Payoffs To Equity Investment Styles On The JSE Securities Exchange: The Case Of South African Equity Market

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ABSTRACT

Empirical tests of market efficiency reveal anomalies that cannot be explained by the capital asset pricing model (CAPM) of Sharpe (1964) and Lintner (1965). These anomalies are firm-specific and can be applied to form potential alpha-generating investment styles that capture the characteristics of the anomalies. We estimate and examine the consistency of the payoffs to firm-specific attributes for South African stocks listed on the JSE Securities Exchange (JSE) over the period from 01 January 1997 to 31 December 2007. The firm-specific attributes under examination are extracted from five categories, namely (1) fundamental values relative to share price, (2) solvency and liquidity, (3) fundamental growth, (4) size and return momentum and (5) consensus analyst forecast. Our test results extract significant attributes from all categories with the exception of the solvency and liquidity category. More specifically, we find that firms with 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.

Keywords: Firm-Specific Attributes; Efficient Market Hypothesis; Style Anomalies; Size Effect; Value Effect; Momentum Effect; Style Payoffs

INTRODUCTION

Modern portfolio theory postulates that the only relevant risk in pricing assets is systematic market risk. Firm-specific attributes computed from accounting fundamentals and historical stock prices are deemed to be unsystematic, diversifiable in large portfolios and thus irrelevant in pricing assets. Empirical literature, on the other hand, supports the merits of firm-specific attributes in asset pricing and regards them as capital market anomalies. The value effect, size effect and momentum effect are pursued by asset managers to develop distinctive investment styles from firm-specific attributes. In the South African equity market, Van Rensburg (2001) identifies three major style clusters, namely size, value and momentum for stocks traded on the JSE Securities Exchange (JSE). This paper attempts to explore market anomalies on the JSE by examining the influences of firm-specific attributes in differentiating the cross-section of JSE equity returns over the period from 01 January 1997 to 31 December 2007. We first estimate the factor payoffs to firm-specific attributes using the cross-sectional regression of Fama and Macbeth (1973) from five categories, namely (1) fundamental values relative to share price, (2) solvency and liquidity, (3) fundamental growth, (4) size and return momentum and (5) consensus analyst forecast. The payoff to each attribute under examination is calculated monthly over the examination period. The time-series mean payoffs for the attributes are computed over the entire examination period and two sub-periods, from 01 January 1997 to 31 December 2001 and from 01 January 2002 to 31 December 2007. We investigate the statistical significance and the signs of the mean payoff to the attributes, with the objective of identifying firm-specific attributes that differentiate the cross-section of JSE equity returns in a consistent manner.

LITERATURE REVIEW

Capital Market Anomalies in the U.S. and Developed Economies

The size effect, where firms with small market capitalizations outperform their counterparts (firms with large market capitalizations), are well documented. This effect was initially tested by Banz (1981) who adopts a methodology similar to Fama and Macbeth (1973). Using firm size (as measured by market capitalization), in addition to beta to explain the cross-section of equity returns, the author finds a negative relationship between average stock returns and firm size, after controlling for risk, of common stocks listed on the New York Stock Exchange (NYSE), over the period from 1927 to 1975. Keim (1983), Reinganum (1983) and Blume and Stambaugh (1983), find that the small-firm effect occurs in the month of January and is thus a small-firm-in-January effect. The size effect is further emphasized by Fama and French (1992), who sort stocks according to both size and beta. Results conclude that high-beta stocks do not produce higher returns than low-beta stocks of the same size.

According to the value effect positive abnormal risk-adjusted returns accrue to portfolios of stocks possessing high ratios of fundamental values relative to their share prices, for example, high dividend-to-price (D/P or dividend yield), high book-to-market (B/M), high cash flow-to-price (C/P), to name a few. Thus, by examining the ratio of a stock's price (market value) relative to its fundamental value (and vice versa), stocks can be classified as either value stocks or growth stocks. For example, firms possessing low B/M, low C/P, low earnings yield and low dividend yield are classified as growth stocks, while those possessing high B/M, high C/P, high dividend yield and high earnings yield, are classified as value stocks. Early tests on the value effect by Basu (1977, 1983) finds that companies with high earnings-to-price ratio (or low price-to-earnings (P/E) ratio) earn positive abnormal returns on the New York Stock Exchange (NYSE).

