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Equity Investment Styles

Recent evidence on the existence and cyclicality of investment styles

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Executive Summary

Over the past two decades, financial academics and investment professionals have documented several anomalies on the global financial markets. A subset of these anomalies, known as equity style strategies, has been shown to yield substantial excess returns, which cannot be explained by traditional finance theory. However, in the light of the financial turmoil during the 2000s, several studies have shown considerable changes in the magnitude of the style-based strategy premiums. The purpose of this thesis is to investigate whether recent data support the continued existence of these premiums and evaluate how these premiums fluctuate in relation to the economic cycle. Furthermore, this thesis provides practical advice on how investors can apply the findings.

Through reiterative monthly sorting processes on data from the combined Standard and Poor's (S&P) US Broad Market Index (BMI), S&P Europe BMI and S&P Japan BMI indices during the period 1990 to 2013, this thesis measures the performance of eighteen fundamental factors within the *Value*, *Growth*, *Momentum*, *Market Beta*, *Quality* and *Size* style strategies. A thorough analysis of the individual factors confirms the existence of statistically significant value, momentum and quality premiums during the sample period. The data on the remaining factors is found to be largely inconclusive.

Traditional risk-based measures are shown to be unable to explain these anomalies. In response, behavioral arguments, such as the extrapolation- and overreaction hypotheses and institutional biases, are discussed and found to support the results.

By applying purchasing managers' index (PMI) data, the premiums of each factor are measured during each phase of the economic cycle. The results show pronounced cyclicality in the returns of the six strategies as both the level and change in the PMI data is found to affect the premiums. Two methodologies for applying the findings, based on traditional asset allocation and multidimensional factor screenings, are reviewed.

Adjusting for transaction costs eliminates the momentum premium but does not affect the significance of the value and quality spreads. However, the compounded effects of increased transaction costs related to both portfolio maintenance and reallocation between factors are found to reduce the observed premiums substantially in the long run. Transition matrixes also indicate that several fundamental factors remain stable over time.

In conclusion, this thesis supports the continued existence of several style-based investment strategies, thereby proposing considerable benefits to investors by exploiting the systematic mispricing in the market. It is argued that the existence of such premiums is not a question of *if* but rather *why* and *when* the premiums appear.

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1. Introduction

Pioneered by papers by academic economists such as Basu (1977), Fama and French (1992), Lakonishok, Shleifer, Vishny (1994) and several others, research on equity style strategies has confirmed that firms with certain fundamental characteristics, such as low price-to-earnings or low market capitalization, systematically outperform the market. The results of such studies have spurred increased interest from practitioners as equity style management is found to be as important as asset allocation in determining the return of equity portfolios,[1] and in addition it provides a valuable tool for enhancing portfolio performance.

The identification of these anomalies to the efficient market hypothesis (EMH) has sparked rigorous debate among scholars on the validity and possible explanations of these style premiums. Despite numerous contributions on the subject that apply either traditional finance measures or behavioral finance, the academic literature has not yet reached a consensus. Furthermore, recent empirical data has documented substantial discrepancies in style premiums since the original studies.[2] These unexplained re- and disappearances have questioned the continued existence of these style factors. In response, it has been hypothesized that systematic patterns exist in these fluctuations, which may be explained by exogenous variables.

1.1 Problem Statement

In order to address the issues mentioned above, this thesis aims to provide further insights into the viability and applicability of equity style premiums by examining empirical evidence on eighteen factors within the *Value*, *Growth*, *Momentum*, *Market Beta*, *Quality* and *Size* style strategies from 1990 – 2013 on the aggregated developed market. In order achieve this, this thesis analyzes the motives and historical premiums of the strategies and investigates whether these can be explained by traditional risk-based measures or behavioral finance. Furthermore, this study examines differences in premiums during phases of the economic cycle and discusses how these findings can be implemented. This leads to the following problem statement:

Does recent empirical evidence support the existence of style premiums on the developed markets, and how do the premiums vary in relation to the economic cycle?

In order to further examine the research question, the following sub-questions will be addressed:

1. Can the presence of style-based investment strategies be explained through Modern Finance Theory or Behavioral Finance?

