C Muller and M Ward*

Style-based effects on the Johannesburg Stock Exchange: A graphical time-series approach

ABSTRACT

Fama and French (1992), in a controversial paper at the time, noted strong associations between cross-sectional equity returns and so-called style variables including size, the price to earnings (P/E) ratio, gearing and the book to market (B/M) ratio. Other researchers have subsequently identified further priced effects relating to (*inter-alia)*: dividends, momentum, cash-flow and a January effect. Many of these have been identified on the Johannesburg Stock Exchange (JSE), (see: Page & Palmer 1991, Page 1996), Plaistowe & Knight 1987, Fraser and Page 2000, van Rensburg 2001, Mutooni and Muller 2007 and Hoffman 2012).

We re-examine many of these styles using an improved methodology and data set. We find that portfolios constructed on the basis of univariate ranked style characteristics exhibit significant effects over the period 1985 to 2011. Most notably, we find significant and persistent excess returns in the following variables: momentum, earnings yield, dividend yield, price to book, cash-flow to price, liquidity, return on capital, return on equity and interest cover. Furthermore, we find no evidence of a size effect, except for fledgling companies.

1. INTRODUCTION

The holy grail of investment finance could be defined as a methodology which allows an investor to simply and persistently 'beat the market'. Investors and fund managers around the world invest significant amounts of time and resources in their quest for such algorithms, aided by the findings of academics. Christopherson and Williams (1997) define an "equity style" as an investment belief held by a group of managers who believe that following it will add value. Unsurprisingly, the allure of easy money has bequeathed a litany of candidate styles; some with appealing theoretical grounding (see for example Haugen and Baker (1996) who examine over 50 styles). In instances where true skill and expertise are required to identify investment opportunities, such as in a detailed analysis of a complex derivative product, it may be possible that such value creation opportunities persist over time. However, we might expect, in an efficient market, that simple trading rules, such as "invest in shares with low price/earnings ratios" or "invest in small capitalisation shares", would produce only ephemeral advantages. We examine several of the more significant style-based strategies on the JSE to evaluate both the quantum of the potential benefit of the style and its persistence.

2. LITERATURE REVIEW

Given the wealth of literature in this area, we focus largely on the more recent South African studies.

Van Rensburg (2001), using dividend adjusted monthly return data from industrial shares on the JSE between 1983 and 1999, examines more than 20 style strategies using a portfolio approach, and finds eleven of these to be statistically significant after adjusting for risk. Using cluster analysis he concludes that three style groupings emerge: "earnings to price (representing the 'value cluster'), market capitalisation (representing the 'quality cluster') and the twelve month past positive returns (representing the 'momentum cluster')" (p 58).

Van Rensburg and Robertson (2003), using dividend adjusted monthly JSE data from the BARRA organisation between 1990 and 2000, re-examine more or less the same style strategies as van Rensburg (2001) but use individual share level characteristics. Using the standard cross-sectional regression procedure (Fama and Macbeth, 1973) and a multifactor model, they find only two significant styles: size and price to earnings.

Mutooni and Muller (2007) investigate style timing strategies on the JSE over the 20 year period 1986 – 2006. They find that "value stocks outperformed growth stocks across the size spectrum" (p 23) and comment that timing the "style spreads was a potentially more profitable strategy than buying and holding the index or (following a) simple (fixed) style strategy" (p 23).

Strugnell, Gilbert and Kruger (2011) build on the observations of van Rensburg and Robertson (2003). They use monthly share price data from INET over the period 1994 – 2007 and find support for a size and price to earnings effect as well as an inverse relationship between return and beta. They state: "These effects are significant and pervasive, and either indicative of some level of market inefficiency or, perhaps more likely, a misspecification of equilibrium pricing models such as the CAPM" (Strugnell *et al.,* 2011: 14).

* Gordon Institute of Business Science, University of Pretoria, Pretoria 0002, Republic of South Africa.
Email: mchlwrd@gmail.com; chrism@iafrica.com

Auret and Sinclaire (2006) use the same dataset as van Rensburg and Robertson (2003). They examine six styles: book to market, price to net asset value (NAV), price to earnings, cash-flow to price, dividend yield and size. Using multiple regression analysis they find book to market has a significant positive association with returns and note that "when B/M is added to the van Rensburg and Robertson (2003) model of P/E and size, B/M almost completely subsumes the effect of size and P/E" (p 36).

Basiewicz and Auret (2009) construct a database of JSE listed company returns and financial statement data from 1992 to 2005 from a variety of sources. They use dividend adjusted returns, control for survivor bias and adjust appropriately for corporate actions. Using the Fama-MacBeth (1973) methodology, with an annual portfolio review period, they confirm the independent existence of a size and P/E effect even after adjustments for illiquidity. However, as with Auret and Sinclaire (2006), they note "that the best measure of the value premium is the book to market ratio, which, in univariate sorts has produced the widest spread of returns and has been found to subsume all other value indicators in multivariate regressions" (Basiewicz and Auret, 2009: 35).

Auret and Cline (2011) examine the inter-relationships between P/E, size and the January effect. They use INET data from 1988 to 2006 but make no adjustments for survivor bias, corporate actions or the inclusion of dividends. They find no support for any effects.

Hoffman (2012) presents an excellent study of share return anomalies on the JSE. He makes use of dividend adjusted returns from 1985 – 2010, controls for corporate actions and survivor bias and uses both an equal weighted and a market value weighted portfolio approach. Following the method of cross-sectional regression and sorted returns used by Fama and French (2008), Hoffman finds support for size, B/M and momentum effects, and to a lesser extent an Earnings to Book (E/B) effect and a 'new shares in issue' (NS) effect.

The international literature is replete with examples of investment styles. Fama and French (1992) show that a value based strategy using a firm's Book Value to Market Value (B/M) can successfully predict future returns. Lakonishok, Shleifer, and Vishny (1994) were amongst the first to show that an alternative value strategy, based on a firm's cash-flow-to-price ratio, was an effective investment style. Jegadeesh and Titman (1993) and Moskowitz and Grinblatt (1999), using momentum based approaches, show that strategies that buy winners and sell losers based on the prior returns generate excess returns. Asness, Moskowitz, and Pedersen (2012) combine a value and momentum strategy, showing these to be negatively correlated, and comment on the benefits of the interaction between these two styles.

Asness, Porter and Stevens (2000) find that within-industry momentum (on variables such as size, book-to-market equity, cash flow-to-price and percentage change in employees) have predictive power beyond that of a cross-industry momentum. They also document a significant one month industry momentum effect.

Asness and Frazzini (2011) use an improved ("timely") approach to measuring B/M, and suggest that this can significantly improve the results for value strategies. In this paper they also make use of a five factor control model which includes the following styles: value, market, size, momentum and a short term reversal factor.

Arnott and Asness (2003) report the surprising result that expected future earnings growth is correlated with higher dividend paying companies. They report a significant, linear relationship between the pay-out ratio and the subsequent 10 year earnings growth for US companies over the period 1946 to 2001.

In summary, the international literature and the South African literature find support for several styles, including value (measured in various ways including variations on B/M, P/E and cash flow to price), momentum, changes in number of employees, dividend pay-out ratios and size. However, some of the local studies suffer (to varying degrees) from data related problems: too short time frames, too long review periods, survivor bias, incomplete data and too much emphasis on small thinly traded shares. We discuss these issues in more detail below.

Our main objective is to re-examine the major styles noted in the literature. To do this we use a significantly improved data set, over a longer time period and a better methodology. Through this will are able to examine the persistence of styles over different phases of the market, and measure the scale of their effect in the form of annualised return.

3. METHODOLOGY

We use 27 years of JSE share price data from 1985 to 2011, in combination with company financial statement data from INET. Our data includes all companies which were listed on the main board of the JSE over this time period, including new listings and delisted companies. Changes in share prices which were a result of share splits or consolidations have been backwards adjusted in the time series data.

