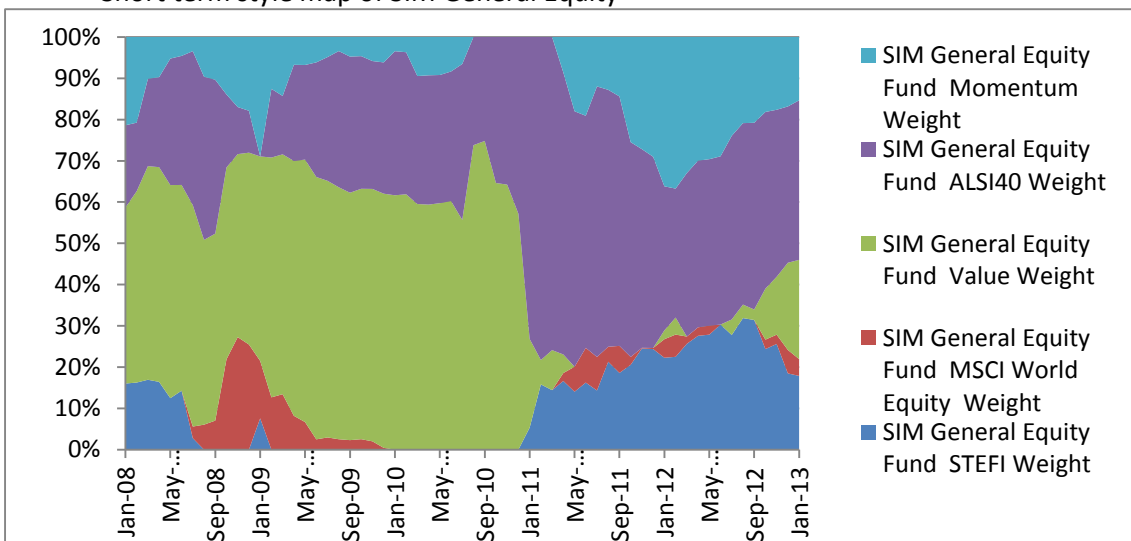
Short term style map of PSG Alphen Equity FoF



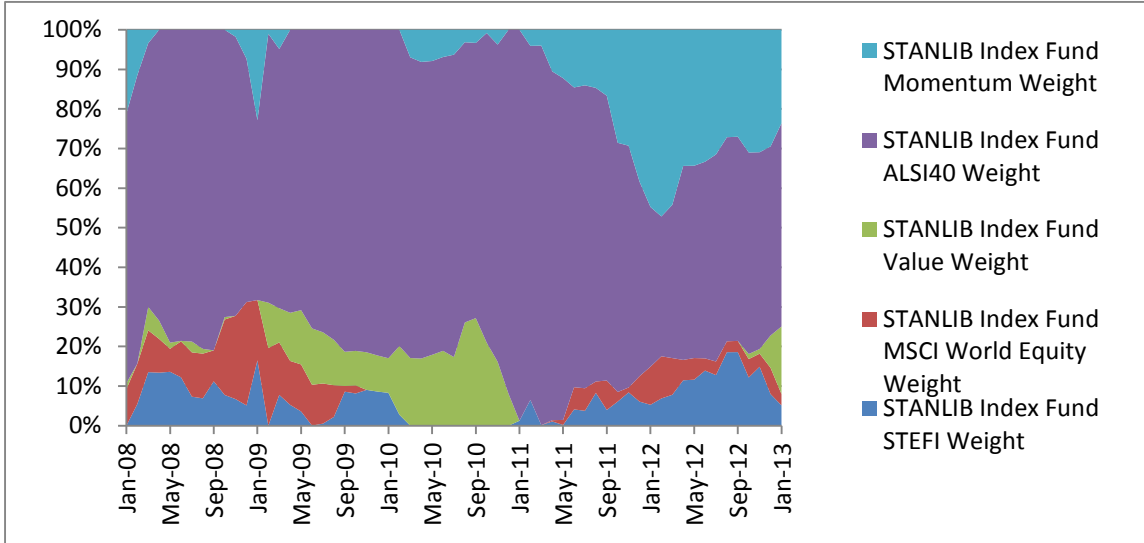
Short term style map of Sanlam Value



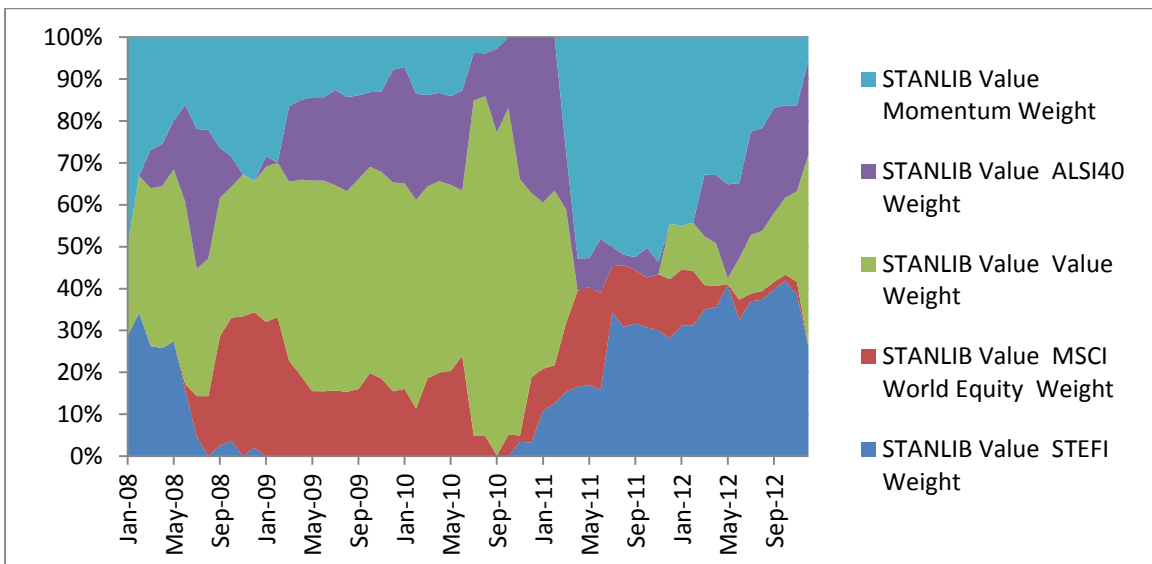
Short term style map of SIM General Equity



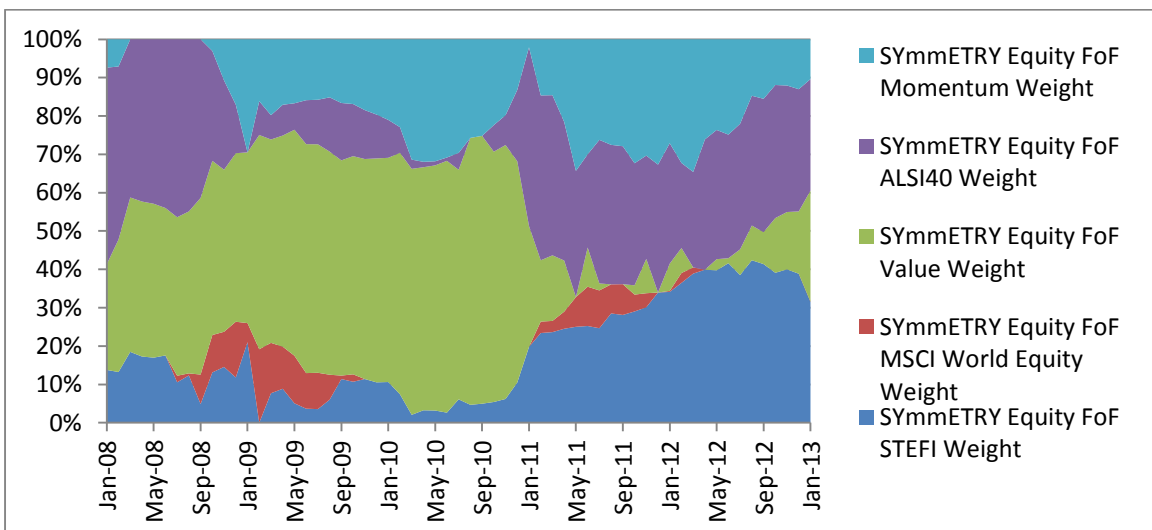
Short term style map of STANLIB Index Fund