Further evidence of a value effect is reported by Litzenberger and Ramaswamy (1979) who document a positive relationship between dividend yield and common stock returns over the period from 1936 to 1977; Bhandari (1988) who documents a positive relationship between leverage and average returns; Statman (1980) and Rosenberg, Reid and Lanstein (1995) report a positive relation between B/M and average returns. Fama and French (1992) combine the following attributes, namely, market beta, size, leverage, book-to-market equity and earnings yield in the cross-section of average returns on the NYSE, American Stock Exchange (AMEX) and the over-the-counter NASDAQ stocks over the period from 1963 to 1990. Stocks are sorted and ranked according to each respective attribute and portfolios formed. Portfolios range from extreme value-oriented to extreme growth-oriented. The results reveal that beta does not explain the cross-section of average returns, the central prediction of the Sharpe-Lintner model. Size and B/M have the strongest relation to average returns, with a stronger role being afforded to B/M. The explanatory power of the other attributes disappears when size and B/M are included in the regression. Fama and French (1992, 1993) conclude that size (as measured by market capitalization) and value (as measured by B/M) actually represent risk factors missing from the CAPM.

Lakonishok, Shleifer and Vishny (1994) examine the value effect using stocks listed on the NYSE and the AMEX over the period 1963 to 1990. Stocks are classified into portfolios 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. The results reveal evidence of a value premium where value stocks outperform growth stocks 5 years after formation. Using the same anomalies suggested by Lakonishok, Shleifer and Vishny (1994), Fama and French (1996) find that when using portfolios based on these variables in their three-factor model, no estimates of abnormal performance that are reliably different from zero is evident.

Evidence of the value anomaly is also found in other developed economies. Fama and French (1998) examine data for the period from 1975 to 1995 for stocks listed on NYSE, AMEX, NASDAQ and EAFE (Europe, Australia and Far East). They form portfolios based on B/M, C/P, earnings yield and dividend yield. The results reveal that value stocks earn higher risk-adjusted returns than growth stocks over the examination period. A value premium is reported with B/M being the most consistent value proxy. Apart from Italy, high B/M stocks outperform low B/M stocks in 12 out of 13 markets. Portfolios based on C/P, earnings yield and dividend yield produce similar value premia. Evidence of a value premium in emerging economies is also cited by the authors.

The final anomaly tested is the momentum effect when past stock returns are used as a firm-specific attribute in the cross-section of equity returns. Evidence of a momentum effect is found by Jegadeesh and Titman (1993, 2001), where recent prior winner returns (that is, 1-year or less portfolio return) outperform recent prior loser returns. The authors examine the returns to buying past winners portfolios and selling past loser portfolios on the NYSE and the AMEX for the period from 1965 to 1989 based on 3- to 12-month prior return momentums. Significant abnormal returns are found for the relative strength strategies in the first year following formation. However, these abnormal returns dissipate in the next two years after formation. Evidence also indicates that the relative strength strategy profitability is not due to its systematic risk. These results are confirmed again by Jegadeesh and Titman (2001).

Fama and French (1996), however, conclude that the short-term momentum strategy of Jegadeesh and Titman (1993) cannot be explained by the Fama and French (1993) three-factor model. Carhart (1997), on the other hand, constructs a 4-factor model (extension of Fama and French 3-factor model), by including a factor that captures the possible momentum anomaly in the U.S.