Where a company in the sample unbundles (spins-off) a subsidiary, we include the returns from the newly listed subsidiary with those of the original holding company for the remainder of the quarterly review period. Thereafter we treat both companies as separate entities.

Dividend receipts constitute a significant portion of the return an investor receives, and we therefore include dividends in share returns using the INET historical time series of dividend pay-outs. On the same basis we also include scrip dividends in share returns. We do not however account for share buybacks, on the grounds that these are a form of capital reduction, which only affect those shareholders who exit the company. We ignore shares granted as compensation to managers.

We include newly listed shares at the start of the next quarter and drop delisted shares at the end of the quarter on the basis of their last price prior to the cessation of trading. We track name changes and follow these through in the sample. Finally, we check for and exclude data errors on (only) the day these occur by treating as zero any daily returns on shares which are less than -40% or greater than +40%[1].

Although there are typically more than 350 companies listed on the JSE over the time frame, the All Share Index (ALSI) comprises only the largest 160 companies, but represents around 99% of the total market capitalisation – see Figure 1. Those companies falling outside of the ALSI are considered too small and too illiquid for most institutional investors. Consequently, unlike most of the studies described above, we exclude these from our analysis. We conduct our initial analysis on all the listed companies, but construct portfolios using only the top 160 ranked by market capitalisation, after ensuring that there are no missing variables in any of the sample companies. The population size varies, depending on the availability of the particular characteristics extracted from each share, to match a given style.

3.1 Style engine

To facilitate our analysis we constructed a "style engine" in Excel, using VBA code to manipulate the data from Access databases. As far as possible, we parameterised the inputs into the style engine so that we were able to easily change settings and define styles. Our system parameters enabled us to select the starting date (usually 31 Dec 1986), ending date (usually 31 Dec 2011), the number of portfolios required (usually 5), the review period (usually 3 months), the number of months of back data required prior to the starting date (usually zero) and whether or not we wanted to write results and/or companies excluded into new Excel sheets.

The style engine also enabled us to define and select for analysis individual and combinations of the more than 30 style characteristics we tested (e.g. market capitalisation, earnings yield, cash-flow to price, etc.) from a set of Excel control sheets, in which we could easily change parameters. We were also able to rank these style variables (ascending/descending), set filters (eg use only Non-Resource shares) and combine, order and weight characteristics in terms of their ranking (eg filter to select only non-resource shares, rank (descending) the population of non-resource shares by market capitalisation and select the top 160, rank (descending) these by earnings yield, rank (descending) these by cash-flow to price and, for example, construct a final weighted score by combining (60% * MarketCapitalisationRank +30% * EarningsYieldRank +10% * Cash-flowToPriceRank)).

Using the top 160 companies, we construct five equal weighted portfolios at the start of each quarter, from 31 December 1986, after ranking the sample in terms of the particular style score (e.g. earnings yield). On a daily basis we calculate the return for each of the 32 shares (including any dividends) in each portfolio, and calculate the value of each of the five portfolios from a base of 1.0.

On the last day of each quarter we retain the value of each portfolio. We repeat the above process with a revised sample of the top 160 companies. We recalculate the style score (earnings yield) using the updated (but out-of-sample prior data) and reconstitute the five equally weighted portfolios, as described above. We continue this approach each quarter, accumulating the value of each portfolio until 31 December 2011.

We ignore transaction costs that relate to the quarterly re-balancing in each portfolio on the grounds that these will be approximately the same between portfolios and immaterial.

A pervasive problem in research of this nature is the so called "look ahead bias" in the data. Financial statement data is typically included in the database and indexed on the financial year-end date of the company. However, most companies are only able to release final audited figures some weeks or months after their official year-end date (the JSE allows up to three months for this). Consequently, when conducting research using historical accounting data, it is important to acknowledge that the share prices (usually) do not reflect this information at the financial year-end date. We solve this problem by lagging any accounting variables we use from the database by three months post the official year-end date.

[1] We also print out a list of all exclusions, which typically relate to data errors, or missing variables.

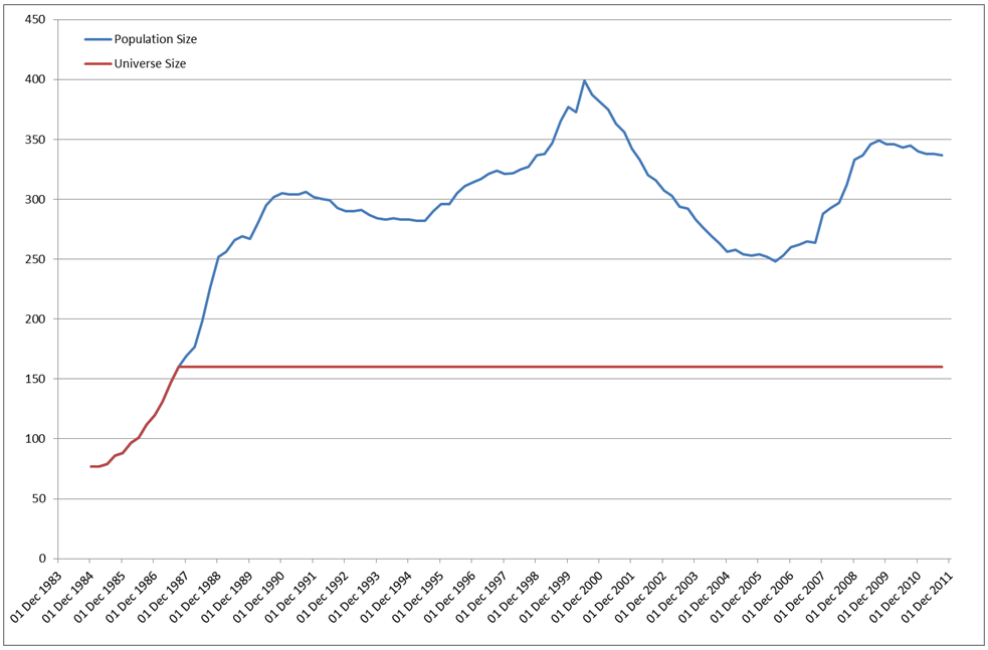

Figure 1: The population of JSE listed shares and the universe we use in our sample

The traditional approach of most researchers who have conducted equivalent studies has been to report average monthly or quarterly portfolio returns, and to use t-tests to test for significant differences in the results. We concur that the construction of portfolios of shares is a necessary approach to reduce the volatility in the data. However, we view the use of average monthly or quarterly returns as methodologically weak compared to cumulative returns, in much the same way as average abnormal returns reveal relatively little compared to cumulative abnormal returns in event studies. Our approach therefore is to plot the cumulative index (value) of each portfolio over the timeframe and to visually compare the results.

To aid the interpretation of the resulting graph of portfolio cumulative values, we construct a "price-relative" by dividing the value of the highest ranked portfolio by that of the lowest portfolio on each day, and plot this on the Y axis. In effect, the price-relative compares the difference between the best and worst portfolios and is akin to the excess return of an investor who holds the shares in the highest ranked portfolio over those of the lowest portfolio. Importantly, the slope of the price-relative also reveals those time periods over which the highest ranked portfolio style out-performed the lowest portfolio. In the periods when the slope of the price-relative is upwards, the highest ranked style portfolio is out-performing, and vice-versa. If the slope of the price-relative is flat for any period of time, then no out-performance is occurring, and there is no difference between the performances of the portfolios over this period.

As an additional benchmark we show the market capitalisation weighted ALSI total return index (J203T) in the graph, and also the price-relative of the highest ranked portfolio against this.