Short term style map of STANLIB Value Fund



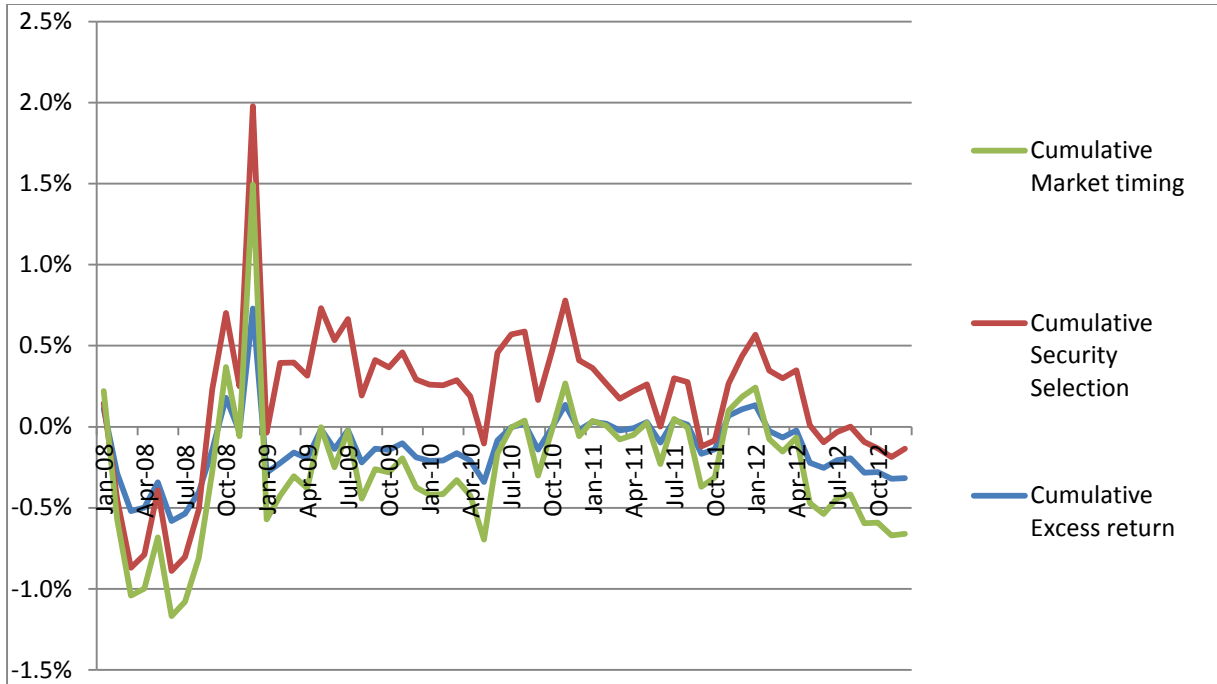
Short term style map of SYmmETRY Equity FoF