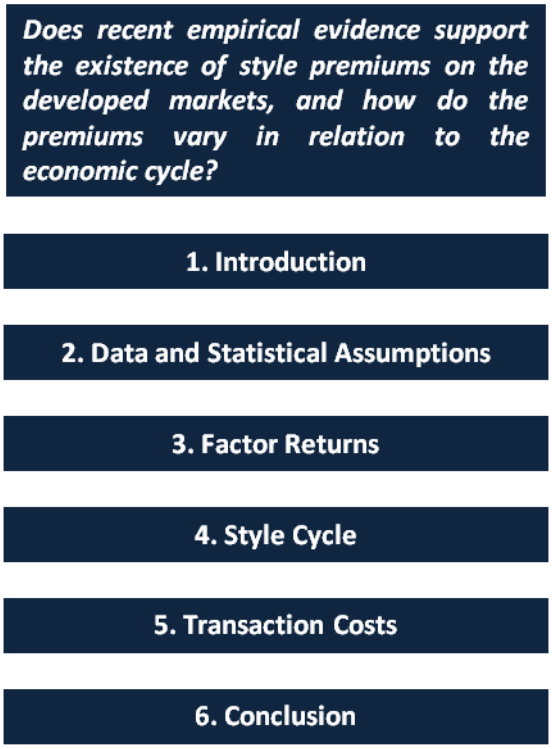
2. How can equity style strategies be implemented by investors, and do they remain viable when accounting for transaction costs?

[1] Klein and Lederman (1995)
[2] van Djik (2011), Fama and French (2011)

1.2 Thesis Structure

In order to provide an overview of how this thesis aims to answer the research questions, figure 1.1 presents the procedure and overall structure used to arrive at the conclusion. To the right of figure, the content of each chapter is outlined.

Figure 1.1 – Thesis Structure[3]



Chapter 1 presents the problem statement and thesis structure.

Chapter 2 introduces the data and methodology used to measure the performance of the investment style strategies.

Chapter 3 present results for each style strategy and discusses potential explanations for the observed premiums.

Chapter 4 examines the performance of each strategy during the economic cycle and elaborates on potential implementation methods.

Chapter 5 analyzes the potential transaction costs by examining the monthly turnover and transactions for each strategy.

Chapter 6 provides a conclusion on the thesis as a whole.

1.3 Delimitation

Due to the size constraints of this dissertation, the following delimitations have been made.

Although investment returns are dependent on the specific taxation rules faced by investors, the subject of taxation will not be addressed in this dissertation as taxation-levels differ depending on the residence and type of investor. Furthermore, differences in taxation of dividends and capital income may affect results as some fundamental factors are inherently linked to dividend payments.

The analysis does not adjust for interdependence between factors as shown in Fama and French (1992) despite observing correlations in returns, as stepwise sorting procedures used to mitigate interdependence are unsuited for the amount of factors examined in this dissertation.

[33] Source: Own figure

In examining risk-based explanations for the observed premiums, only measures of total risk (variance) and market risk (β) will be analyzed quantitatively. As the return series is unadjusted for interdependence, the three-factor model of Fama and French (1996) cannot be applied correctly. Thus, the three-factor model is discussed qualitatively. Furthermore, the data does not allow for a quantitative verification of the explanations provided by behavioral finance. Instead, these are thoroughly discussed by reviewing relevant academic literature.

Lastly, this thesis will not engage in quantitative forecasting models aimed at producing quantitative trading strategies. Rather, the analysis will provide advice on optimal style positioning within each phase of the cycle and leave the forecasting of the economic development to the investor.

2. Data and Statistical Assumptions

This chapter covers the basis for the empirical analysis applied in this paper. This entails a discussion of the sample period, market selection, style indicators, portfolio formation and the calculation of the economic reference data. Furthermore, I also address return calculation and evaluate the statistical properties of the return series applied in the statistical tests in the following chapter. Lastly, potential biases within the data are discussed.

2.1 Sample Period

The analysis of this dissertation applies a sample period ranging from January 1990 – January 2013. This range has been selected based on a series of considerations aimed at maximizing the reliability of the results.

A primary concern when conducting an analysis of fundamental indicators is the availability of data. Whereas several fundamental inputs, such as price or dividends, are readily observable in the market, the majority rely on either reported data from companies or consensus estimates, which are not easily available as the time horizon expands. Thus, the sample period is limited at 1990, as any further extension reduces the availability of the data, thereby compromising the reliability of the results.

The subjective selection also entails the prevalence of time period risk. The selection of a sample period containing two major crises, the dot-com bubble and the subsequent decline in investments from 1999-2001 and the financial and domestic credit crisis during 2008-2009, may affect the observed premiums. Furthermore, the sample period captures the asset price bubble in Japan, which influences the findings for the region. Despite the potential distortions, the inclusion of major financial events in the sample period provides the possibility of examining the behavior of the premiums during extreme markets.

The selected sample period results in 277 monthly data points, which is sufficient to make sound statistical tests. Although increasing the sample period would yield more observations, thereby improving the accuracy of the statistical measures, it would also erode the quality of the data. As such, I have chosen to limit the analysis at 1990.