We also construct methodologies to test the robustness of our data and our methodology. Firstly, to test the integrity of our share return data we reconstruct a market capitalisation weighted index (including dividends) commencing 31 December 1994 and compare this to the J203T (the ALSI total return index). Because the J203T was only launched in 2003, we use the JSE's backwards constructed J203T for the 10 years prior to this. We expect our reconstructed index to closely track the J203T.

Secondly, we test our methodology as follows. We follow the identical data selection and portfolio construction method described above, except that we randomise the ranking of the 160 shares in the sample each quarter by creating a style score of random numbers and ranking on these. We expect no clear separation between the portfolios on this basis, and anticipate that the results will provide an indication of the level of randomness in the cumulative returns from our methodology.

3.2 Choice of styles

Given the plethora of possible styles in the literature, we categorise these into: financial ratio based styles, market based styles and behavioural finance based styles.

3.2.1 Financial ratio based styles

Financial theory supports the idea that companies which exhibit strong accounting based results ought to show correspondingly better performance in terms of

investor returns. For example, companies with high return on capital or high levels of operating cash flow might be expected to outperform their peers. Graham and Dodd's book "Security Analysis" is credited with providing the theory of so-called "Value Investing", the science of buying cheap shares on the basis of fundamental analysis (Graham & Dodd, 1934). Building on this, Joseph Piotroski's paper titled "Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers" (Piotroski, 2000) provides a useful point of departure for our purposes.

Piotroski's paper specifically focuses on enhancing the returns to value investors, i.e. portfolios of shares with good fundamental to market values. Since a high book to market ratio can also be an indicator of a troubled company, Piotroski provides a nine point check list to distinguish the quality of companies in a value portfolio. He shows that by considering the following list of variables an investor "could shift the entire distribution of realized returns to the right" (p. 1): gross margin, net income, return on assets, asset turnover, operating cash-flow, debt to assets, the current ratio, the change in shares outstanding and the quality of earnings. Some of these variables can be grouped into measures of profitability, efficiency and gearing, following the so-called Dupont method of ratio analysis.

From the literature we select the following attributes to examine financial ratio based styles:

Return on Capital	As a measure of accounting return to both debt and equity providers we use the INET FAS code PF43 (Return on Capital Employed)[2]
Return on Equity	As a measure of accounting return to equity holders we calculate ROE from the INET FAS codes IS23/LI05[2]
Interest Cover	We use interest cover as a measure of financial leverage on the grounds that income statement ratios are generally superior to balance sheet ratios. We use the INET FAS code CV01 (Interest Cover)
Net Asset Growth	We use the year on year increase in net assets (measured as long-term assets at cost less accumulated depreciation).

[2] We exclude banks from this analysis

3.2.2 Market based styles

As noted above, many researchers have shown that the size of a company is negatively correlated with returns. Similarly, financial ratios which include the current market value of a share have been shown to differentiate between style metrics such as value and growth (value doing better). Share tradability or liquidity is also considered to be a significant criterion for investment decisions (with illiquidity being associated with higher returns). Finally, in South Africa there is a dichotomy between industrial and resource shares. We select the following attributes to examine market related styles:

Size	We calculate the market capitalisation at the end of each quarter using the last reported closing share price multiplied by the number of shares in issue
Price to NAV	We estimate the market capitalisation to net asset value using INET FAS code (MD09)
Dividend Yield	We use the JSE dividend yield percentage
Industry	We use the sector classification of Industrial or Resources to classify a share into its major industry group
Earnings Yield	We use the Earnings Yield ratio to distinguish between "Value" (low P/E ratio) and "Growth" (high P/E ratio)
Cash-flow/Price	We use the INET FAS code CF08 (Cash-flow After Working Capital) / Price)[3]
Liquidity	We use the INET FAS code MD08 (Value of Shares Traded / Market Capitalisation)

3.2.3 Behavioural finance based styles

Amongst the various behavioural indicators, momentum and mean reversion feature strongly in the literature ((van Rensburg, 2001) and (Muller, 1999)). Typically, momentum is ascribed to the short term effect of shares which have exhibited strong returns over the last 12 months (say), continuing with good returns over the short term (one or two months). Mean reversion relates to shares which have performed poorly over a long period, eventually reverting to the mean.

[3] We exclude banks from this analysis

Momentum	We rank share returns over the prior 12 months as a short term momentum indicator for the next quarter

Finally, on the basis of our findings from testing the above styles, we construct a "combination" style, based on a grouping of the most effective results. The methodology we use for this is akin to forward stepwise regression; we start with the best performing style, and then add the style(s) which contribute(s) the greatest improvement to the result.

4. RESULTS

Figure 2 below shows a reconstruction of the daily J203T total return ALSI over the period 1994 – 2011 using our share price and dividend data, and compares this with the J203T itself.

As can be observed there is a close fit between the actual J203T index and our reconstructed index. The green coloured price-relative does indicate a slight discrepancy, with the reconstructed index showing higher returns over the period 1998 to 2003, but these are dissipated over the remaining period of the data. We conclude that our data is complete and accurate.

Figure 3 below shows the results of randomly ranking the top 160 shares each quarter into five portfolios.