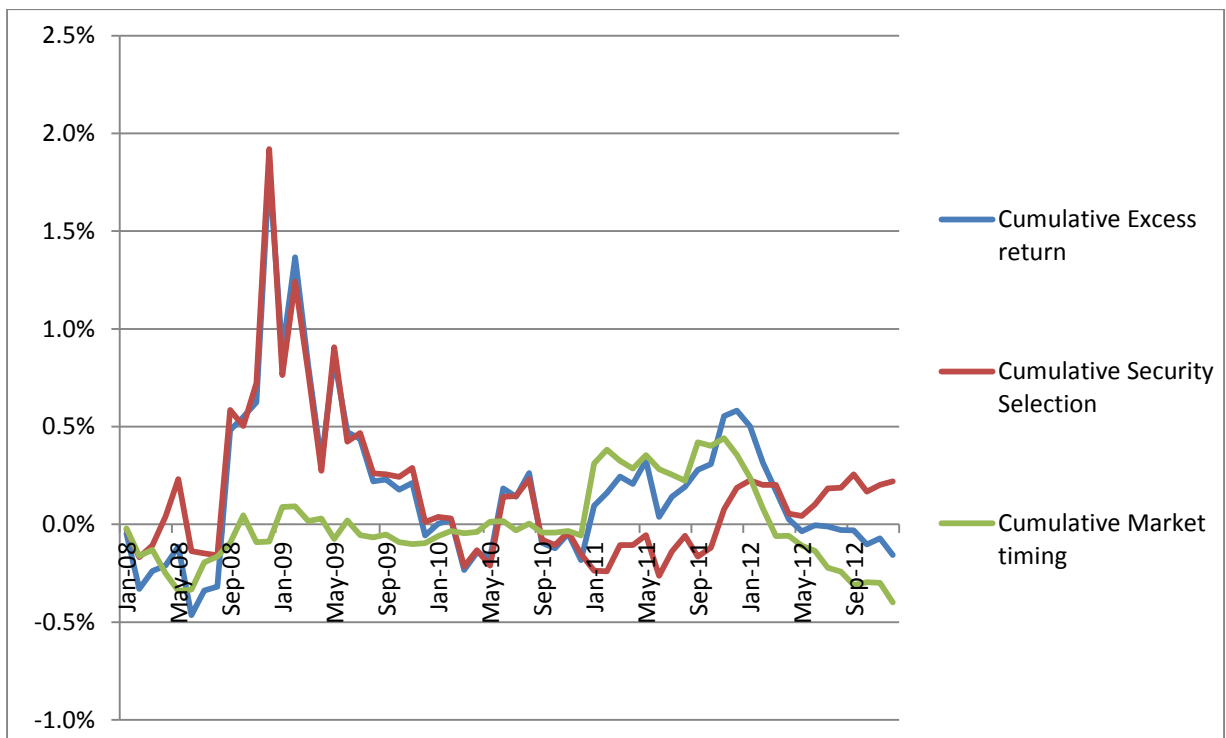
Appendix F

Cumulative return decomposition of unit trusts from January 2008 – December 2012

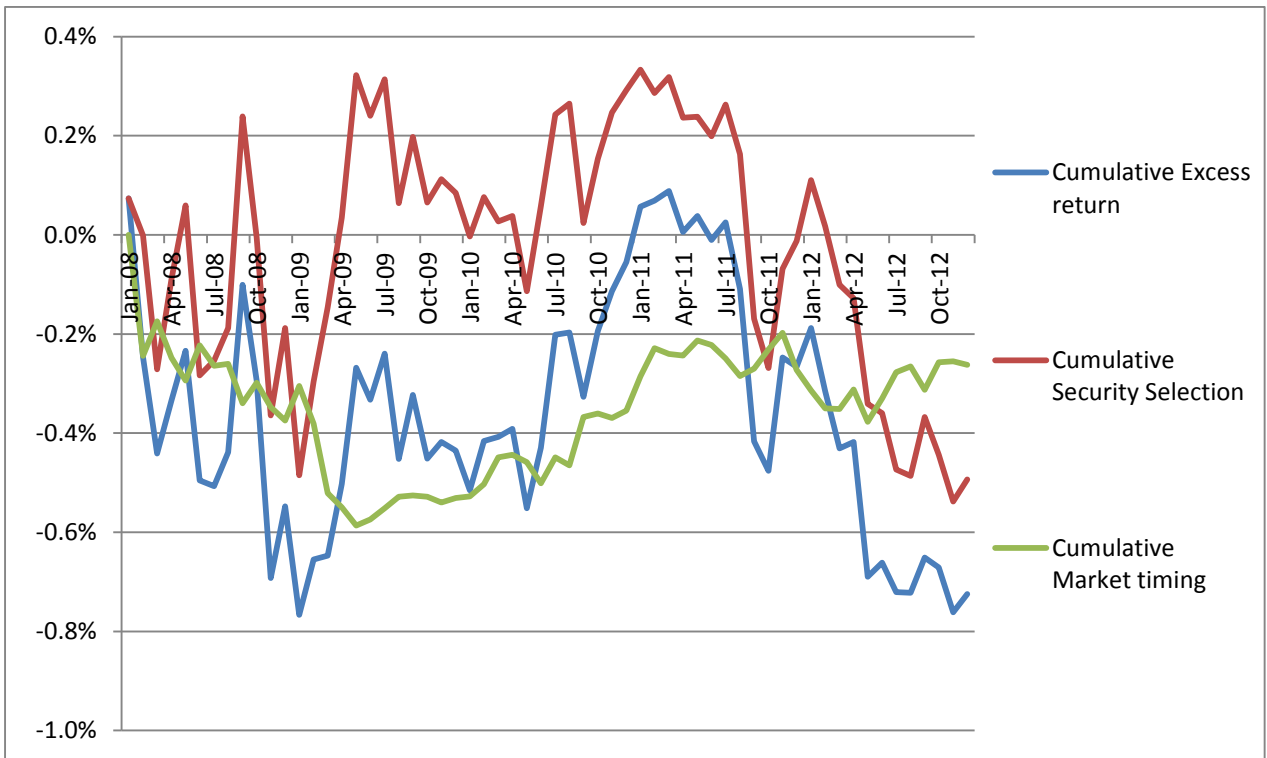
ABSA



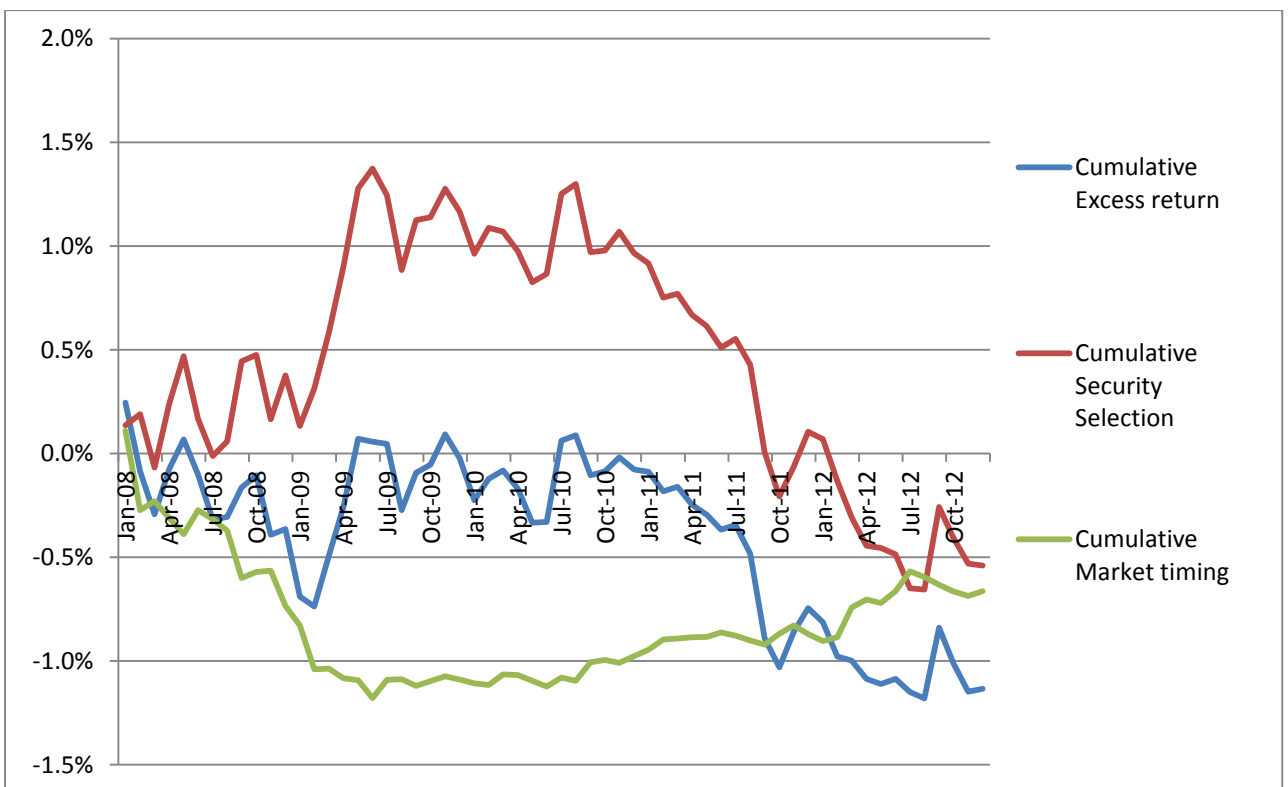