2.2 Markets

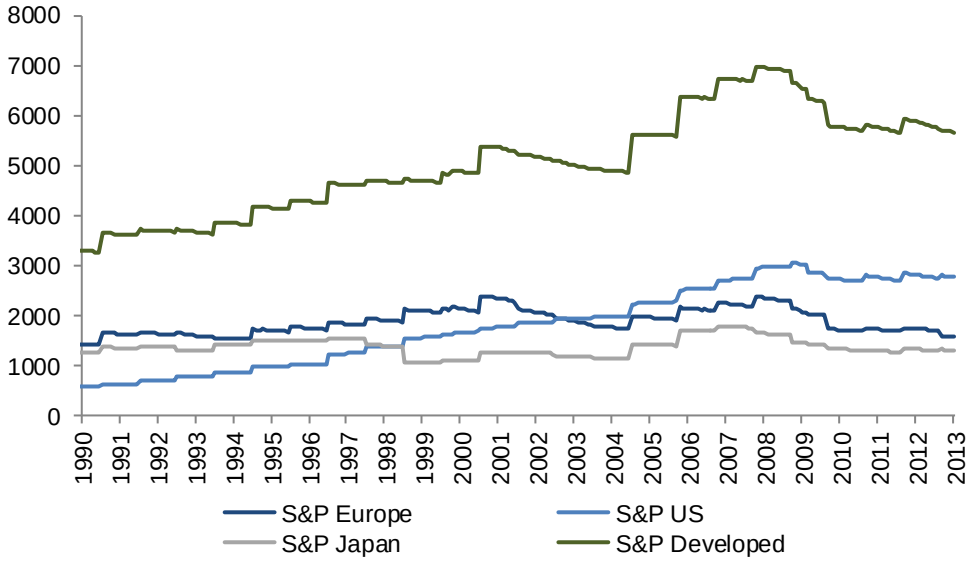
This paper reports the performance of several investment styles in the developed markets of US, Europe and Japan. The three regions are combined into an aggregate developed market, which will be the focus of this dissertation. The emerging markets have been omitted as they are still deficient in terms of governance, transparency, openness and do not have sufficient available history. The primary advantage in using the combined US, European and Japanese markets is a substantial increase in the underlying sample space, as

the aggregate developed market accounts for roughly 95% of the global market capitalization.[4] Thus, an increase in the amount of constituents within each basket is achieved, thereby improving the inter-basket diversification. This effectively reduces the volatility of the findings, which, in turn, increases their statistical accuracy.

2.2.1 Index Selection

In order to attain the broadest coverage of the individual regions the Standard & Poors Developed Broad Market Index (S&P Developed BMI) and its three sub-indices, S&P United States BMI, S&P Europe BMI and S&P Japan BMI have been selected. The total number of constituents within the indices can be seen from figure 2.1 below.

Figure 2.1 - Constituents of S&P BMI[5]

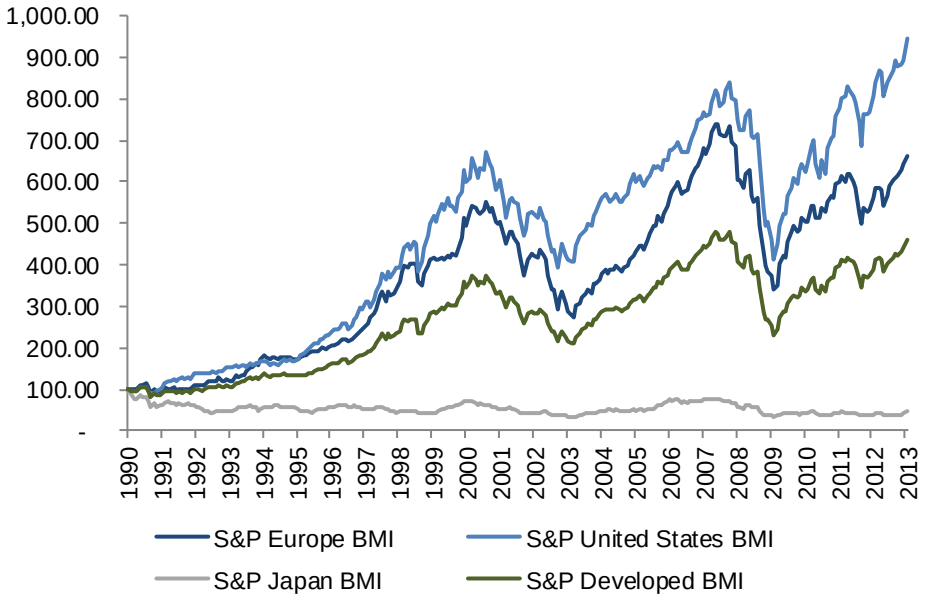


The S&P BMI indices include all publicly listed equities with a float adj. mkt. cap. of USD 100m or above and an annual liquidity of USD 50m, thus capturing the majority of companies listed within each region. The indices are weighted by mkt. cap. and are reconstituted yearly at the 3rd Friday of September.[6] The aggregate developed index is constructed by combining the US, European and Japanese indices. The indices yield the following advantages as they: 1) contain the necessary history, 2) include small companies, thus enabling more representative tests for firm size, 3) cover 95% of the investable universe within each region and 4) include companies from all sectors. The large number of constituents also allows sorting the market into deciles, thereby enabling an examination of deep factor returns due to satisfactory diversification within baskets.