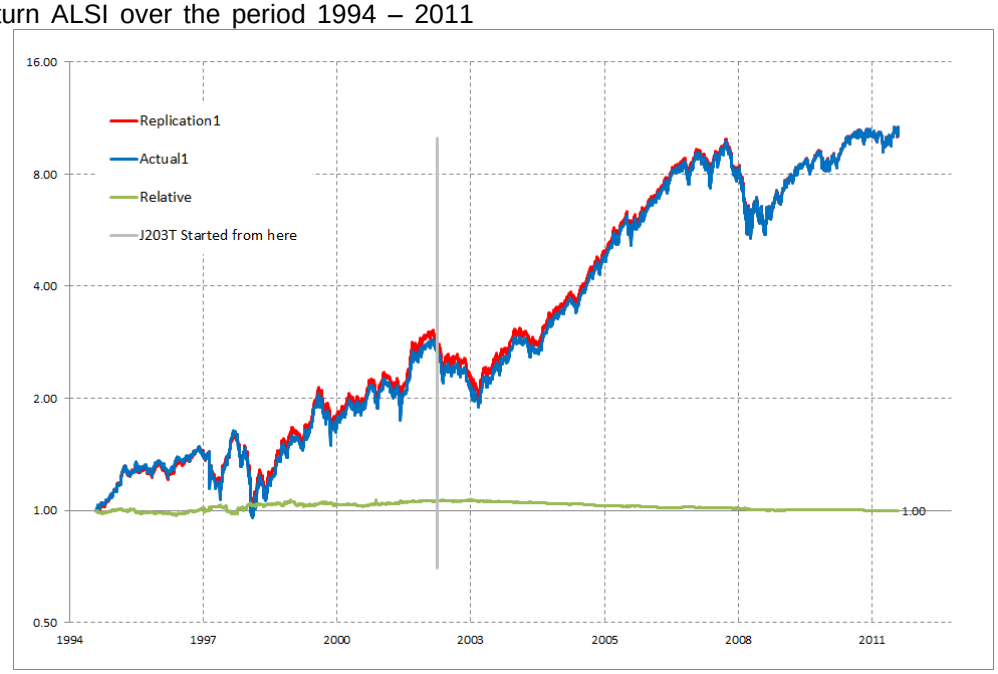

Figure 2: Replicating the J203T index using our share price and dividend data

4.1 Randomised portfolios

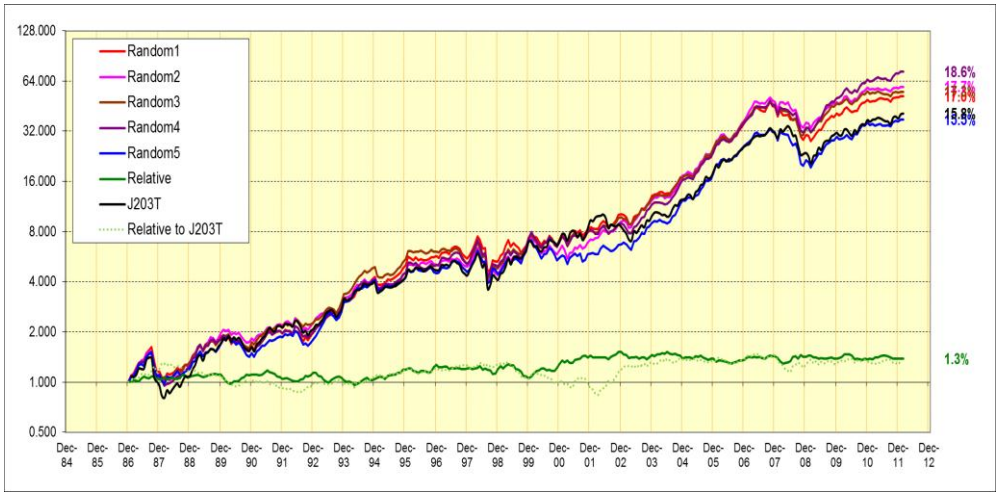

Figure 3: Random allocation of shares into portfolios

Over the 25 year period of our study there is an observable difference in the final performance of the five portfolios. However, instead of a clear and sequential separation between the lines, we find (as expected) a pattern of randomness. This is a good indication that there is no inherent bias in our methodology. Portfolio 5 (smallest random numbers) appears to track the J203T index for the last 10 years of the data, whereas the other four portfolios end at a slightly higher level but in a random sequence (4,2,3,1). It should be noted that on average our five equal weighted portfolios out-perform the market capitalisation weighted J203T between 2000 and 2002 (see the dotted green price-relative) possibly indicating a small size effect. The fact that the slope(s) of the green price-relative(s) appear(s) to be flat from about December 2002, indicates that any size effect in the Top 160 companies constituting our sample is no longer evident.

4.2 Size effect

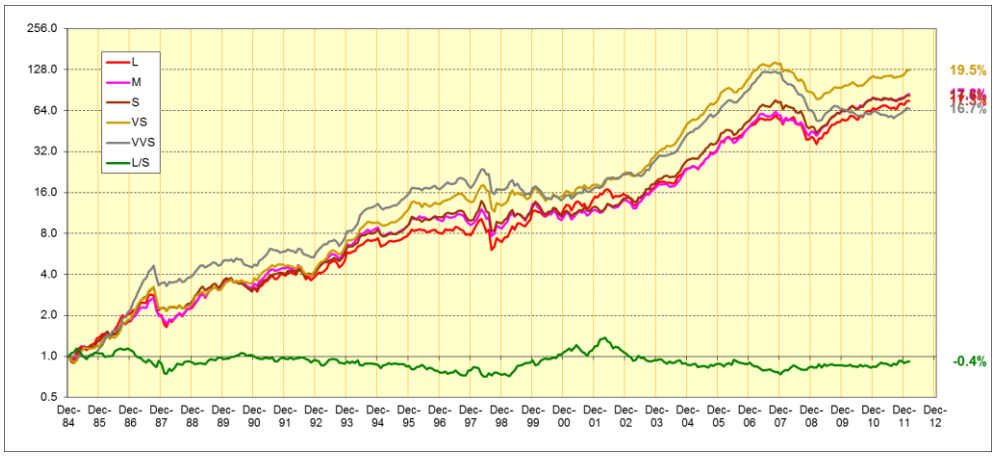

Figure 4: Style – Market capitalisation

At the start of each review period we create five portfolios on the basis of ranked market capitalisation at the end of the prior quarter. Portfolio L contains the largest 40 companies (representing the TOP40 Index), portfolio M contains the next 60 companies (representing the MIDCAPS), portfolio S contains the next 60 companies (representing the SMALLCAPS), portfolio VS contains the next 60 shares and portfolio VVS the next 60 (in total the top 280 shares).

The green price-relative shows that there is no small size effect over the 27 years of the time-series between the TOP40 and SMALLCAPS. Although there are periods when a small size effect is evident (August 1989 to December 1998 for example), these are small, and quickly reversed out. We do find a positive small size effect in portfolio VS (market cap ranks 161 – 220) and note that over the time-series this portfolio out-performs by around 2% p.a. However, this result appears to be spurious as we observe that portfolio VVS (market cap ranks 221 – 280) has been under-performing since the global financial crisis, and ends with the lowest return of all the portfolios.

Almost all the literature reports a small size effect, so to test our results more critically we create 30 portfolios, each with 10 equal weighted shares ranked by market capitalisation. Figure 5 below shows the resulting average return for each of the 30 portfolios over the 27 years.

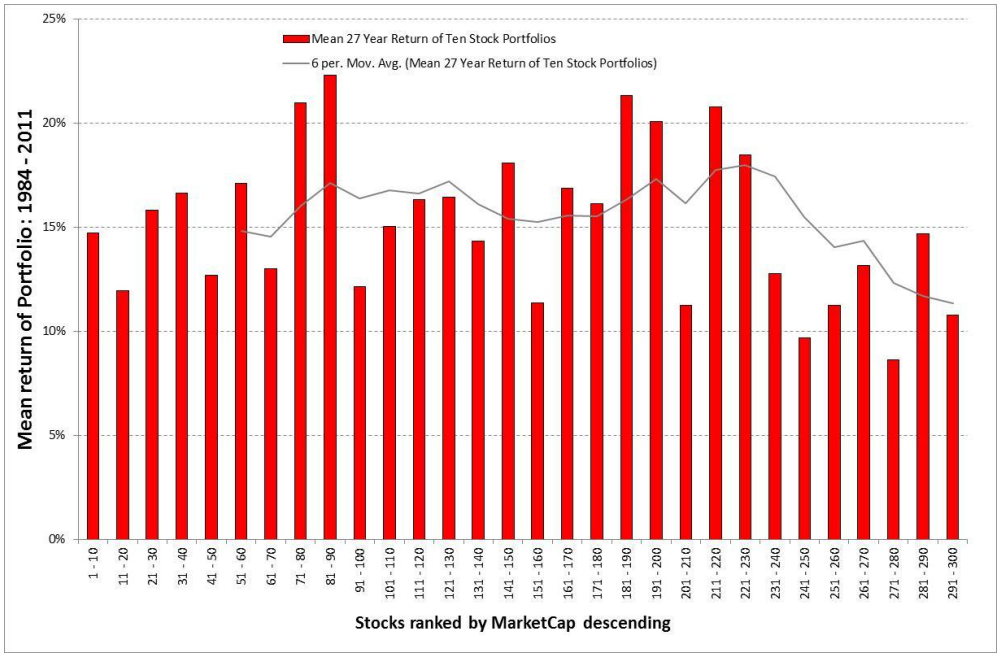

Figure 5: Style – Size: Average return for 30 portfolios of 10 equal weighted shares

There is no clear trend in the return pattern in Figure 5. We do note that some of the portfolios show relatively higher returns than the rest (71-80, 81-90, 181-190, 191-200, 211-220). The six-point moving average we plot shows a fairly steady line, which peaks around portfolio 211-220 which would explain the results in our VS portfolio above. We also observe that after this, there is a steady decline in average returns in the smaller market capitalisation ranked portfolios indicating the fledgling companies under-perform.

This is a surprising result given prior studies, but we find no evidence of a positive small size effect, except for very small companies, which together represent less than 1% of the JSE's market capitalisation.