Allan Gray Equity Fund



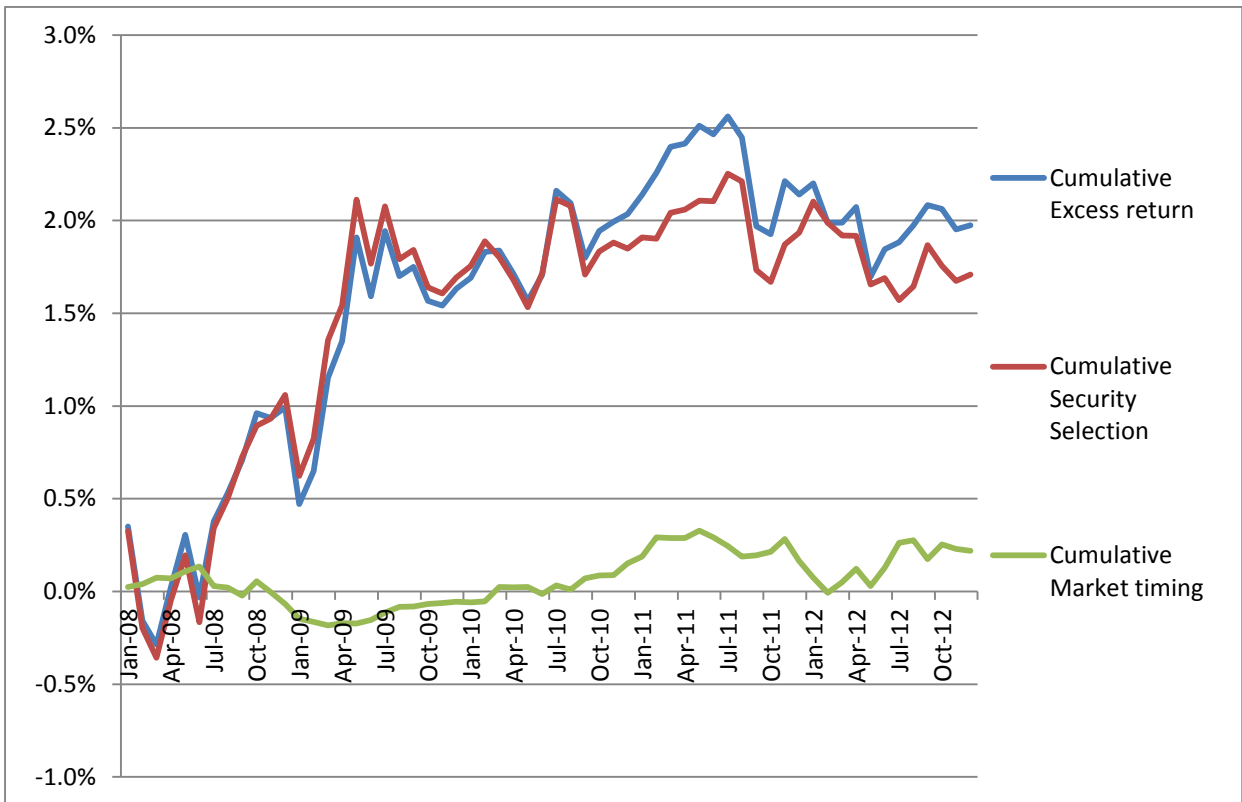
Analytics Managed Equity FoF



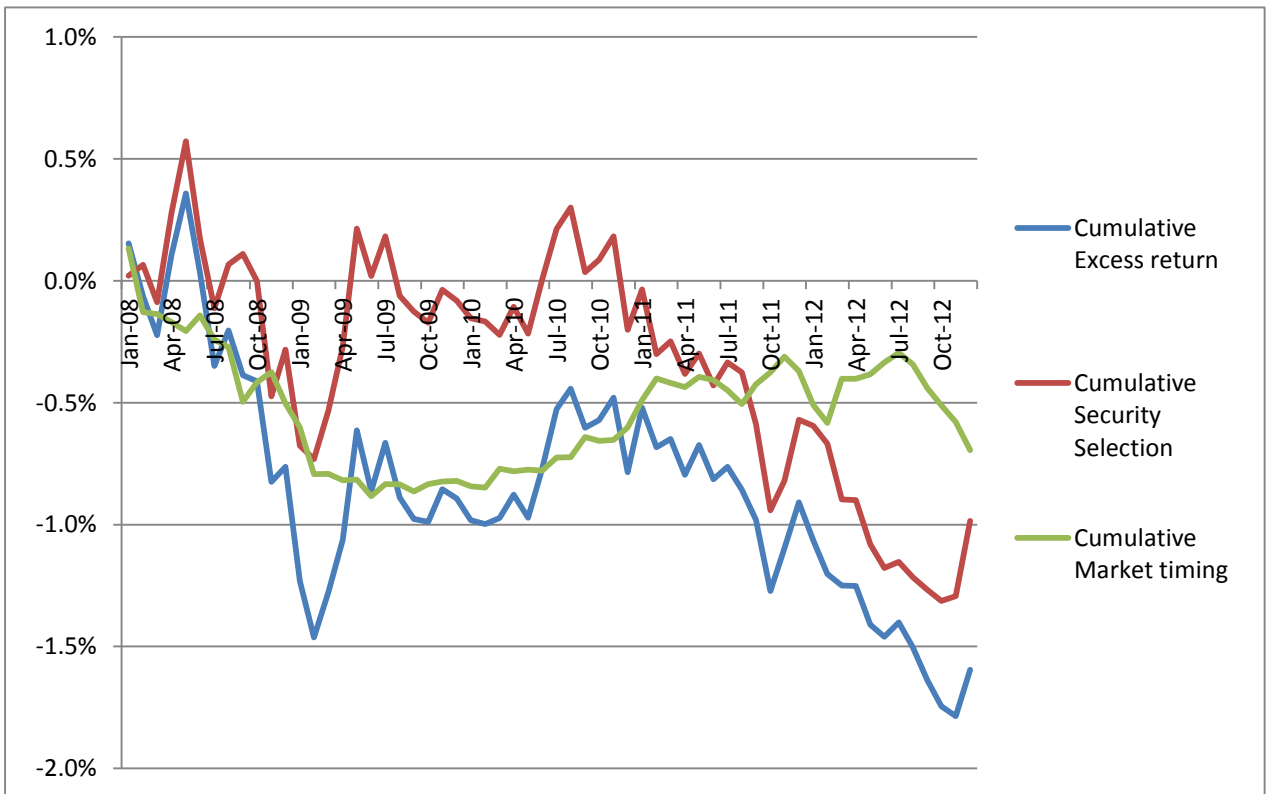
Community Growth Fund



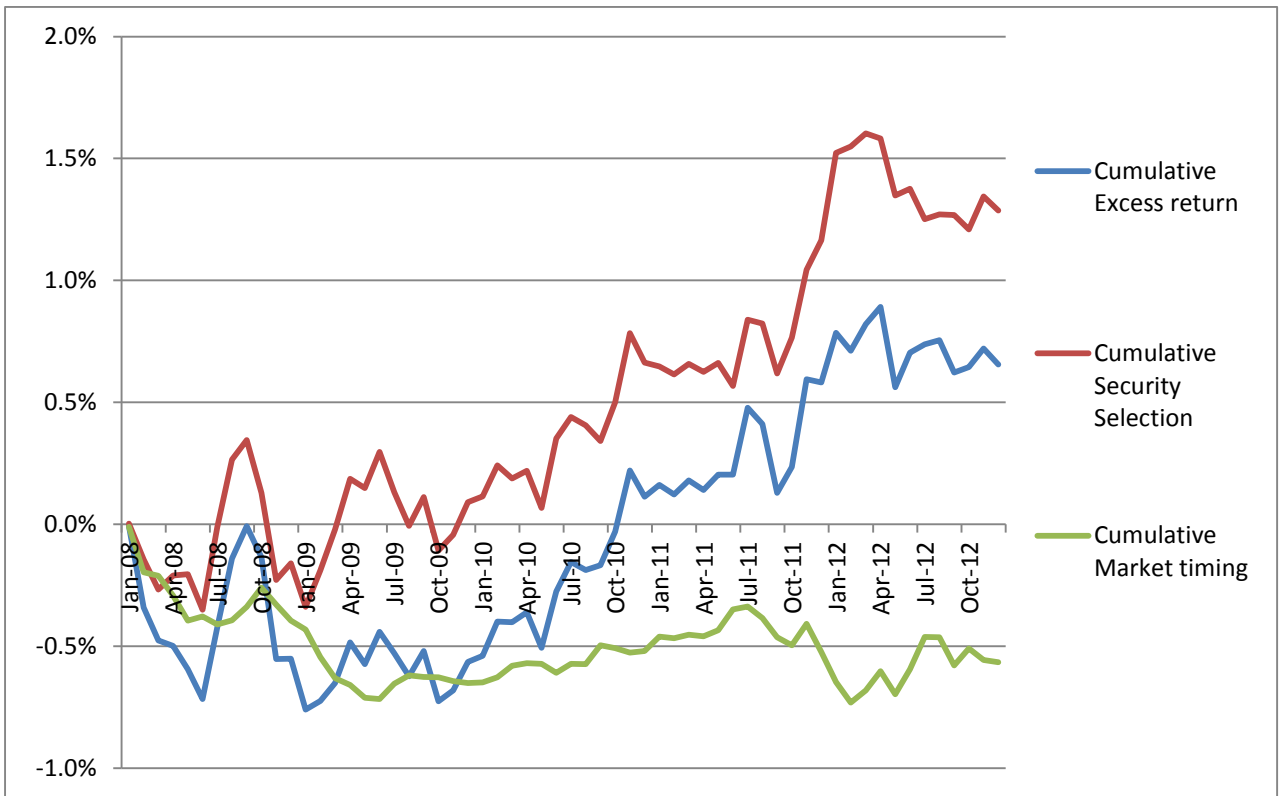