[4] Fama and French (2011)
[5] Source: FactSet
[6] S&P Global BMI Methodology (2012)

In order to eliminate currency effects all regional returns are calculated in local currencies. The returns when examining the aggregate market are calculated in USD. The total return indices for the four S&P BMIs are presented in figure 2.2 below.

Figure 2.2 – Total Return Indices (Index 1990 = 100)[7]



As shown in figure 2.2 above, the S&P Japan BMI has significantly underperformed the remaining indices with an annual average return of -3.1% due to the bursting of the bubble in 1990 and the continued slide in equity prices. In comparison, the US market has yielded a return of 10.2% during the same period.[8] The index developments also show similar impacts of the dot-com and financial crises within each region, indicating heightened integration between the financial markets.

2.2.2 Issues in Aggregating Markets

Although combining the developed markets yields attractive properties several caveats need to be addressed. Firstly, the institutional framework is quite different between regions. While the discrepancies between the US GAAP and the European IFRS remain fairly mild despite differences in appreciation of goodwill, recognition of intangible assets and inventory-cost calculations,[9] the Japanese regulations do not allow for different reporting methods for tax purposes and financial statements. This leads many companies to use the accelerated depreciation methods for financial reporting, thereby distorting earnings for startup companies or

[7] Source: FactSet
[8] This is a prime example of time period risk. Had not included the bursting of the bubble and used January 1993 as the starting point, the Japanese index would have been flat with an average return of 0.2%, a difference of 3.4%.
[9] PWC (2012)

companies with large capital investments which constitute a large part of the Japanese economy. As such, factors involving earnings estimates, such as P/E, EPS estimates, ROE and ROIC, may be distorted.[10] [11]

Furthermore, any fundamental biases will affect the results, i.e. if Japanese stocks have a higher average P/E than in the remaining markets the high P/E baskets will have a higher exposure to the low returns of the Japanese market. While this may affect the results, this analysis assumes that investors are unbiased with regard to region and sector and simply look for the highest return spreads available within the universe. Thus, I assume that capital markets are integrated and investors are unconcerned with deviations from the purchasing power parity (PPP).[12] This is a rough set of assumptions; however, in order to describe the return premiums accurately one would require an algorithm capable of sorting across multiple dimensions, which is beyond the scope of this dissertation. It is partly for this reason that academic research on international factor returns is rather limited.[13]

When comparing results across regions this paper focuses on return spreads (premiums) between high and low baskets, as these effectively eliminate the potential error caused by different market movements. Uniform market exposure between baskets is here assumed. This is assumption is confirmed within the analysis, as factors such as market beta hold little relationship with the fundamental factor loadings within baskets.

2.3 Style Indicators

This section describes the calculation of the fundamental ratios used to rank stocks according to their style loadings. A more in-depth qualitative presentation of the individual factors and the rationally for selecting these are presented in the analysis chapter. Although factors are selected based on their alignment with the principles of the different investment styles and their popularity amongst practitioners and scholars the factors shown are by no means the only method for quantifying the investment strategies. It should also be noted that the investment strategies are not mutually exclusive. An overview of the strategies and factors are shown in appendix 8.1.

2.3.1 Value

Value firms are generally characterized by a low price relative to some fundamental measure of their true value. This ratio can be interpreted as a proxy for the market's expectations of future growth. The idea is illustrated by Gordon's growth formula:

[10] Chan, Hamao and Lakonishok (1991)
[11] Risager (2009)
[12] While this may be theoretically incorrect, large deviations from the PPP has been observed empirically, thereby questioning the merits of the rigid PPP.
[13] Fama and French (1998)

$$P_t = \frac{d_{t+1}}{r-g} \quad \textbf{(2.1)}$$

$P_t = Share\ price\ at\ time\ t$
$d_{t+1} = Dividend\ at\ time\ t+1$
$r = Required\ rate\ of\ return\ on\ equity$
$g = Expected\ perpetiuty\ growth\ rate$

Because dividends are defined as earnings per share (EPS) or free cash flow per share (FCFPS) times the relevant payout ratio, the equation above can be reorganized to obtain an expression for the P/E and FCF/P ratios:

$$\frac{P_t}{EPS_t} = \frac{(1+g)*PR}{r-g} \quad \textbf{(2.2)}$$

$EPS_t = Earnings\ per\ share\ at\ time\ t$
$PR = Payout\ ratio$

By holding payout ratio and risks unchanged, increasing the expected growth also increases the P/D, P/E and P/CF ratio. Investors are thus willing to pay more if they believe that the firm in question has good growth opportunities and less if the company's risks increase.[14]