4.3 Major industry sector – resources vs non-resources

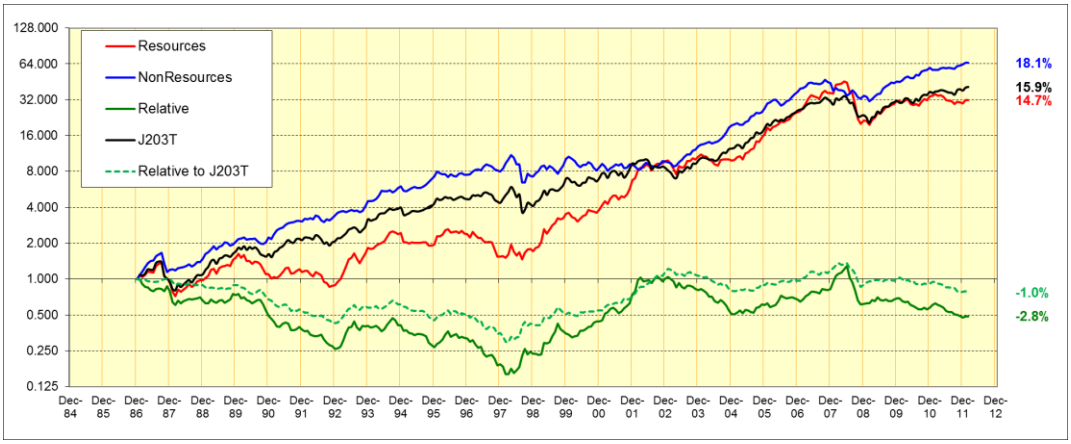

Figure 6: Style – Major industry sector

We construct two portfolios using only the top 160 companies: resources companies and non-resources companies. Over the full time-series, we find that Non-resource shares do somewhat better. The graph shows the effect of commodity cycles. Resource stocks out-perform over the period 1998 – 2002 and to a lesser extent over the period 2005 – mid 2008. As many other researchers have noted, given the dominance of resource counters on the JSE, the commodity cycle is a significant determinant of returns. It is not however, a persistent style, and requires market timing skills to predict commodity cycles.

From this point onwards we use the top 160 companies and construct equal weighted portfolio quintiles (32 shares in each) for each style, ranking each style from large to small (descending).

4.4 Earnings yield

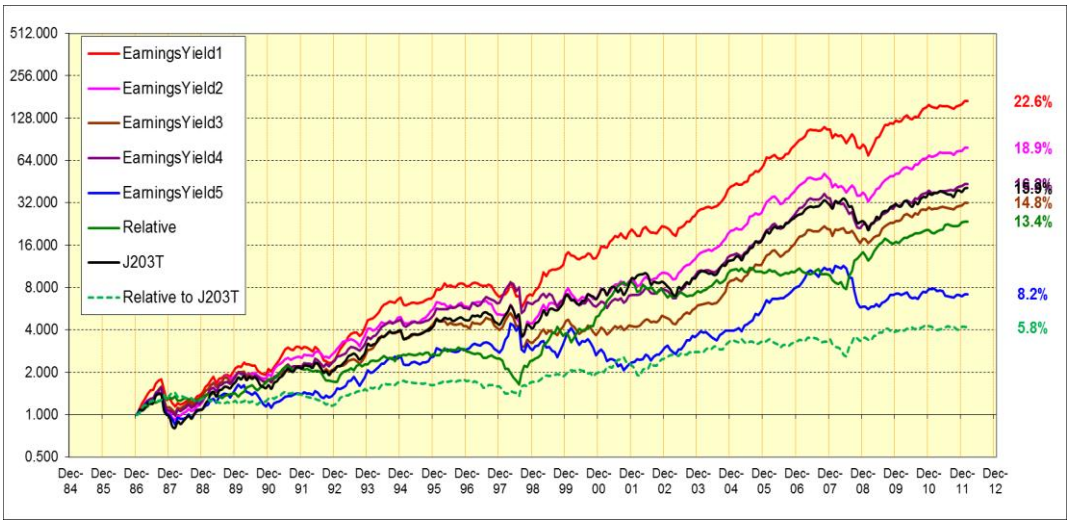

Figure 7: Style – Earnings yield or value versus growth

We observe a significant spread between the best and worst portfolios ranked on earnings yield. We note that the ranking between the quintiles is (mostly) in the expected order throughout the time-series. Finally we observe that the trend in the two green price-relatives is (mostly) consistently upwards, indicating that high levels of earnings yield provide significant out-performance.

On the basis of these observations we would support the findings of other researchers that a persistent earnings yield style does exist. Our results show a substantial premium of 13,4% pa for the large earnings yield portfolio over the small earnings yield portfolio.

4.5 Return on capital (ROC)

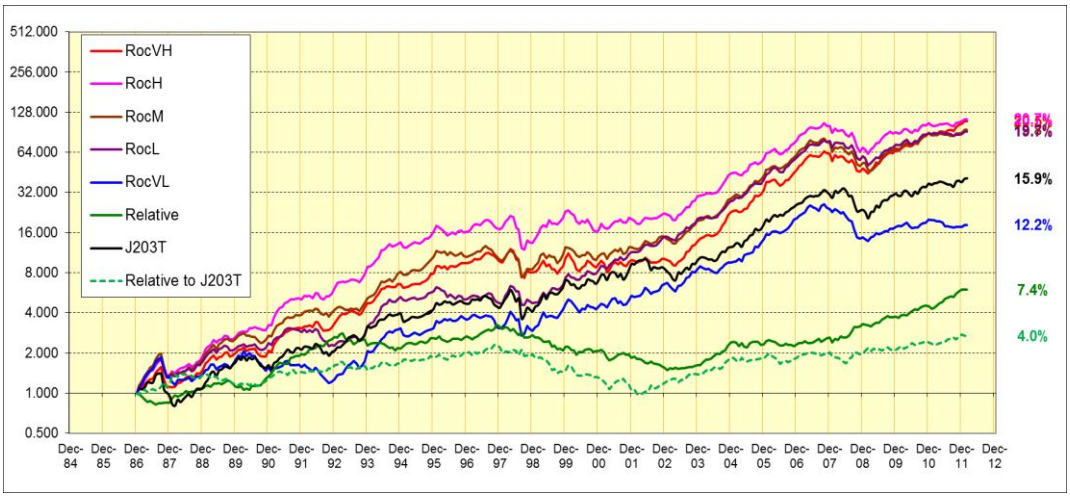

Figure 8: Style – Return on capital

We observe that the lowest ROC portfolio (RocVL) substantially underperforms the others. The second ranked portfolio (RocH) performs best, and there is some evidence that the style appears to work for the first half of the time-series. However, the top four portfolios close at approximately the same level. The price-relatives do show an advantage to companies with high levels of ROC over the J230T ALSI.

On the basis of these observations we would advise investors to avoid companies in the 5th quintile, very low ROC. Our results show a premium of 7,4% p.a. for the large ROC portfolios over the very low ROC portfolio. Apart from this we find no significant ROC effect.

Although these results do not contradict prior studies, we find that low ROC counters should be avoided. The other portfolios all out-perform the ALSI, but without a further ROC effect being evident.

4.6 Return on Equity (ROE)

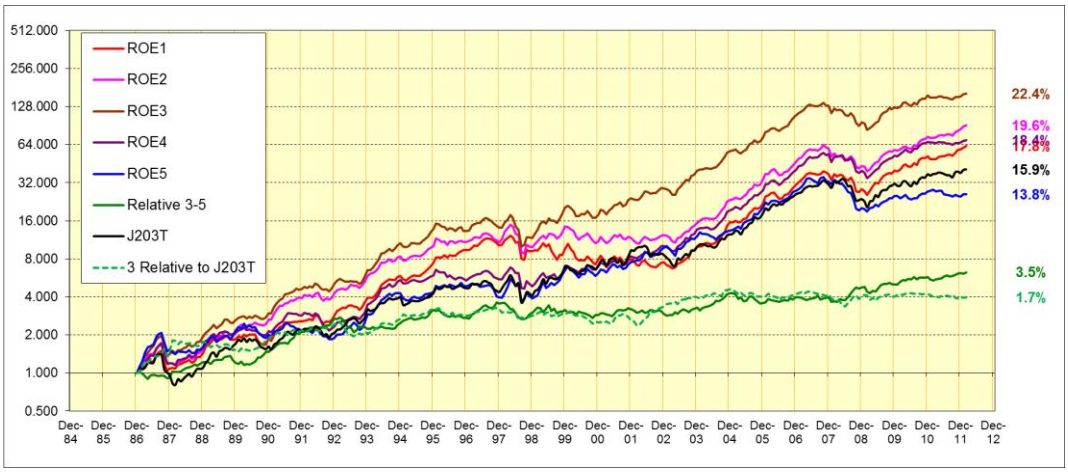

Figure 9: Style – Return on Equity

It can be shown algebraically that the main difference between ROC and ROE is leverage. Consequently we would anticipate the results between these two styles to be similar.