Coronation Top 20



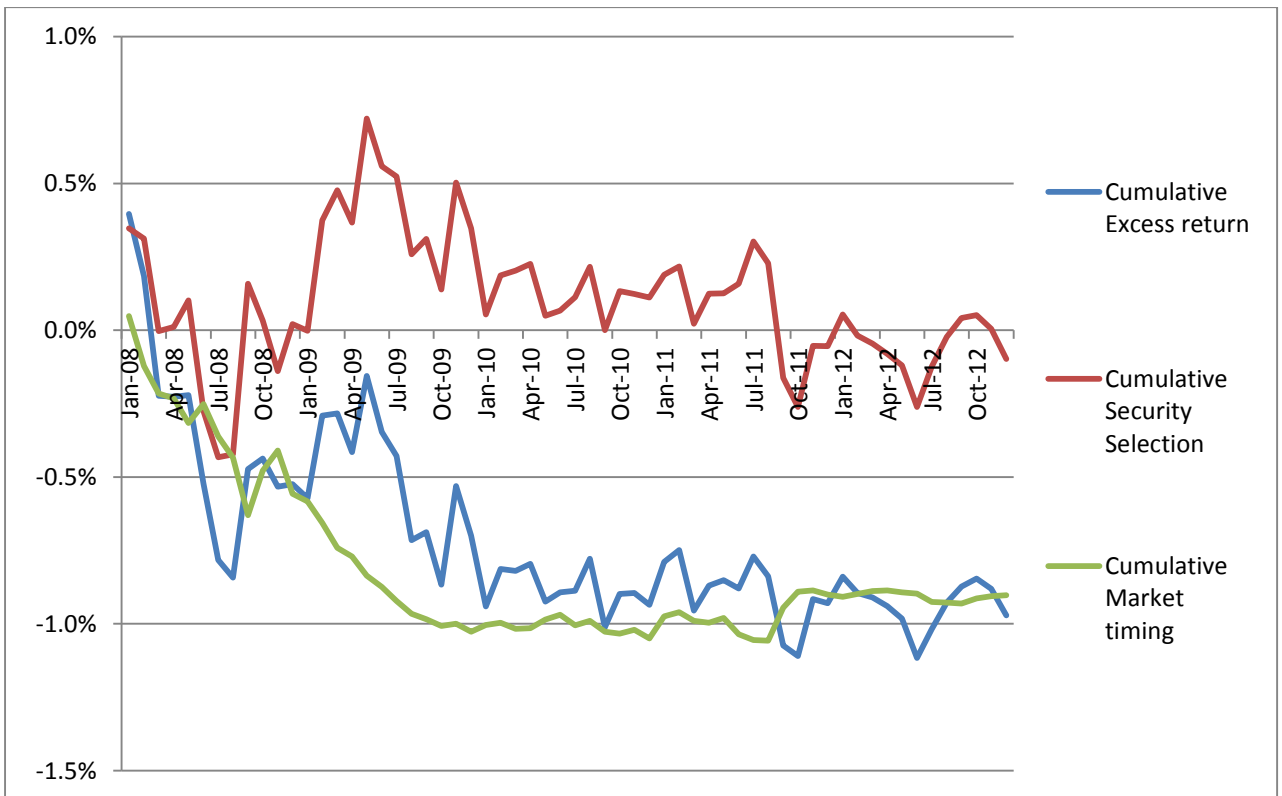
FNB Growth Fund



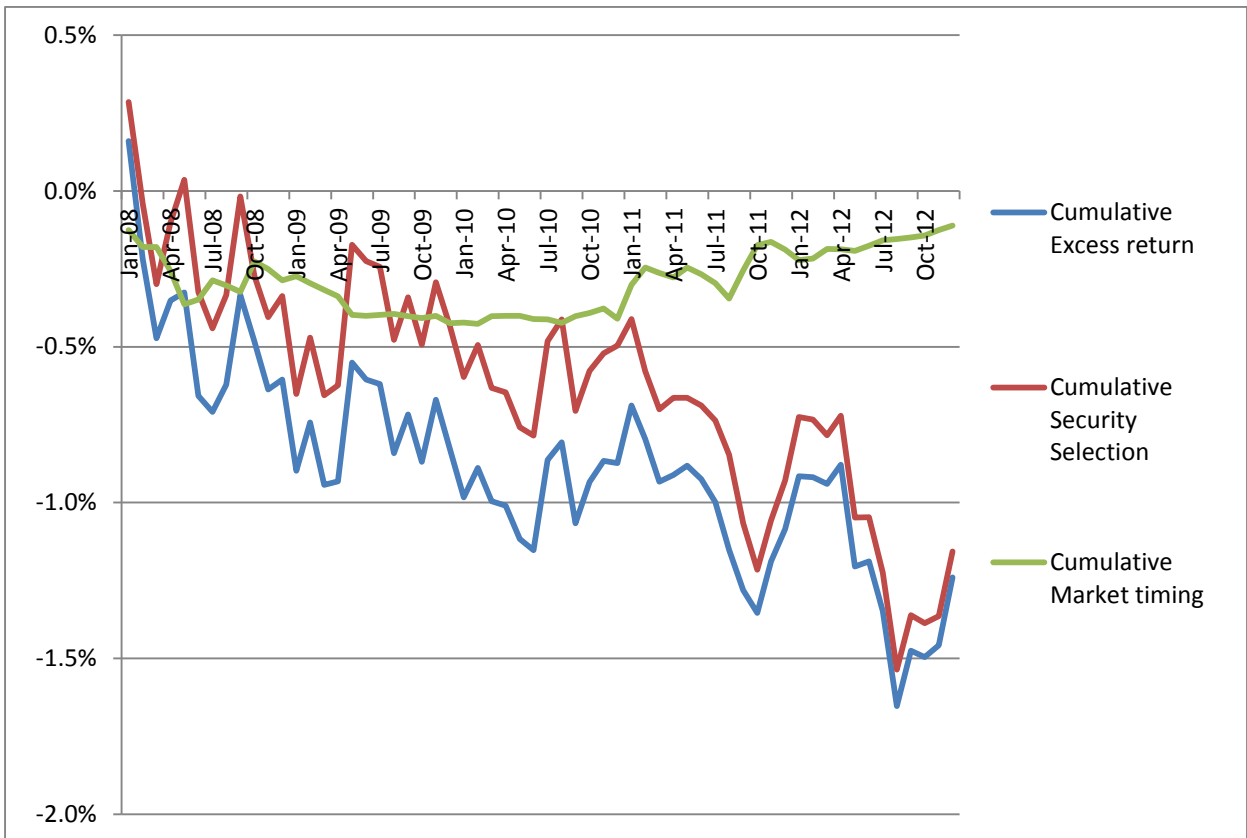
Foord Equity Fund



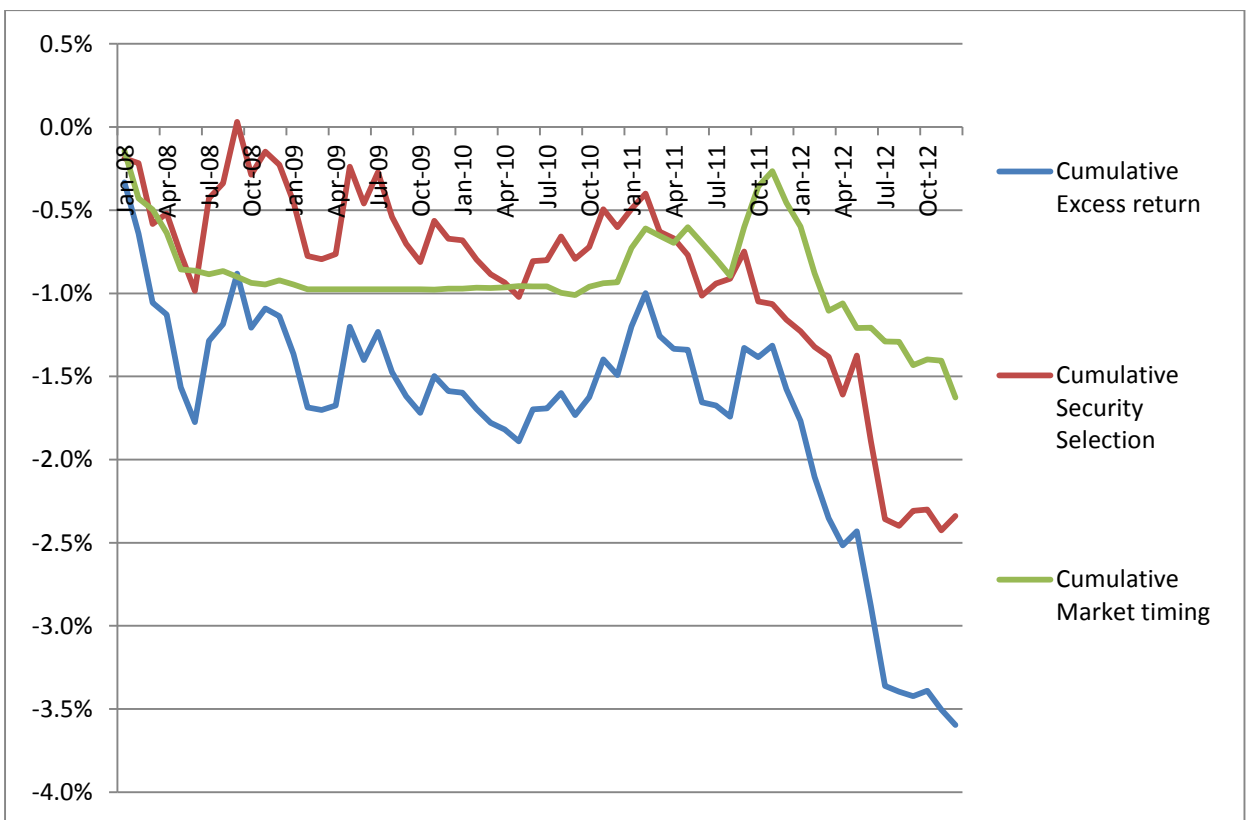
Investec Equity Fund