Capital Market Anomalies in South Africa and Other Emerging Economies

Early South African tests on efficient market anomalies include research conducted by De Villiers, Lowlings, Petit and Affleck-Graves (1986), Bradfield, Barr and Affleck-Graves (1988), Bradfield (1990), Page and Palmer (1991) and Page (1996). Van Rensburg (2001) is one of the first publications to document tests on the identification of style-based effects in South Africa by examining a multitude of candidate style attributes on the JSE. Van Rensburg (2001) examines 23 candidate style attributes using shares listed on the industrial sector of the JSE over the period from 1983 to 1999. Style attributes are categorized into one of the following groups: (1) value, (2) future earnings and growth and (3) irrationality/neglect. By adopting a 'portfolio-based' approach, factor mimicking portfolios are formed with their risk premia assumed to be the spread between the risk premium of the fractile with high attribute and the risk premium on the fractile with low attribute value. Two risk factors identified in this research include a value risk premium and a small-firm risk premium. Anomalies associated with the following nine attributes are identified: (i) earnings yield, (ii) past twelve month returns, (iii) market capitalization, (iv) dividend yield, (v) six month's past returns, (vi) leverage, (vii) cash flow-to-debt, (viii) turnover and (ix) three month's past returns. In a follow-up study, Van Rensburg and Robertson (2003a) adopt the 'characteristic-based' approach of Daniel and Titman (1997) on the JSE over the period from 1990 to 2000. Using cross-sectional regression, share returns are regressed on the values of 24 style attributes. In a univariate test, the time-series factor payoff to each style attribute is estimated. The univariate results provide evidence of a value effect and size effect where the following attributes, namely, price-to-NAV, dividend yield, price-to-earnings, cash flow-to-price, price-to-profit and market capitalization are extracted. Van Rensburg and Robertson (2003b) adopt the methodology of Fama and French (1992) on the JSE. The results reveal that low P/E shares, whilst earning higher returns, also have lower betas. Contrary to international evidence, which find small firms to actually be riskier investments, in this study small capitalization shares are found to earn higher returns, while possessing lower betas. The results are also consistent with the evidence of Fraser and Page (2000) and Van Rensburg and Robertson (2003a) in that the size and value effects are found to operate independently of each other on the JSE.

With regard to emerging market studies, Claessens, Dasgupta and Glen (1998) examine the cross-section of stock returns for 19 emerging economies by examining the effect of several explanatory variables, in addition to beta, on asset returns over the period 1986 to 1993. The results reveal that, in addition to beta, size and trading volume are found to have significant explanatory power in some economies. Earnings-to-price ratio and dividend yield are also found to have explanatory power in fewer economies. Exchange rate risk also has significant explanatory power. The authors conclude that while size, price-to-book ratio and dividend yield have explanatory power, the signs of the coefficients are not consistent with those of developed economies. This is most pronounced for size. Rouwenhorst (1999) examines the sources of return variation in 20 emerging markets over the period 1982 to 1997. The authors find evidence that emerging market return factors are qualitatively similar to return factors in developed economies. Averaging across all emerging economies, results indicate evidence of a value effect, momentum effect and a size effect. This is consistent with the findings of Fama and French (1998) but inconsistent with the findings of Claessens, Dasgupta and Glen (1998). Serra (2003) examines the role of a set of *a priori* specified factors in order to determine the commonality in the cross-section of returns across emerging economies

(including South Africa). The results reveal that the important factors are common across emerging economies and similar to the factors identified in developed economies and that the driving factors in emerging markets are consistent with Fama and French (1998). The six most important attributes in the cross-section of emerging market returns included technical factors (12-week lagged holding period returns), firm characteristics (earnings-price, book-to-market, dividend yield) and liquidity factors (size and price per share). Results do not reveal evidence of a size effect.

DATA AND SAMPLE SELECTION

The examination period for the research is from 01 January 1997 to 31 December 2007 (a total of 132 months). As of 31 March 2009, 159 shares comprising the FTSE/JSE All Share Index are selected as the sample stocks for this research. The monthly data of the closing stock prices, indexes and firm-specific attributes are downloaded from DataStream International. Firm-specific attributes are divided into five categories, namely, (1) fundamental values relative to share price, (2) solvency and liquidity, (3) fundamental growth, (4) size and return momentum and (5) consensus analyst forecast. Attributes in the fundamental values relative to share price category distinguish value stocks from growth (glamour) stocks. Value stocks have small fundamental values per share relative to their share prices compared to growth stocks. Solvency and liquidity ratios serve as indications for the companies' financial positions. Attributes in the fundamental growth category are historical growth rates in cash, earnings, profit margins, dividends and sales for the companies. Return momentum measures the growth rate in the total return index of the sample shares. The natural logarithm of share price and market capitalization are indications of the current market values of sample shares. Style attributes in the size and return momentum category are price-sensitive attributes. Attributes in the consensus analyst forecast category incorporates analyst forecasts regarding future earnings and dividends. The descriptors of the candidate style attributes as well as their computations are demonstrated in Table 1.