As expected, and as noted above for ROC, we observe that the smallest ROE portfolio (ROE5) substantially underperforms the others, and the J203T index. The highest ROE portfolio (ROE1) also under-performs, but to a lesser extent. The best portfolio is ROE3, which significantly out-performs all the others, with a 22,4% annualised return. The price-relatives also show an appreciable benefit to this style, and would look better if measured against ROE3 and not ROE1.

On the basis of these observations we would advise investors to avoid companies in the 5th quintile – very low ROE and in the 1st quintile – very high ROE. Two possible explanations for the poor performance of the high ROE portfolio are possible. Either these shares are already fully priced by investors, or else (and more likely) the very high levels of ROE in the prior period have peaked and are not sustainable. A strategy which targets companies with ROE in the vicinity of 20% (see Table 1 below) would appear to be beneficial.

4.7 Interest cover (IntCov)

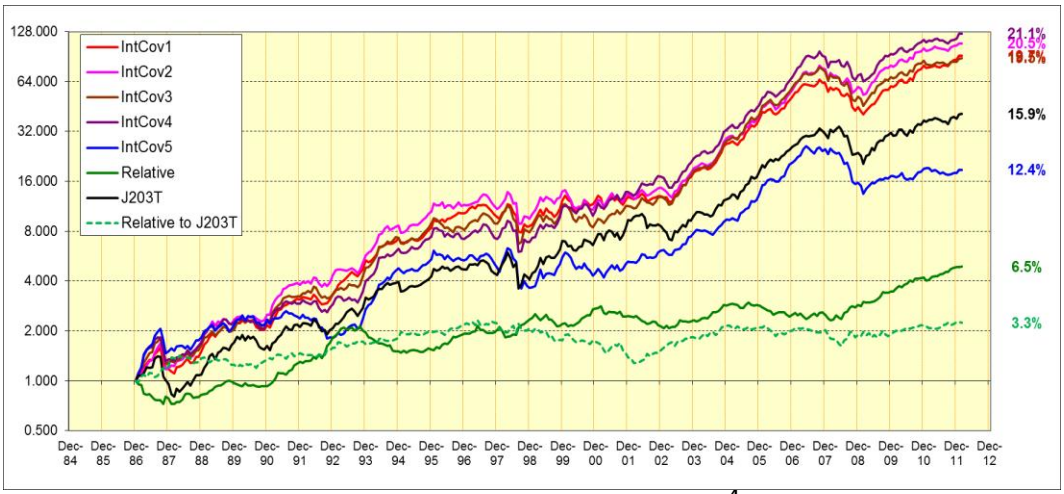

Figure 10: Style – Interest cover[4]

[4] Companies with zero interest paid were excluded.

The theory on capital structure suggests that there is an optimal gearing level for companies and our results support this. The best performing portfolio is portfolio 4 (IntCov4). Very low levels of interest cover (IntCov5) are indicative of over-gearing and financial stress and this is very evident in our result. The price-relative indicates that these companies persistently under-perform and should be avoided.

On the basis of these observations we would conclude that investors should avoid companies with very low levels of interest cover (i.e. below about 3x, see Table 1). Our results show a nominal premium of 5,2% p.a. for the fourth portfolio (IntCov4) over the J203T ALSI. However, most of this out-performance occurs between 1987 and 1994, thereafter there is no sustained evidence of out-performance against the ALSI.

4.8 Net asset growth

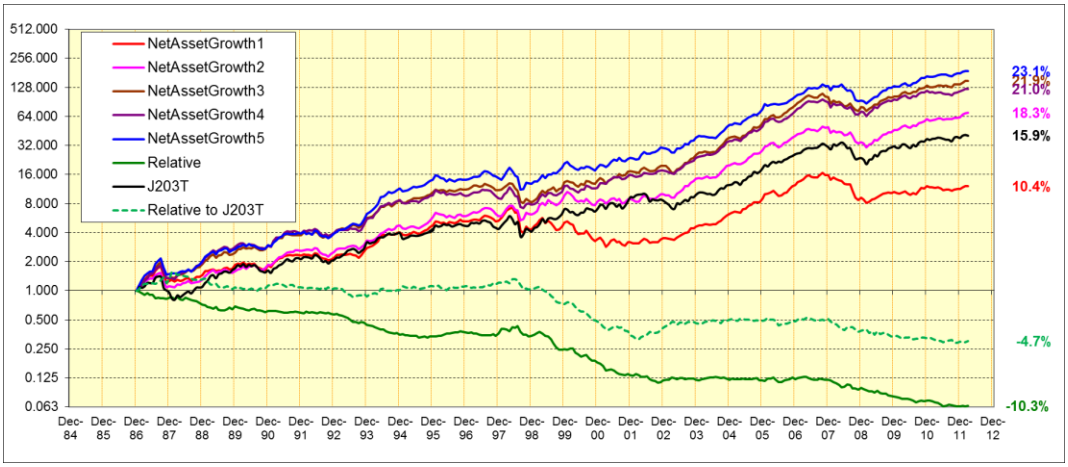

Figure 11: Style – Net asset growth: Measured as (long-term assets – accumulated depreciation)

Although previous researchers have not noted strong evidence of a Net Asset Growth style effect, our results show that this style is effective. We observe that portfolios 3,4 and 5 (the lowest levels of growth in net assets) do the best, clustering around an annualised return of about 22%. Portfolio 1 (highest growth in net assets) is to be avoided, with an annualised return of only 10,4%, well below the J203T index.

It should be noted that this style can only be measured on an annual basis for each company since it is based on balance sheet data. As noted earlier, we lag the style data by 3 months to ensure no look-ahead bias.

We observe that solid green price relative (portfolio 1 versus portfolio 5) shows a fairly consistent downward slope, although there are periods (1995 – 1997 and 2003 – 2007) where the price relative is horizontal and no style effect is evident.

4.9 Price to book (P/B)

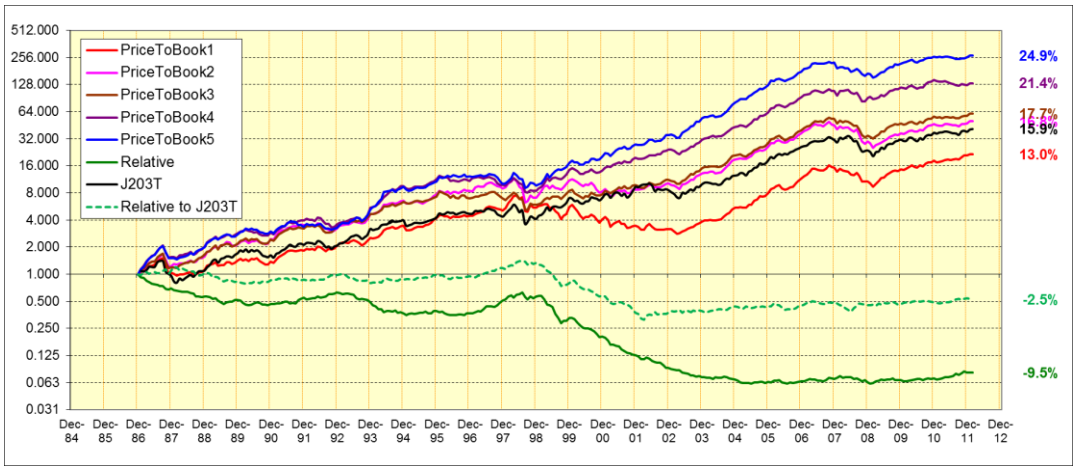

Figure 12: Style – Price to book ratio

Most of the literature finds P/B to be a significant style, and our results support this. We observe that low price to book ratios outperform on average.