Value investors follow contrarian strategies by exploiting the exuberant and erroneous growth expectations in the market. Thus, they invest in stocks which trade at cheap levels compared to known fundamentals such as assets, earnings, cash flow etc. This dissertation applies four of the most common value ratios when screening for value stocks within the indices:

- Price/Earnings (P/E): Share price at portfolio formation divided by the trailing 12m reported earnings per share before extraordinary items
- Price/Book (P/B): Share price at portfolio formation divided by the trailing 12m book value of equity per share
- Dividend Yield (Div Yield): Trailing 12m trailing divided by the share price at portfolio formation
- Free Cash Flow Yield (FCF Yield): Trailing 12m free cash flow per share divided by the share price at portfolio formation

2.3.2 Growth

Growth investors seek out stocks which they believe have the ability to outgrow the market. Contrary to value investing, which focus on observed facts, growth investors focus on the future prospects of a company by extrapolating past growth patterns into the future. The following growth ratios are applied in the analysis:

- Asset Growth: YoY change in trailing 12m total assets

[14] Koller, Goedhart and Wessels (2010)

- EPS Growth: YoY change in trailing 12m EPS

These factors address growth from two different perspectives: EPS growth is derived from the P&L and measures the company's operational growth while asset growth represents the growth in the invested capital from shareholders and creditors.

2.3.3 Momentum

Momentum strategies entail bets against the random walk process of security prices inherent in the EMH.[15] As such, investors following momentum strategies believe in exploitable return patters in either stock returns (autocorrelation) or momentum in market sentiment. The analysis examines the effect of short term return momentum and momentum in consensus analysts' earnings forecasts on equity returns:

- 1M Reversal: 1 month total return of the stock
- 3m Change in Forward EPS: Percentage change in consensus 12m forward EPS prior to portfolio formation
- EPS Estimates Revisions: Calculated monthly using the following formula:

$$Revision\ Ratio = \frac{n_{upgrades} - n_{downgrades}}{n_{upgrades} + n_{downgrade}} \quad \textbf{(2.3)}$$

$n_{upgrades} = Number\ of\ EPS\ upgrades$
$n_{downgrades} = Number\ of\ EPS\ downgrades$

Consensus data are gathered using I/B/E/S figures available through FactSet. Both the 3m change in forward EPS and EPS estimates revisions rely on consensus data and are therefore dependent on the level of stock coverage within the universe. Sufficient data on analyst estimates are not readily available for smaller companies until the early 1990s and as such, the data for these factors are based on relatively few observations for the first six months of the sample period.

2.3.4 Market Beta

The market beta strategy is measured using the market beta as derived in the Capital Asset Pricing Model (CAPM) of Sharpe, Lintner and Mossin.[16] Market beta is calculated as follows:

$$\beta_{i,m} = \frac{Cov(r_i, r_m)}{\sigma_m^2} \quad \textbf{(2.4)}$$

$\beta_{i,m} = Systematic\ risk\ of\ security\ i\ against\ the\ market\ portfolio$
$r_i = Return\ of\ security\ i$
$r_m = Return\ of\ the\ market\ portfolio$
$\sigma_m^2 = Variance\ of\ the\ market\ portfolio$

[15] Samuelson (1965), Campbell, Lo and MacKinlay (1997)
[16] Bodie, Kane and Marcus (2009). The calculation does not adjust for a risk-free rate or return.

Investors following the market beta strategy look for stocks with high beta-values, defined by the following factor:

- Market Beta (β): β of a stock calculated using daily total return observations over 12m prior to portfolio formation against the local S&P BMI

As this measure require twelve months of data in order to calculate the β-value the first baskets within the market beta investment style is formed in 1991.

2.3.5 Quality

A high quality investment strategy entails investing in highly profitable and stable companies. The value proposition of profitability is evident if one expands the perpetuity DCF model, as can be seen from the equation below:[17]

$$Enterprise\ Value_t = \frac{FCF_{t+1}}{WACC-g} = \frac{Invested\ Capital_{t+1} * ROIC * \left(1-\frac{g}{ROIC}\right)}{WACC-g} \quad \textbf{(2.5)}$$

$FCF = Free\ cash\ flow\ (firm)$
$ROIC = Return\ on\ invested\ capital$
$WACC = Weighted\ average\ cost\ of\ capital$

Equation 2.5 above separates the theoretical enterprise value of a firm into three drivers of value creation, profitability (ROIC), growth (g) and risk (WACC). As can be seen, increasing ROIC will, theoretically, always lead to a higher enterprise value. Investors following the quality strategy believe that the market systematically undervalue the effect of a high and sustainable profitability. In order to test this, this paper applies the following three ratios:

- Return on Invested Capital (ROIC): Trailing 12m net operating profit after tax (NOPAT) divided by the trailing 12m invested capital
- Return on Equity (ROE): Trailing 12m net earnings after tax divided by the trailing 12m book value of equity
- Net Margin 5Y Stability: Net margin coefficient of variation over the last 5 years. The coefficient of variation is defined as the standard deviation of the net margin divided by the median. A low value is indicative of a quality stock