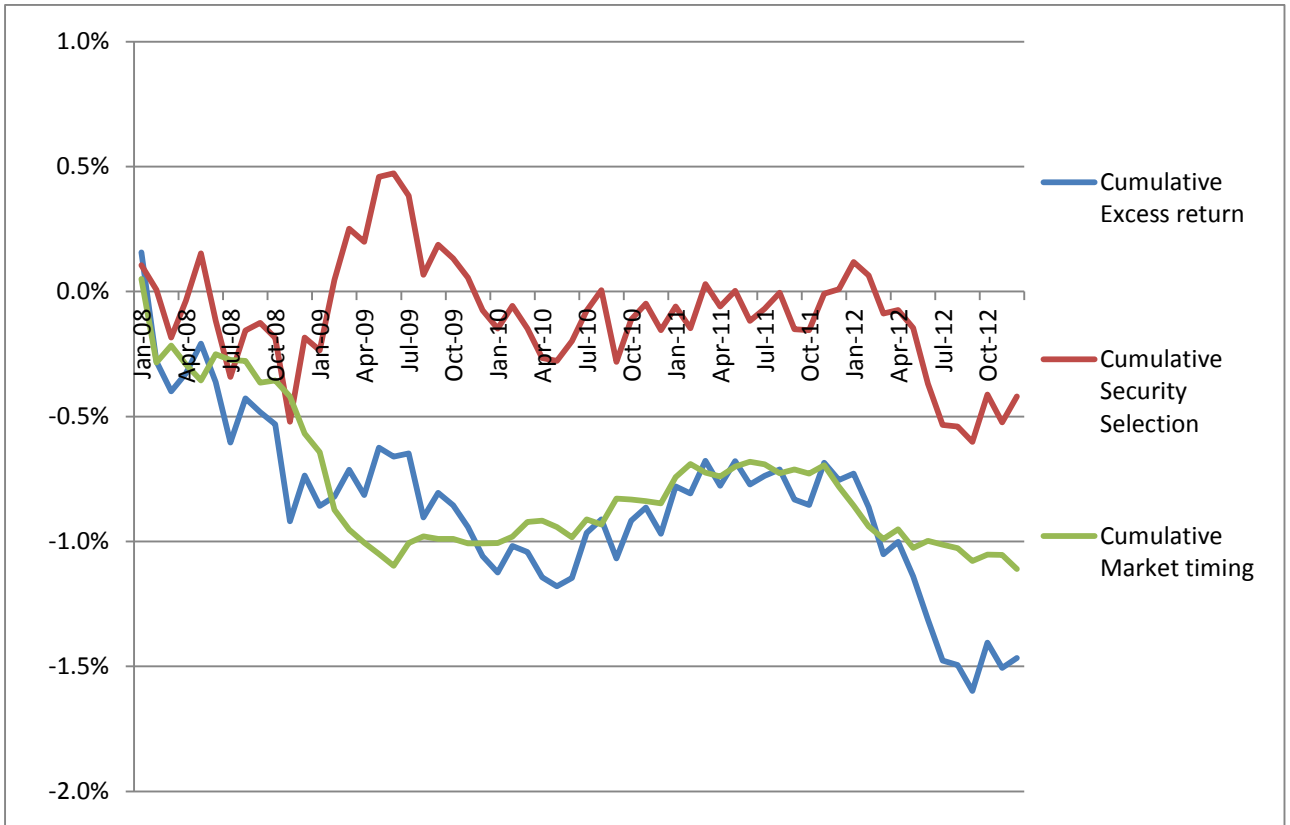
Investec Growth Fund



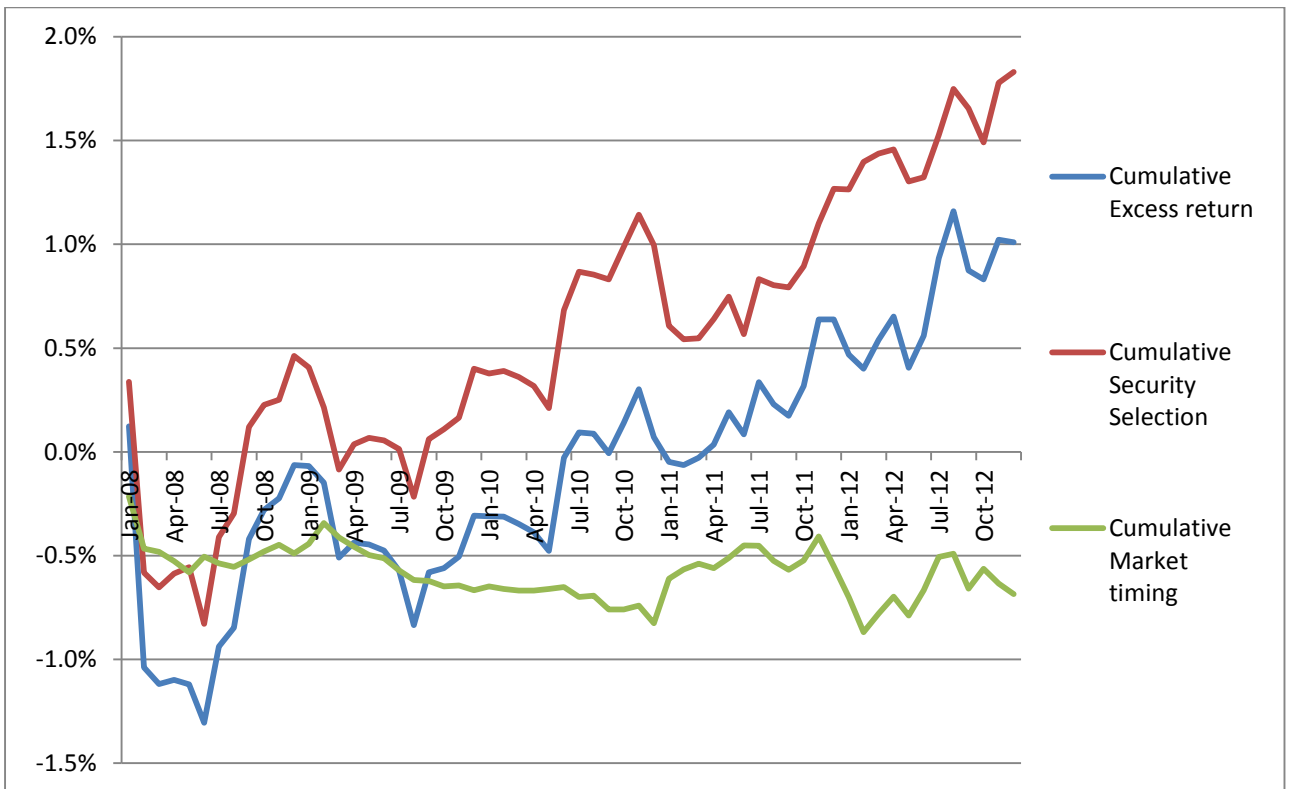
Investec Value Fund



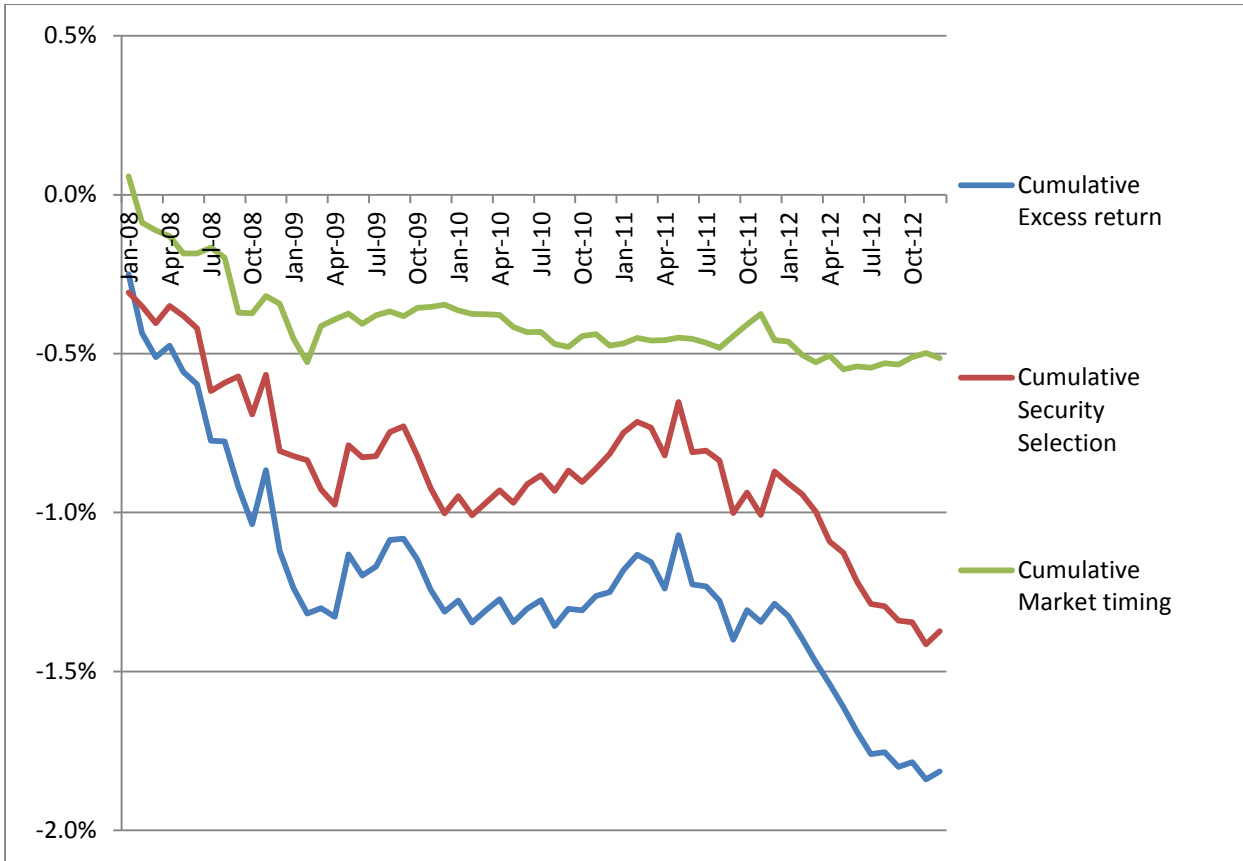
Investment Solutions Multi-Manager Equity FoF