The price-relatives support this observation, but show evidence that this style is not persistent. The style clearly worked particularly well over the period 1999 – 2004, but since 2004 there is very little evidence that the style continues to add value.

On the basis of these observations we would conclude that low price to book ratios may at times have been advantageous, but, if they still exist, require timing skill. Our results show a nominal premium of 9% p.a. for the low P/B portfolio over the J203T ALSI.

4.10 Dividend yield

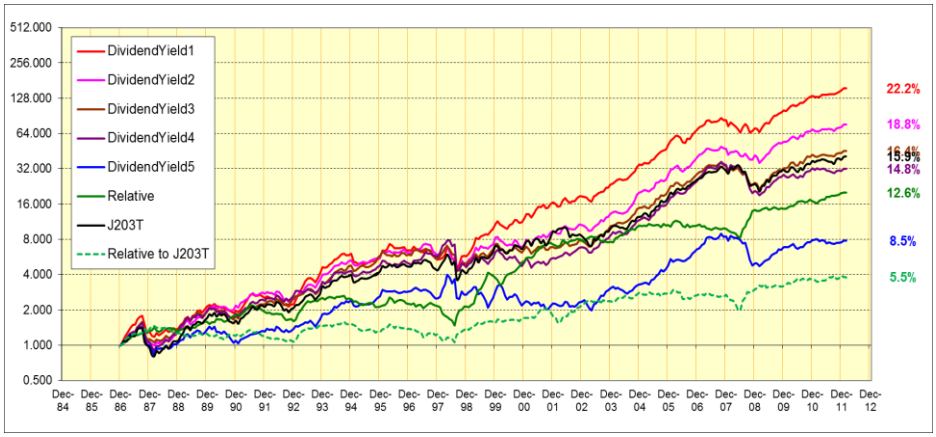

Figure 13: Style – Dividend yield

There is good support in the literature that investors like dividends and our results support this. Given the necessity of good earnings to pay dividends, we expect these results to be similar to those of the earnings yield style above.

We observe a significant spread between the best and worst portfolios. We note that the ranking between the quintiles is in the expected order throughout the time-series. Finally we observe that trend in the two green price-relatives is (mostly) consistently upwards.

On the basis of these observations we would support the findings of other researchers that a dividend yield style does exist. Our results show a substantial premium of 12,6% p.a. for the large dividend yield portfolio over the small dividend yield portfolio.

4.11 Cash-flow to price

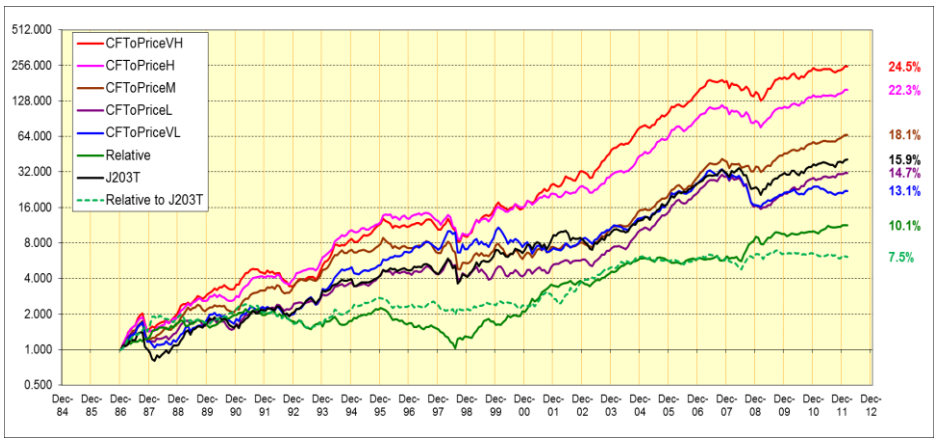

Figure 14: Style – Cash-flow to price

Whilst there are good economic reasons to prefer cash-flow to earnings as a measure of performance, we would however, expect these results to be similar to those of the earnings yield style above.

As before, we observe a significant spread between the best and worst portfolios. We note that the ranking between the quintiles is (mostly) in the expected order throughout the time-series although the two lowest portfolios (CFToPriceL and CFToPriceVL) perform equally poorly. Finally we observe that the trend in the two green price-relatives is (mostly) consistently upwards.

On the basis of these observations we would support a cash-flow to price style effect. Our results show a substantial premium of 10,1% p.a. for the high cash-flow to price portfolio over the J203T ALSI.

4.12 Liquidity: Value traded as a percentage of market capitalisation

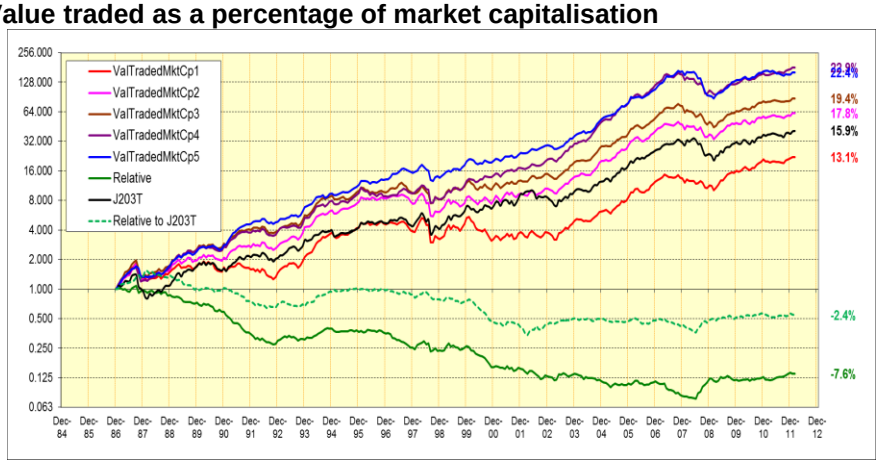

Figure 15: Style – Value traded as a percentage of market capitalisation (Liquidity)

The literature generally supports the idea that there is an "illiquidity" premium. Our results show this to be the case.

As before, we observe a significant spread between the best and worst portfolios, with the two least liquid portfolios showing the highest returns. We note that the ranking between the quintiles is (mostly) in the expected order throughout the time-series. Finally we observe that the trend in the two green price-relatives is (mostly) downwards for the initial part of the time-series but generally flat for most of the last nine years. This would indicate that the illiquidity premium no longer exists. We speculate that this is a consequence of lower transaction costs and electronic trading.

Our results show a nominal premium of 9,8% p.a. for the two lowest liquidity portfolios over the highest liquidity portfolio.