In order to ensure that the sample shares have sufficient liquidity, a turnover ratio is computed by dividing the average number of shares traded daily for a particular month by the total number of outstanding shares on the first day of the month. Shares with equal to or less than a turnover ratio of 0.01% are excluded for that month to ensure that each sample share is traded at least once in any particular month. In addition, companies that exhibit major corporate restructuring, mergers and acquisitions or share splits are excluded as of the date of the above mentioned corporate event. The database is subject to survivorship bias since only shares listed on the JSE as at 31 March 2009 are considered in the initial sample. This bias is partially addressed through the retention of liquid shares in the research sample, which are generally more established firms that are less likely to be non-survivors. Attributes to be examined are winsorized by setting the maximum and minimum monthly values of each attribute to 99.5^{th} and 0.5^{th} percentiles respectively to remove the extreme outliers in each month. Once the monthly style attributes are free of outliers, the monthly cross-sectional mean of each style attribute is subtracted from the cross-sectional distribution of each style attribute. The cross-sectional distribution of each style attribute is subsequently divided by its respective cross-sectional standard deviation. Repeating this procedure monthly enables the monthly distribution of each style variable to be normally distributed over the examination period. Standardizing style attributes allows for comparison to be made amongst style factor payoffs estimated in the cross-sectional regressions. Due to the fact that data are recorded directly from the published financial statement information downloaded from DataStream International with the attributes lagging the corresponding share returns in the regression analysis, the database is not subject to look-ahead bias.

Table 1: Computation of Firm-Specific Style Attributes

	No.	Descriptor	Style Attribute		Computation
(I)	**FUNDAMENTAL VALUES RELATIVE TO SHARE PRICE**				
	1.	BVTP	Book value-to-price	=	Book Value of Equity / Share Price
	2.	CFTP	Cash flow-to-price	=	Cash Earnings per Share / Share Price
	3.	DY	Trailing dividend yield	=	Ordinary Shareholders' Dividends per Share / Share Price
	4.	EY	Trailing earnings yield	=	EPS / Share Price
	5.	SALESTP	Sales-to-price	=	Sales per Share / Share Price
(II)	**SOLVENCY AND LIQUIDITY**				
	6.	CFTCURRLIABS	Cash flow-to-current liabilities	=	Net Cash Flow / Current Liabilities
	7.	CFTDEBT	Cash flow-to-debt	=	Net Cash Flow / Total Liabilities
	8.	CURRENTRATIO	Current ratio	=	Current Assets / Current Liabilities
	9.	DEBTTMVE	Debt-to-market value of equity	=	Total Liabilities / Market Value of Equity
	10.	DEBTTBVE	Debt-to-book value of equity	=	Total Liabilities / Book Value of Equity
	11.	ICBT	Interest coverage before tax	=	Profit Before Interest and Tax / Accrued Interest
(III)	**FUNDAMENTAL GROWTH**				
	12.	G12MCPS	12-month cash holdings growth	=	(Current Cash Holdings per Share / Prior 12-Month Cash Holdings per Share) -1
	13.	G12MDPS	12-month dividend growth	=	(Current DPS / Prior 12-Month DPS) – 1
	14.	G12MEPS	12-month earnings growth	=	(Current EPS / Prior 12-Month EPS) – 1
	15.	G12MGPMARGIN	12-month gross profit margin growth	=	(Current Gross Profit Margin / Prior 12-Month Gross Profit Margin) – 1
	16.	G12MNPMARGIN	12-month net profit margin growth	=	(Current Net Profit Margin / Prior 12-Month Net Profit Margin) – 1
	17.	G12MSALES	12-month sales growth	=	(Current Sales / Prior 12-Month Sales) – 1
	18.	G24MEPS	24-month earnings growth	=	(Current EPS / Prior 24-Month Earnings per Share) – 1
	19.	GROWTH	Dividend growth rate	=	Return on Equity * (1 – Dividend Payout Ratio)
(IV)	**SIZE AND RETURN MOMENTUM**				
	20.	LAGLPRICE	Lagged log of market price	=	Ln (Prior 1-Month Share Price)
	21.	LPRICE	Log of market price	=	Ln (Current Share Price)
	22.	LSIZE	Log of market capitalization	=	Ln (Market Capitalization)
	23.	MOM1	1-month return	=	(Current Return Index /Prior 1-Month Return Index) – 1
	24.	MOM12	12-month return	=	(Current Return Index /Prior 12-Month Return Index) – 1
	25.	MOM12-1	Lagged 11-month return	=	(Prior 1-Month Return Index / Prior 12-Month Return Index) – 1
	26.	MOM24	24-month return	=	(Current Return Index /Prior 24-Month Return Index) – 1
	27.	MOM3	3-month return	=	(Current Return Index / Prior 3-Month Return Index) – 1
	28.	MOM6	6-month return	=	(Current Return Index / Prior 6-Month Return Index) – 1
(V)	**CONSENSUS ANALYST FORECAST**				
	29.	EARNREV	Earnings forecast revision	=	(Consensus Next EPS Forecast / Consensus Previous EPS Forecast) – 1
	30.	EG1	1-year forward earnings growth	=	(Consensus Next EPS Forecast / Current EPS) – 1
	31.	FOREY1	1-year forward earnings yield	=	Consensus EPS Forecast 1-year Forward
	32.	FOREY2	2-year forward earnings yield	=	Consensus EPS Forecast 2-year Forward