2.3.6 Size

Investors who follow the size strategy bet on the performance of large companies relative to small companies. To measure size, I apply the most common approach:

[17] Koller, Goedhard and Wessels (2010)

- Size (Market Capitalization): Market capitalization of the firm's shares at portfolio formation

2.3.7 Composite Factors

Composite factors are calculated for the value, growth, momentum and quality investment strategies by combining the underlying factors within each strategy. The composite score of a given stock at portfolio formation is calculated by assigning a value between 0 and 1 to each factor based on the factor values of the company relative to the constituents of its universe. The values are then averaged, as shown by equation 2.6 below:

$$Composite\ Score_s = \frac{\sum_{i=1}^{f} \frac{Rank(x_i, i)}{n_i}}{f} \quad \textbf{(2.6)}$$

$f = Number\ of\ factors$
$x_i = Value\ of\ the\ i'th\ factor$
$Rank(x_i, i) = Rank\ of\ the\ factor\ x_i\ within\ the\ i'th\ factor$
$n_i = Number\ of\ observations\ for\ the\ i'thfactor$

The ranking direction of each factor is determined by its relation to the investment strategy, i.e. the highest composite score is achieved by a low P/E, low P/B, high Div Yield and high CF Yield. Composite factors have several advantages as they are more resilient against outliers and are capable of capturing the combined effects of each factor within a given strategy.

2.4 Portfolio Formation

In order to measure the return effect of different factor loadings, this paper applies one-way sorting procedures similar to those of Lakonishok, Shleifer and Vishny (1994), Fama and French (2011), Bird and Whitaker (2003) and many others.

At the beginning of each month from 1990 – 2013 the fundamental ratios for each stock is downloaded from the FactSet database. All stocks are then sorted according to each indicator and divided equally into 10 baskets. The result is 10 portfolios each containing one-tenth of the constituents in the universe, with the high basket containing the companies with the highest factor scores and vice versa. Decile sorting enables an analysis of deep-factor returns; however, this also entails elevated turnover ratios and requires sufficient constituents to ensure diversification against company specific events within portfolios. As the number of constituents within the developed universe grows steadily from 3283 to 5664, portfolios are assumed to be well diversified.

The return is calculated using a buy and hold strategy until the next portfolio formation using the following formula:

$$r_{pf} = \sum_{i=1}^{n} w_i r_i \quad \textbf{(2.7)}$$

$r_{pf} = Total\ return\ net\ dividends\ of\ the\ portfolio$
$r_i = Total\ return\ net\ dividends\ of\ stock\ i$
$w_i = Portfolio\ weight\ of\ stock\ i$

Motivated by the empirical evidence of a size bias shown in Banz (1981) and van Djik (2011) stocks are weighted according to their mkt.cap. The use of capitalization weighted returns reduces the potential size effect in returns; however, it also increases the sensibility to mega-cap companies, which may destabilize the results. This partly explains why uneven changes between baskets are observed.

This approach has several advantages relative to cross-sectional analysis: 1) Sorting procedures reduce measurement error and enhance the statistical power of hypothesis tests,[18] 2) the slopes of cross-sectional regressions are not always easy to judge and 3) regression coefficients are affected by interdependence between factors, which is shown to exist in the analysis. Although monthly rebalancing may not properly reflect the returns achievable by long term investors, this frequency is necessary as companies shift their style orientation over time, which could lead to misplacement issues and incorrect premium measurements.[19]

In order to avoid cumbersome and possible erroneous manual sorting and return calculations, the process has been modeled in MatLab and Excel in order to ensure a reliable and unbiased data collection. Both returns and fundamental figures required for the calculation of indicators are gathered from the FactSet database. In addition to the return series, the algorithm also calculates the monthly turnover and transition matrixes for each factor. The final model output, which contains the monthly return series of all 10 baskets for each of the 18 factors, their monthly turnover and transition matrixes across each of the four regions, is presented in the Excel file *Data – Style Factors* on the attached CD. Thus, the data is freely available to the reader for further analysis of the series.

2.4.1 Adjustments for Missing Data Points and Corporate Actions

The aforementioned sample period and the inclusion of smaller companies within the regional universes result in missing data points for some companies. To mitigate the potential errors caused by insufficient data, companies are excluded when ranking according to the factor for which the data is unavailable. This procedure also applies for companies with negative P/E.

[18] Lo and MacKinlay (1990)
[19] The transition matrixes in table 5.2 indicate that indicators are remarkably stable over time, and that stocks tend to remain within a single basket for prolonged periods of time.

The returns are adjusted for corporate actions such as stock splits, mergers, acquisitions and defaults. Companies that are delisted due to default yield a return of -100%, whereas delisting due to mergers, acquisitions or privatization are measured using their last available closing price of the stock.