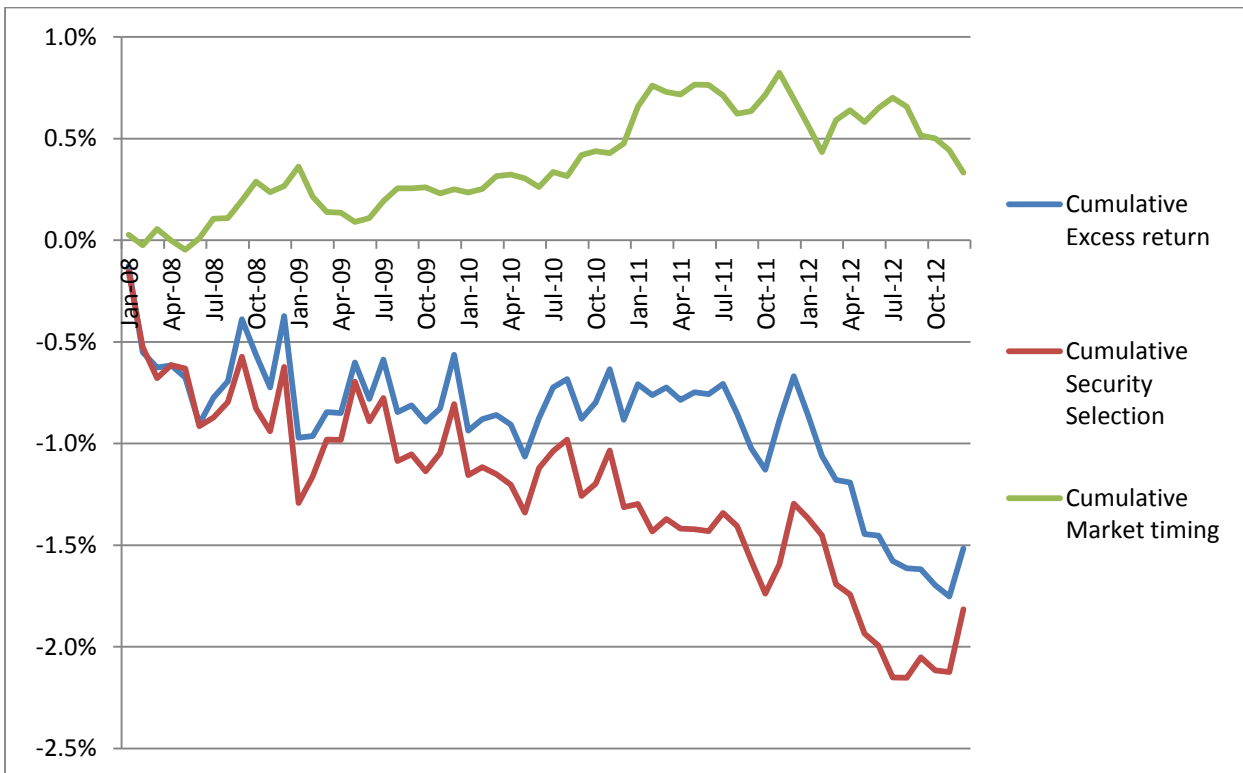
Marriott Dividend Growth Fund



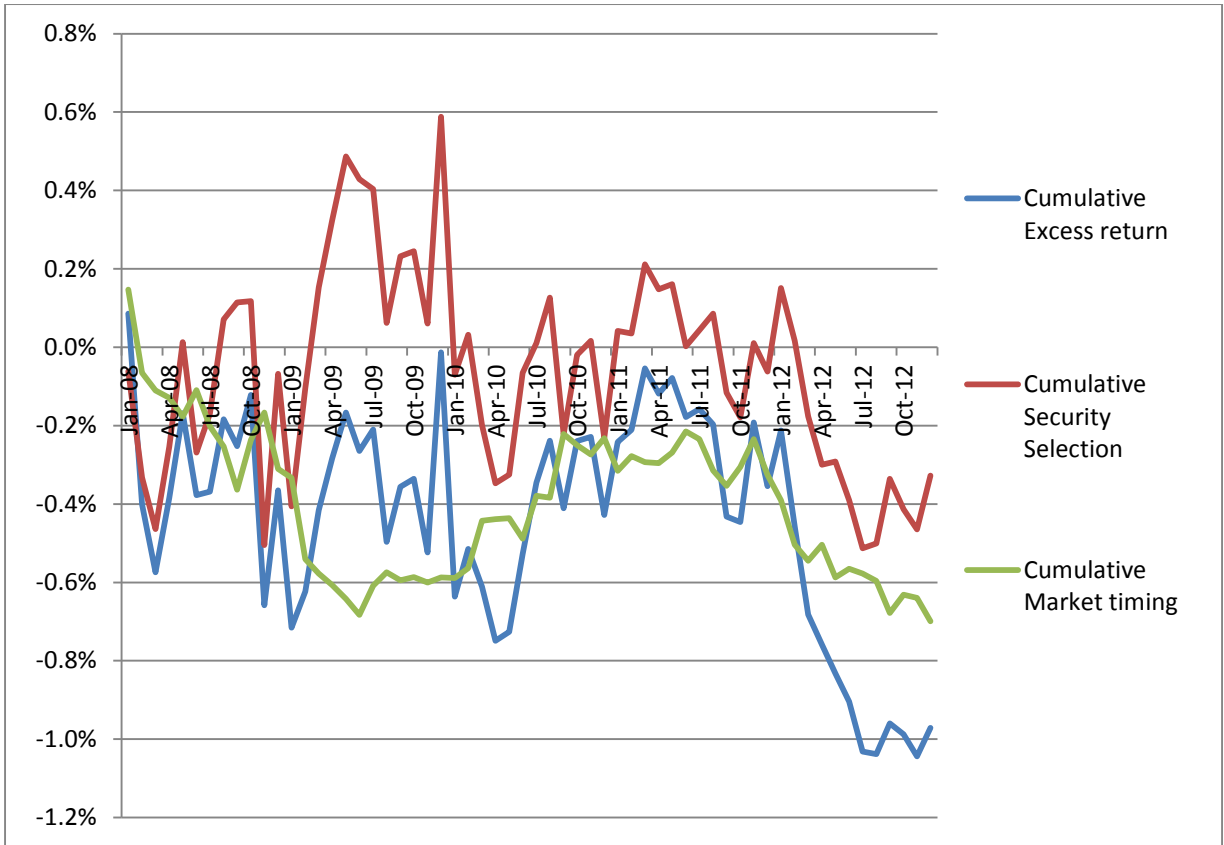
Momentum Multifocus FoF



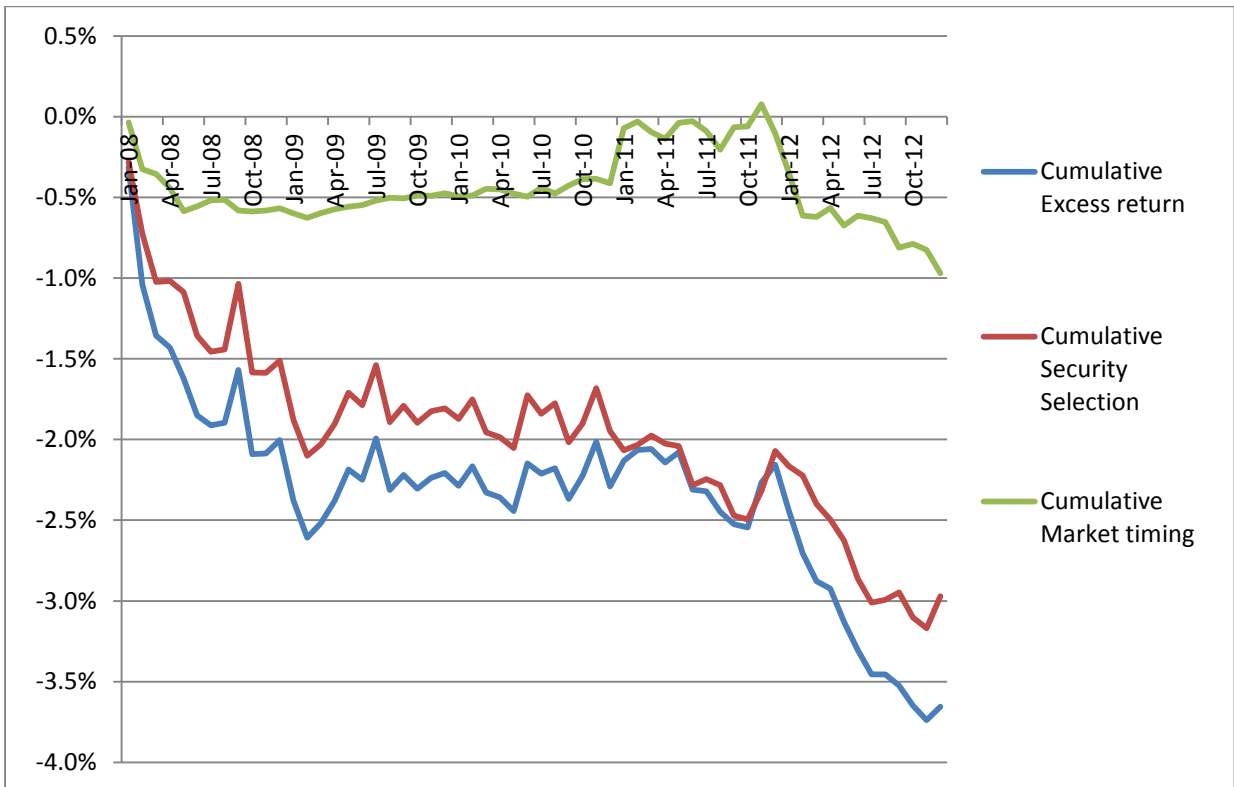
Nedgroup Investments Quants Core Equity Fund