RESEARCH METHODOLOGY

The factor model of Fama and Macbeth (1973) is employed to estimate the payoff to each attribute monthly as shown in Equation 1.

$$R_{i,t+1} = a_{t+1} + b_{t+1} \times F_{i,t} + e_{i,t+1} \quad (1)$$

Where:

$R_{i,t+1}$ = the realized return on share i for month $t+1$;
b_{t+1} = the estimated cross-sectional payoff to the attribute; and
$F_{i,t}$ = the lagged standardized value of the attribute.

Once the payoffs to the attributes for all the months in the examination period are estimated, the *t*-statistics for the time-series mean payoffs to each attribute for the sub-periods and the entire examination period are computed to determine the statistical significance of the payoffs. In assessing the consistency of the attributes, a binomial sign test, Wilcoxon signed ranks test and Van der Waerden (normal scores) test is employed. The binomial sign test assumes that the sample proportion above and below the median of a binomial distribution should be exactly 50 percent. Consequently, the null hypothesis of the binomial sign test is that the median of the factor payoff to a given style attribute is equal to zero. With regard to the Wilcoxon signed ranks test, the absolute value of the distance of each observation from the mean is calculated and subsequently ranked. Once the observations are ranked, the sum of the ranks of the positive observations is compared to that of the negative observations to determine the direction consistency for the attribute payoffs. The Van der Waerden test, derived from Wilcoxon signed ranks test, is based on smoothed ranks by converting ranks into quantiles of the normal distribution. Since these tests are tests that are based on the median of the distribution, the median of each style factor payoff being tested is set to zero. Thus, if the null hypothesis is rejected for a given style attribute, it is statistically more likely for the style attribute to receive either a consistent positive or negative payoff.

RESULTS

The characteristics of the attribute payoffs are demonstrated in Appendix A. Both the Student's *t*-test on the attribute mean payoffs and the sign tests on the median of the attribute payoffs are set at 5 percent significance level. Significant *t*-statistics are highlighted in bold. Examining Appendix A.1 through Appendix A.5 reveals that 10 (out of 32) attributes exhibit significant *t*-statistics for their mean payoffs over the first sub-period. Out of these 10 attributes, 3 attributes are from the fundamental values relative to share price category, 6 attributes are from the size and return momentum category, and the remaining attribute is from the consensus analyst forecast category. The explanatory power of the attributes improves drastically in the second sub-period. During this period, 20 attributes significantly explain the cross-sectional equity returns on the JSE. Out of these 20 attributes, 4 attributes are from the fundamental values relative to share price category, 1 attribute is from the solvency and liquidity category, 5 attributes are from the fundamental growth category, 7 attributes are from the size and return momentum category, and 3 attributes are from the consensus analyst forecast category. Although the majority (5 out of 8) of the style attributes in the fundamental growth category have significant mean factor payoffs over the second sub-period, none of the attributes from this category appears to be significant in the first sub-period.

Over the entire examination period from 01 January 1997 to 31 December 2007, all attributes from the fundamental values relative to share price category, 3 attributes from the fundamental growth category, 1 attribute from the solvency and liquidity category, 7 attributes from the size and return momentum category and all attributes from the consensus analyst forecast category demonstrate their abilities to explain the cross-sectional equity returns. An important observation is that all attributes from the liquidity and solvency category, with the exception of DEBTTBVE, are not able to explain the cross-sectional equity returns over both sub-periods as well as the overall examination period. Examining the results of the median tests on the factor payoffs of the style attributes reveals that most of the significant attributes are associated with significant signs. The detailed discussion of payoffs in each category is discussed below.