2.5 Return Calculation and Statistical Issues

This section addresses the calculation of returns and the primary statistical issues concerning the distribution of return series data.

The returns of each stock within the portfolios are calculated as monthly net returns with reinvested dividends using the following formula:[20]

$$r_{t-1,t} = \left[\frac{p_t}{p_{t-1}} \prod_{i=1}^{n} \left(1 + \frac{d_i}{p_i}\right)\right] - 1 \quad \textbf{(2.8)}$$

$r_{t-1,t} = Net\ return\ of\ an\ equity\ with\ reinvested\ dividends\ between\ time\ t-1\ and\ t$
$p_t = Price\ of\ asset\ at\ time\ t$
$p_i = Price\ of\ asset\ at\ the\ time\ of\ dividend\ payment\ (t = i)$
$d_i = Dividend\ payed\ at\ time\ i$

The formula above is an extension of the more common simple net return formula $R_t = (p_t + d_i) / p_{t-1}$. The key difference between the two formulas is that the first formula assumes reinvested dividends, whereas the latter assumes that dividends are not reinvested and distributed at the end of the period. In this dissertation the difference is negligible due to the frequency of the return calculations. The total return over multiple periods is calculated as follows:

$$r_{t,T} = \prod_{t=1}^{T}(1 + r_{t,t-1}) - 1 \quad \textbf{(2.9)}$$

$r_{t,T} = Total\ return\ between\ time\ t\ and\ T$

In order to calculate the average return over n (=T-t) periods ($1+r_{t,T}$) can be raised to power of 1/n.

The return calculation presented in equation 2.9 poses several problems as the statistical tests in the analysis assume that the data is normally distributed as well as independently and identically distributed (IID). This is not the case for return series and it is widely acknowledged that stock returns are not normally distributed and show excess kurtosis. Secondly, if normally distributed single period returns are assumed, multi period returns cannot also be normal as they are the product of the single period returns. The obvious solution to these problems would be the application of continuous compounding by using log-returns which scale proportionally to time:

$$r_{t-1,t} = \log(1 + R_t) = \log(\frac{p_t + d_i}{p_{t-1}}) \quad \textbf{(2.10)}$$

[20] Morningstar (2009)

Log return series have two disadvantages which make them unsuitable for the purpose of the analysis: 1) The series show autocorrelation which violate the 'normality of sums'-rule, and 2) One cannot calculate the simple weighted average return of a portfolio as shown in equation 2.7, as the log of a sum is unequal to the sum of logs. Thus, simple net returns are used as the basis for the calculations.[21]

In order to examine the normality of the return series the Jarque-Bera goodness-of-fit test is applied:

$H_0: r \sim Normal\ Distribution$

$$JB = \frac{n}{6}\left(S^2 + \frac{1}{4}(K-3)^2\right) \sim \chi^2(df = 2)\ ^{22} \qquad \textbf{(2.11)}$$

$n = Number\ of\ observations$
$S = Sample\ skewness$
$K = Sample\ kurtosis$

The test results are shown in appendix 8.2. The majority of the return series on the aggregate developed market reject the null-hypothesis, thus violating the normality criteria. The return series are, on average, negatively skewed ($\bar{S} = -0.52$) and have fat tails ($\bar{K} = 1.75$). As such, the return series are prone to "tail-risk" events, which implies that the custom of assuming standard normal distributions in questionable. Empirical return data are in fact infamous for having a tendency for "Fat Tails" – this arises when extreme returns are observed with a higher frequency than expected for normal distributions. This implies that if normality is assumed the actual risk of negative returns is underestimated. Replicating the tests on log returns and/or with outliers removed does not yield any different result. As such, it is acknowledged that there is presence of non-normality in a considerable part of the data and readers are thus advised to keep this in mind when applying and interpreting the results.

2.6 Macroeconomic Reference Series

This section outlines the calculation of the macroeconomic reference data used to model the economic cycle.

Optimally, the economic cycle would be modeled by output-gap[23] using GDP measures from each region. However, GDP measures are unsuitable for this analysis as they are published infrequently[24] with delay and have insufficient history for the aggregate developed markets and the combined European economy. Instead, the economic cycle is modeled through Purchasing Managers Index (PMI) data as it is 1) published monthly 2) is comparable across regions 3) reliable in tracking the developments of the underlying economies.[25] One

[21] Campbell, Lo and MacKinlay (1997)

[22] $S = \frac{\hat{\mu}_3}{\hat{\sigma}^3} = \frac{\frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^3}{\left(\frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^2\right)^{3/2}}$, $K = \frac{\hat{\mu}_4}{\hat{\sigma}^4} = \frac{\frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^4}{\left(\frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^2\right)^2}$