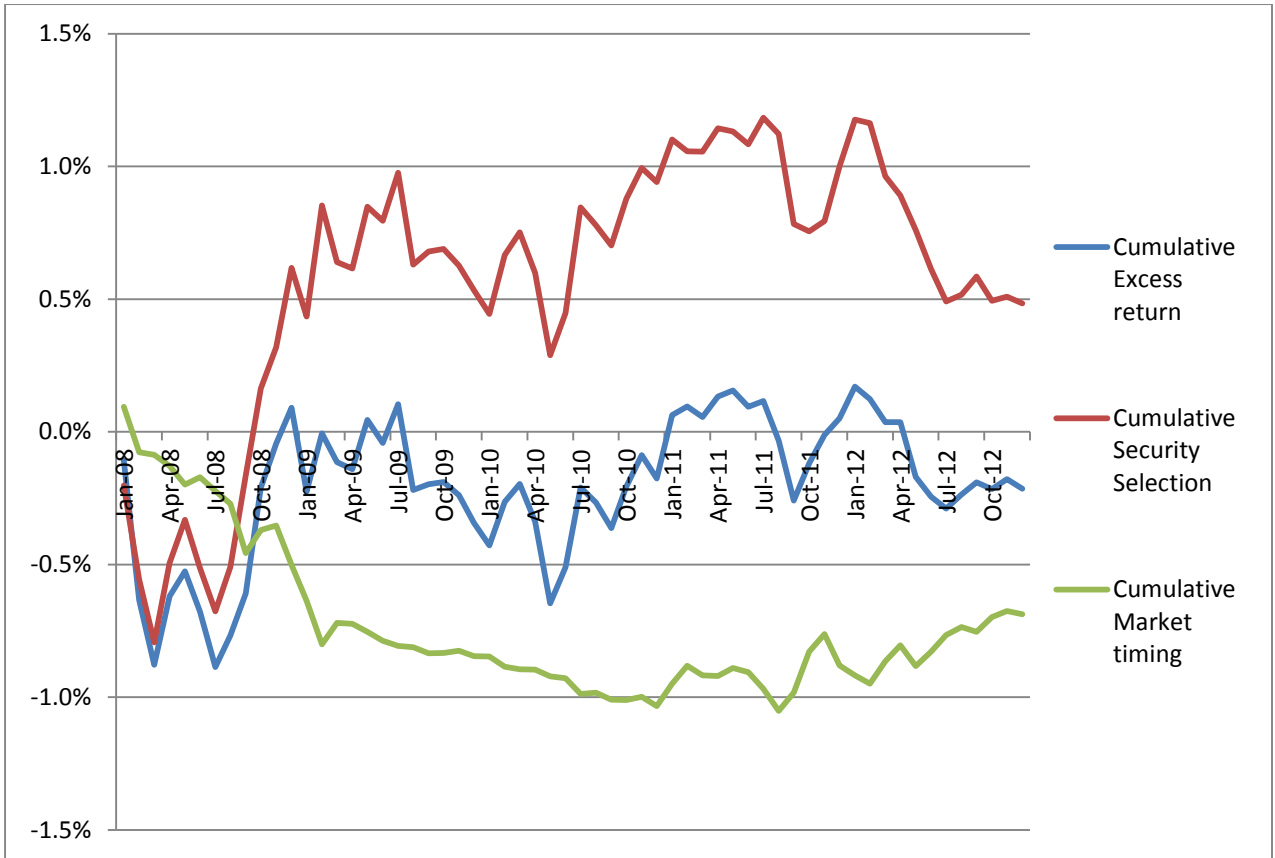
Nedgroup Investments Rainmaker Fund



Old Mutual High Yield opportunity Fund



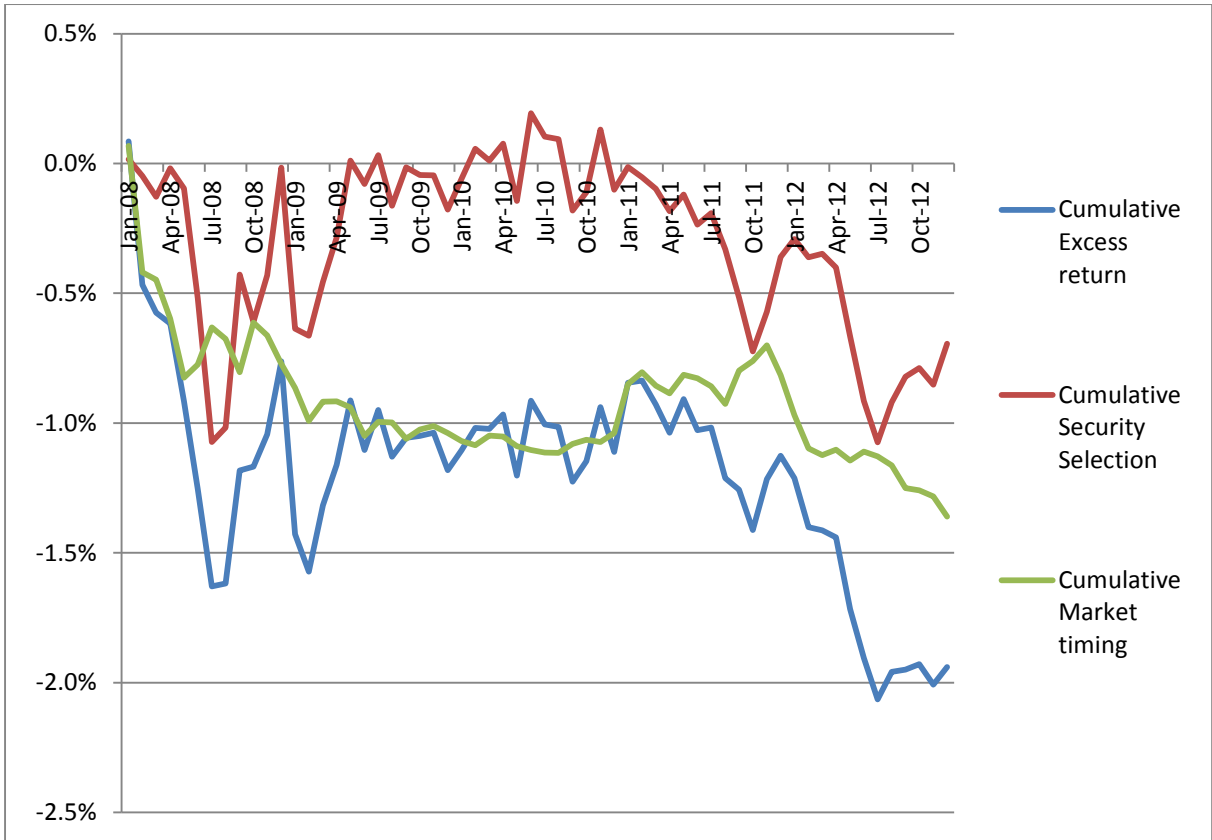
Prudential Equity Fund



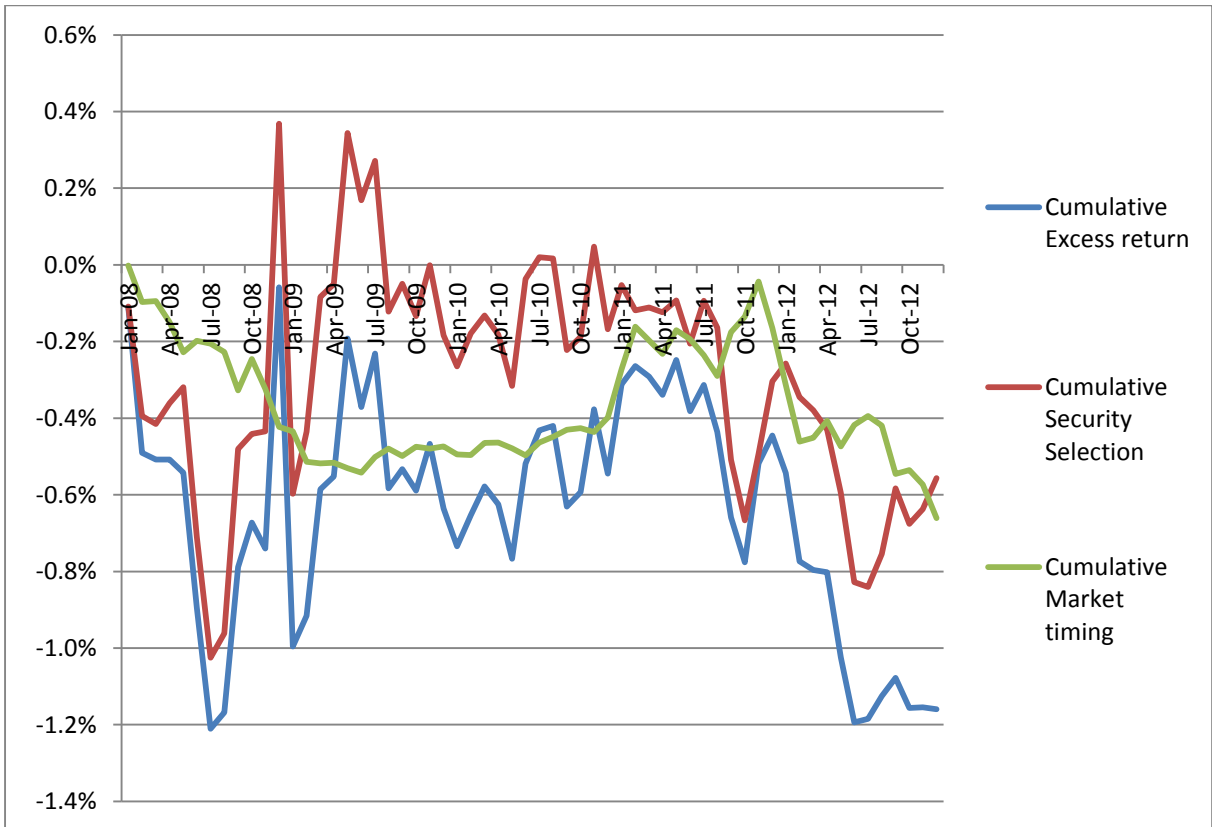
PSG Alphen Equity FoF



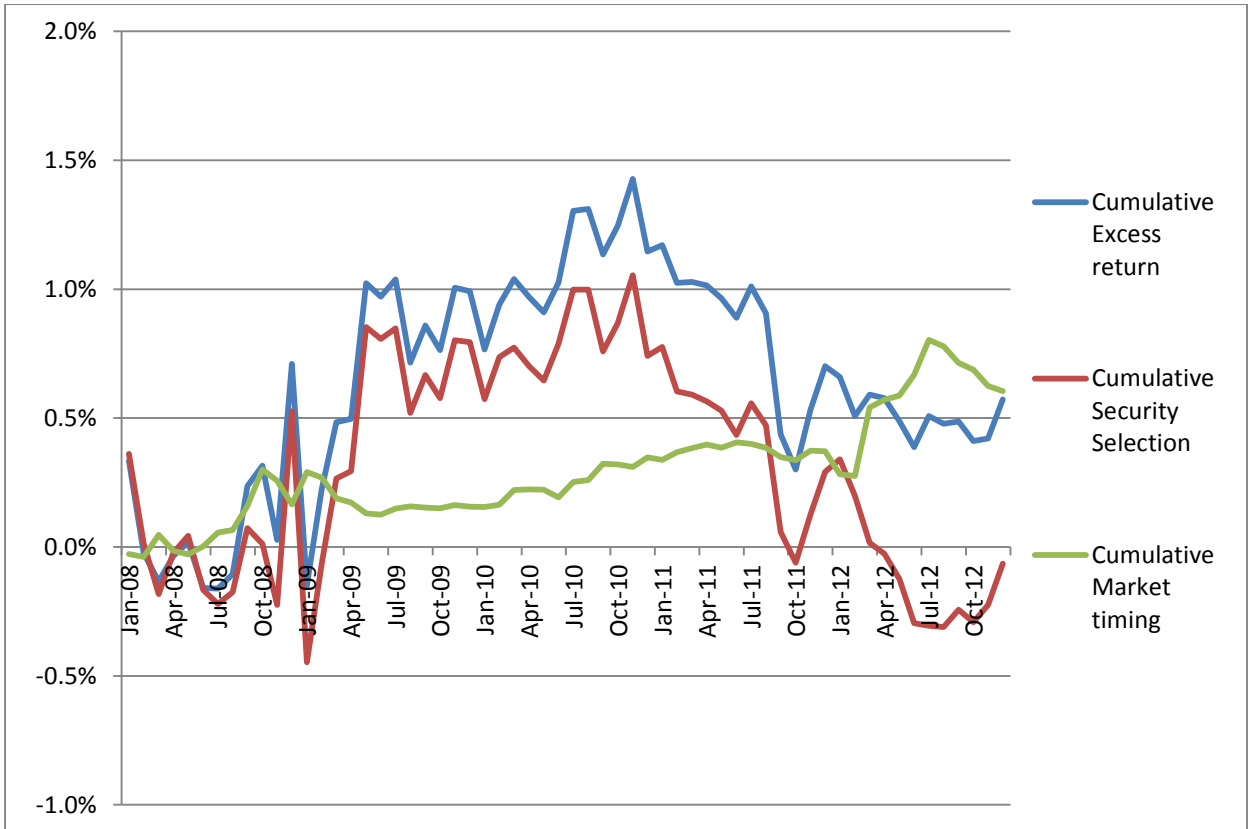
SANLAM Value



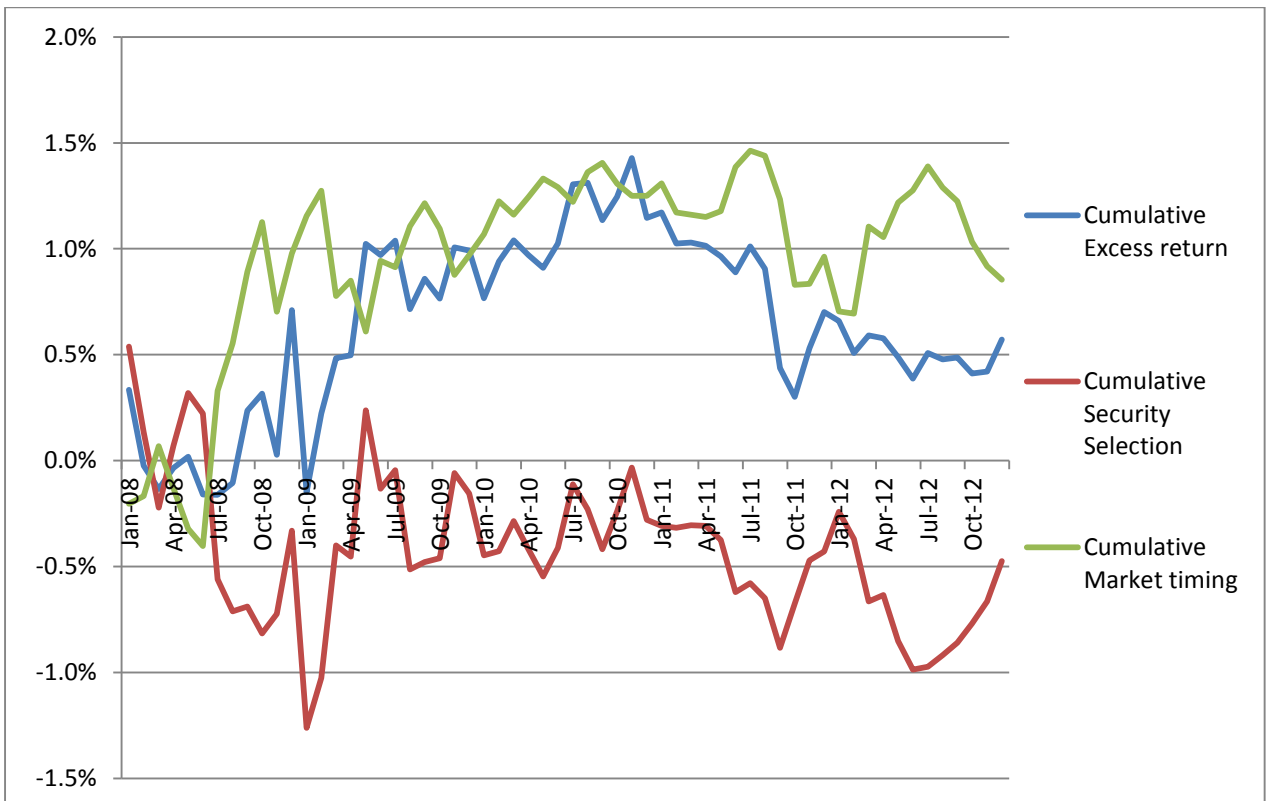
SIM General Equity



STANLIB Index



STANLIB Value



SYmmETRY Equity FoF