I. Fundamental Values Relative to Share Price

Examining the *t*-statistics of the mean payoffs to the attributes in Appendix A.1 indicates that all attributes in this category (BVTP, CFTP, DY, EY and SALESTP) have significant mean payoffs over the examination period. In addition, all attributes in this category possess significant positive signs for their payoffs. This means that firms with relatively high fundamental values to their share prices (that is, the value firms) are temporarily undervalued, and the market will correct shortly and reward these firms with higher payoffs. The payoffs to the value firms are well documented in both local and international studies. Overall, the attributes in this category exhibit significant, consistent, positive payoffs over both sub-periods as well as the entire examination period. BVTP and CFTP, amongst other attributes, receive the most positive and consistent payoffs over the examination periods.

II. Solvency and Liquidity

The majority of the attributes have failed to explain the cross-sectional returns on the JSE over the examination periods (refer to Appendix A.2). DEBTTBVE, amongst other 5 attributes, is the only attribute that exhibits significant payoffs in the examination period. The significant negative payoffs to DEBTTBVE over the second sub-period and the overall examination period reveals that high leveraged firms with substantial financial risk do not impress investors, and are penalized with lower payoffs in the subsequent period.

III. Fundamental Growth

Although none of the attributes in the fundamental growth category are significant in explaining the cross-sectional equity returns over the first sub-period, 5 out of the 8 attributes in this category (G12MDPS, G12MEPS, G12MNPMARGIN, G24MEPS and GROWTH) exhibit significant payoffs over the second sub-period (refer to Appendix A.3). Although only G12MDPS and G12MEPS pass all four sign tests in the overall period, the payoffs to the attributes (with the exception of GROWTH) in this category are positive over the second sub-period and the entire examination period. This provides some degree of evidence that firms with steady growth in fundamental values are rewarded positively.

IV. Size and Return Momentum

Appendix A.4 shows that attributes in this category exhibit significant payoffs over both sub-periods with the exception of MOM3. The payoffs to the three size attributes (LAGLPRICE, LPRICE and LSIZE) are significant and consistently negative over the examination periods. This observation is consistent with the well-documented small-firm effect in both local and international research. On the other hand, the mean reversal of MOM1 observed in Van Rensburg and Robertson (2003a) is only found in the first sub-period. The fact that significant positive signs for MOM12, MOM12-1, MOM24 and MOM6 are detected is an indication of their non-exhaustive momentum. Subtracting the most recent 1-month momentum from MOM12, MOM12-1 appears to be the most rewarding short-term momentum attribute.

V. Consensus Analyst Forecast

The data for the attributes in this category is only available from 1999. The characteristics of the payoffs to the attributes displayed in Appendix A.5 show that all four analyst forecasts (EARNREV, EG1, FOREY1 and FOREY2) are rewarded with significant payoffs. This implies that either the analysts have superior abilities in forecasting earnings, or investors, to some degree, follow the recommendations of the analysts.

CONCLUSION

The examination of the characteristics of the payoffs to the pre-specified attributes show that attributes in the fundamental values relative to share price category, the fundamental growth, the size and momentum category and the consensus analyst forecast category are able to explain the cross-sectional JSE equity returns in their individual capacities. Attributes with significant mean payoffs, in general, are associated with consistent signs for their payoffs. The consistent signs of the attribute payoffs provides indication as to whether the payoffs are fairly priced as theoretically expected, or mispriced. When the signs of the payoffs to the attributes are not in line with their theoretical expectation, the apparent market anomalies are documented and the market corrections/reversals have taken place. Important market anomalies found in this paper include the value effect, the size effect, and the short-term momentum effect. In addition, there seems to be a mild reversal of one-month momentum in the first sub-period. Firms that have relatively high fundamental values relative to their share prices are deemed undervalued and are rewarded positively. Amongst all attributes in the fundamental values relatively to share price category, BVTP and CFTP are the attributes that exhibit the highest and the second highest payoffs over the examination periods.

Another way of assessing the style consistency of the candidate style attributes is to determine whether the magnitudes and the directions of the payoffs are consistent over time. This could be achieved by observing the cumulative attribute payoffs over time. We recommend this area for further research.