4.13 Momentum

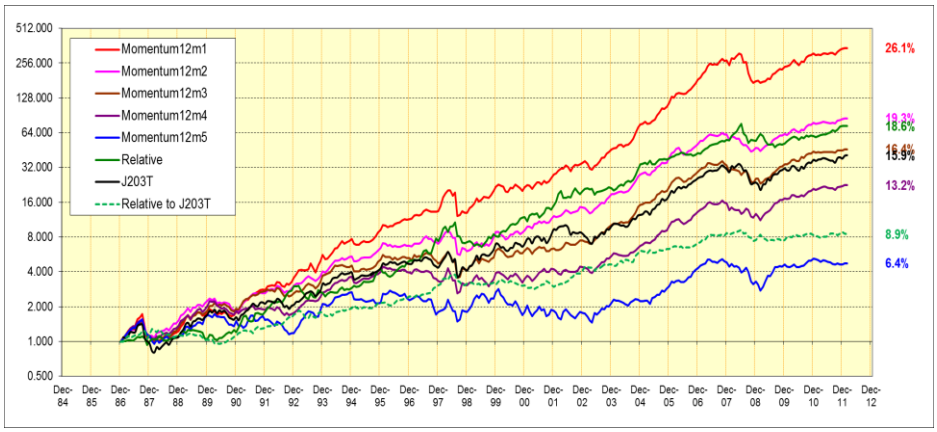

Figure 16: Style – Momentum 12 months

In our style engine we hold the portfolio review period (i.e. the holding period) constant at 3 months (quarterly). There is evidence that momentum strategies work best over even shorter holding periods (Muller, 1999), but we did not examine changes in the holding period in this study.

Although we do not show all the results, we did examine 1, 3, 6, 9, 12, 15 and 18 month momentum formation periods. We found the results of using different formation periods fitted a curve, with the optimal formation period for measuring momentum being 12 prior months. This is the result we report.
As seen in Figure 16, momentum proved to be the best of all the styles we examine. Not only is there a substantial spread between the best and worst portfolios, but the portfolios are aligned in the expected order, and the trend of the price-relatives is consistently upwards. Although there is some evidence that for the last five years the price-relative against the J203T is flat, there is still a relative gain for portfolio 1 over portfolio 5.

On the basis of these observations, we find a momentum style with a formation period of 12 months and a holding period of 3 months to be the best performing strategy. Our results show a substantial premium of 18,6% p.a. for the high momentum portfolio over the lowest momentum portfolio.

4.14 Combination

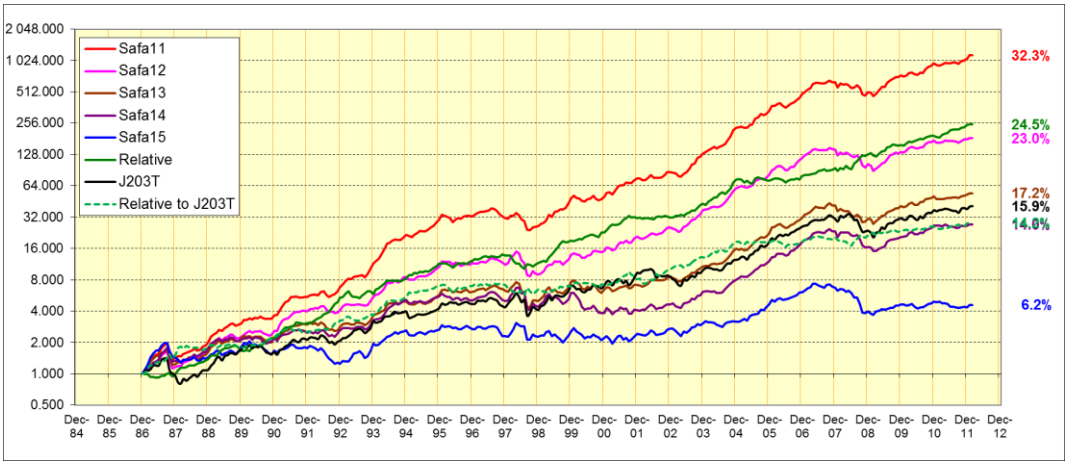

Figure 17: Style – Combined style strategy

As discussed above, we used a manual trial and error approach to choose the constituent characteristics of a combination style. We started with the Momentum 12 month style, on the grounds that this produced the highest univariate annualised return over the time-series. We tested combinations of the remaining styles and found that a combination style of momentum, return on capital, cash-flow to price and earnings yield gave the best result (see above). To obtain a combination style score, we ranked each company in the sample on each of the univariate styles above, and then used the average score. We ranked the average score and formed the quintiles shown above.

As can be seen in Figure 17, the portfolio with the highest rank (SAFA11) achieved an annualised return of 32,3% over the period. The portfolios are all ordered as expected, with the lowest two showing underperformance against the J203T ALSI.

The price-relatives both show a persistent upwards trend.

4.15 Summary of the results

Table 1: Summary of the style characteristics and excess returns (best portfolios are in bold)

	Median Style Characteristic						
Style	Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	Excess return Highest vs Lowest	Excess return Highest vs J203T
Combination	N/A	N/A	N/A	N/A	N/A	**24,5%**	**14,2%**
Momentum (12 month return)	**76,6%**	34,2%	14,1%	-2,7%	-23,7%	18,6%	8,9%
EamingsYield	**12,8%**	8,7%	7,0%	5,1%	1,3%	13,4%	5,8%
DividendYield	**6,1%**	3,9%	2,8%	1,5%	0,0%	12,6%	5,5%
NetAssetGrowth	67,7%	25,0%	12,4%	3,7%	**-7,2%**	-10,3%	-4,7%
CashFlowToPrice	**42,7%**	24,2%	16,8%	11,1%	1,2%	10,1%	7,5%
PriceToBook	6,3	2,7	1,8	1,1	**0,6**	-9,5%	-2,5%
ValueTraded%MarketCap	31,8%	18,6%	11,4%	**7,4%**	**2,8%**	-7,6%	-2,4%
RetumOnCapital	45,6%	27,1%	**19,7%**	12,5%	3,8%	7,4%	4,0%
InterestCover (Times)	54,6	12,2	6,4	**3,7**	1,5	6,5%	3,3%
RetumOnEquity	65,2%	27,0%	**19,3%**	13,3%	4,2%	3,5%	1,7%
MarketCapitalisation (R bn)	11 231	2 965	1 072	428	165	0,0%	N/A

Table 1 summarises the median style characteristics for each portfolio across all 27 years. Since the Combination style is an average ranking across four other styles we cannot report medians. It shows that the "ideal" portfolio has the following (median) characteristics (in descending order of importance): 12 month momentum = 77%; E/Y = 13%; D/Y = 6%; NetAssetGrowth = -7%, CashFlowToPrice = 43%, P/B = 0,6, ValueTraded%MarketCap = 5%, ReturnOnCapital = 20%, InterestCover = 4x and ROE = 20%.

The optimal interest cover was portfolio 4 (see Figure 10) with a median interest cover of only 3,7 times. Levels of interest cover lower than this are to be avoided. Similarly, for earnings yield, dividend yield, return on capital and return on equity, levels below those shown for portfolio 4 in each style category should be avoided.

The excess annualised return over the J203T ALSI was 8,9% for the 12 month momentum style. This is a substantial excess return. The combination style increases the excess return to 14,2%pa – which is very attractive!

5. CONCLUSIONS

Using an improved data set, and a graphical time-series approach we examine several styles on the JSE over a 27 year period. In contrast to prior research, we exclude very small shares (with a market capitalisation rank greater than 160) from our study, on the grounds that the top 160 shares represent 99% of the market capitalisation on the JSE, and are therefore of interest to institutional investors.

Significantly, and in contrast to other studies, we find no evidence of a small size effect. In fact, we find some indication that shares with market capitalisation rank greater than 230 under-perform the larger capitalisation shares.

Most significantly, we endorse the findings of other researchers in that momentum is an important style. A momentum style with a 12 month formation period and a 3 month holding period persistently out-performed the ALSI by around 9% per annum.

Although we found strong evidence of other styles, we note that a combination style which included momentum, return on capital, cash-flow to price and earnings yield gave the best overall result, persistently out-performing the ALSI by around 14% p.a. The other styles were effectively subsumed in these.

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