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APPENDIX A: Characteristics of Factor Payoffs to Style Attributes

A.1 Fundamental Values Relative to Share Price

	BVTP	CFTP	DY	EY	SALESTP
SUB-PERIOD 1					
Factor Payoffs (97m01 to 01m12):	0.014	0.013	0.005	0.002	0.006
Mean Tests:					
t-statistic:	***3.669***	***3.935***	1.847	0.771	***2.298***
Rank:	2	1	13	24	8
SUB-PERIOD 2					
Factor Payoffs (02m01 to 07m12):	0.010	0.005	0.002	0.005	0.003
Mean Tests:					
t-statistic:	***4.007***	***3.015***	1.314	***3.408***	***3.051***
Rank:	6	13	26	9	11
WHOLE PERIOD					
Factor Payoffs (97m01 to 07m12):	0.012	0.009	0.004	0.003	0.004
Mean Tests:					
t-statistic:	***5.284***	***4.803***	***2.248***	***2.267***	***3.286***
Rank:	2	4	19	18	10
Median Tests:					
Sign (exact binomial):	***90.000***	***85.000***	***79.000***	76.000	***83.000***
Sign (normal approximation):	***4.187***	***3.831***	***2.762***	2.227	***3.474***
Wilcoxon signed rank:	***5.059***	***4.672***	***2.693***	***3.036***	***3.801***
Van der Waerden (normal scores):	***5.110***	***4.705***	***2.463***	***2.735***	***3.613***
No. of Observations > 0:	90	88	82	79	86
No. of Observations < 0:	42	44	50	53	46

A.2 Solvency and Liquidity

	CFTCURRLIABS	CFTDEBT	CURRENTRATIO	DEBTTBVE	DEBTTMVE	ICBT
SUB-PERIOD 1						
Factor Payoffs (97m01 to 01m12):	0.000	-0.001	0.002	-0.002	0.003	-0.001
Mean Tests:						
t-statistic:	0.029	-0.342	0.572	-0.857	1.127	-0.330
Rank:	38	33	28	22	19	34
SUB-PERIOD 2						
Factor Payoffs (02m01 to 07m12):	-0.002	0.001	0.001	-0.004	-0.001	0.001
Mean Tests:						
t-statistic:	-0.983	0.588	0.803	***-3.777***	-1.126	0.937
Rank:	29	34	32	7	28	30
WHOLE PERIOD						
Factor Payoffs (97m01 to 07m12):	-0.001	0.000	0.002	-0.003	0.001	0.000
Mean Tests:						
t-statistic:	-0.476	-0.112	0.830	***-2.681***	0.393	0.130
Rank:	30	36	26	14	31	35
Median Tests:						
Sign (exact binomial):	69.000	68.000	69.000	***81.000***	67.000	69.000
Sign (normal approximation):	0.445	0.267	0.445	***2.584***	0.089	0.445
Wilcoxon signed rank:	0.657	1.023	0.270	***3.063***	0.071	0.438
Van der Waerden (normal scores):	0.249	0.736	0.400	***-3.027***	0.297	0.402
No. of Observations > 0:	69	68	69	51	65	69
No. of Observations < 0:	63	64	63	81	67	63

A.3 Fundamental Growth

	G12MCPS	G12MDPS	G12MEPS	G12MGPMARGIN	G12MNPMARGIN	G12MSALES	G24MEPS	GROWTH
SUB-PERIOD 1								
Factor Payoffs (97m01 to 01m12):	0.002	0.004	0.003	0.001	0.003	0.002	-0.001	-0.002
Mean Tests:								
t-statistic:	0.767	1.709	1.136	0.399	1.269	0.676	-0.194	-0.802
Rank:	25	14	18	31	15	26	36	23
SUB-PERIOD 2								
Factor Payoffs (02m01 to 07m12):	0.002	0.004	0.005	0.000	0.004	0.002	0.004	0.002
Mean Tests:								
t-statistic:	1.256	***3.033***	***3.146***	0.314	***2.688***	1.547	***2.811***	***2.025***
Rank:	27	12	10	35	17	23	16	20
WHOLE PERIOD								
Factor Payoffs (97m01 to 07m12):	0.002	0.004	0.004	0.001	0.003	0.002	0.002	0.000
Mean Tests:								
t-statistic:	1.325	***3.005***	***2.645***	0.508	***2.543***	1.332	1.133	0.195
Rank:	23	12	15	29	16	22	25	33
Median Tests:								
Sign (exact binomial):	71.000	***81.000***	***77.000***	65.000	74.000	68.000	79.000	71.000
Sign (normal approximation):	0.802	***2.584***	***2.405***	0.267	1.336	0.267	2.227	0.802
Wilcoxon signed rank:	1.083	***3.099***	***2.866***	0.253	2.089	0.903	1.984	0.747
van der Waerden (normal scores):	1.206	***2.941***	***2.630***	0.342	***2.334***	1.172	1.521	0.491
No. of Observations > 0:	71	81	80	64	74	68	79	71
No. of Observations < 0:	61	51	52	68	58	64	53	61

A.4 Size and Return Momentum

	LAGLPRICE	LPRICE	LSIZE	MOM1	MOM12	MOM12-1	MOM24	MOM3	MOM6
SUB-PERIOD 1									
Factor Payoffs (97m01 to 01m12):	-0.008	-0.009	-0.006	-0.007	0.007	0.009	0.006	0.002	0.005
Mean Tests:									
t-statistic:	***-2.800***	***-3.009***	***-2.019***	***-2.061***	***2.454***	***3.242***	1.866	0.661	1.236
Rank:	6	5	11	10	7	3	12	27	16
SUB-PERIOD 2									
Factor Payoffs (02m01 to 07m12):	-0.009	-0.009	-0.010	-0.001	0.006	0.007	0.006	0.001	0.006
Mean Tests:									
t-statistic:	***-5.098***	***-5.075***	***-5.131***	-0.295	***2.824***	***3.417***	***2.891***	0.302	***2.569***
Rank:	2	3	1	37	15	8	14	36	18
WHOLE PERIOD									
Factor Payoffs (97m01 to 07m12):	-0.008	-0.009	-0.008	-0.004	0.007	0.008	0.006	0.001	0.005
Mean Tests:									
t-statistic:	***-5.227***	***-5.365***	***-4.626***	-1.809	***3.702***	***4.681***	***3.206***	0.720	***2.442***
Rank:	3	1	6	21	7	5	11	27	17
Median Tests:									
Sign (exact binomial):	***87.000***	***90.000***	***90.000***	78.000	***86.000***	***91.000***	***84.000***	69.000	74.000
Sign (normal approximation):	***3.653***	***4.187***	***4.187***	2.049	***3.474***	***4.365***	***3.118***	0.445	1.336
Wilcoxon signed rank:	***4.787***	***4.894***	***4.414***	1.607	***3.747***	***4.607***	***3.389***	1.220	***2.496***
van der Waerden (normal scores):	***-4.760***	***-4.821***	***-4.267***	-1.645	***3.630***	***4.468***	***3.232***	1.160	***2.484***
No. of Observations > 0:	45	42	42	54	86	91	84	69	74
No. of Observations < 0:	87	90	90	78	46	41	48	63	58

A.5 Consensus Analyst Forecast

	EARNREV	EG1	FOREY1	FOREY2
SUB-PERIOD 1				
Factor Payoffs (97m01 to 01m12):	0.008	0.001	0.005	0.008
Mean Tests:				
t-statistic:	***2.239***	0.148	1.217	***3.113***
Rank:	9	37	17	4
SUB-PERIOD 2				
Factor Payoffs (02m01 to 07m12):	0.003	0.005	0.006	0.002
Mean Tests:				
t-statistic:	1.958	***4.191***	***4.913***	***2.211***
Rank:	22	5	4	19
WHOLE PERIOD				
Factor Payoffs (97m01 to 07m12):	0.005	0.003	0.006	0.004
Mean Tests:				
t-statistic:	***2.968***	***1.993***	***3.487***	***3.690***
Rank:	13	20	9	8
Median Tests:				
Sign (exact binomial):	57.000	57.000	***64.000***	***64.000***
Sign (normal approximation):	0.985	0.883	***2.255***	***2.255***
Wilcoxon signed rank:	2.045	1.769	***3.420***	***3.325***
van der Waerden (normal scores):	***2.523***	1.870	***3.491***	***3.481***
No. of Observations > 0:	57	57	64	64
No. of Observations < 0:	46	47	40	40

NOTES