[23] The difference between actual and potential GDP

[24] Quarterly for US and Europe, yearly in Japan

[25] Makit (2009)

disadvantage of the PMI-methodology is its limited history for combined markets. To compensate, this paper applies either PMI series from relating regions or industrial production figures to proxy until PMI data is available:[26]

- **US**: [1990–2013] Institute of Supply Management Manufacturing PMI (ISM PMI)
- **Europe**: [1990–1991] ISM PMI, [1991–2001] Eurostat Industrial Production (ex. Construction) (IIP), [2001–2013] Eurozone PMI
- **Japan**: [1990–2013] TANKAN Index[27]
- **Aggregate Developed Market**: [1990–1998] ISM PMI, [1998–2004] JPM Global Manufacturing PMI, [2004–2013]: JPM Global Composite PMI

The PMI, IIP and TANKAN data is normalized around their respective base values to ensure comparability between the series using the following formula.

$$N_{t,i} = \frac{O_{t,i} - B_i}{\sigma_i} \quad \textbf{(2.12)}$$

$N_{t,i} = Normalized\ value\ of\ series\ i\ at\ time\ t$
$O_{i,t} = Observed\ value\ of\ series\ i\ at\ time\ t$
$B_i = Base\ value\ of\ series\ i$
$\sigma_i = Standard\ deviation\ of\ series\ i$

The standardized series have a standard deviation of 1, a mean of $(\mu_i - b_i) \,/\, (\sigma_i)$ and a base value of 0. The standardization procedure enables interlinking of the different indicators into consistent series. Finally, in order to stabilize the data a simple three-month moving average procedure is applied. Figure 2.3 below presents the finished series.

[26] The correlations between the indicators is shown in appendix 8.3
[27] As the index is published quarterly linear interpolation in has been applied to generate monthly observations.

Figure 2.3 – Macroeconomic Reference Data[28]

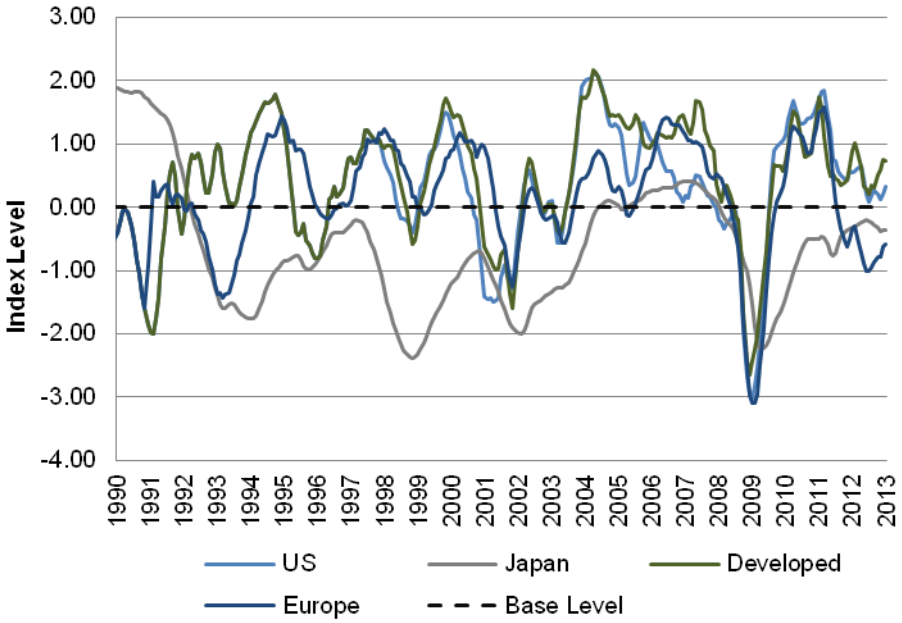


Figure 2.3 shows that the Japanese economy has been operating below its potential since the bursting of the asset market in the early 1990s, except for the period 2004 – 2008. The remaining geographical areas correlate strongly with the aggregate developed market. It is also worth noting that the European data appear to lag the American throughout the 1990s and the early 2000s.

2.6.1 Defining the Four Phases of the Economic Cycle

The macroeconomic data outlined in the previous section is used to assign the months into the four phases of the economic cycle: recession, recovery, boom and slowdown. The phases are defined using the level and change of the underlying reference data. These definitions are shown in table 2.4 below.

Table 2.4 – Phases of the Economic Cycle[29]

	Reference Data		*% of months*			
Phase	**Level**	**Change**	**Developed**	**Japan**	**US**	**Europe**
Recession	Below 0	Decreasing	15%	33%	18%	22%
Recovery	Below 0	Increasing	12%	42%	13%	17%
Boom	Above 0	Increasing	37%	9%	36%	32%
Slowdown	Above 0	Decreasing	37%	16%	33%	29%

As can be seen from figure 2.4 above the Japanese economy has been performing below potential for 75% of the sample period compared to just 27% for the aggregate developed markets. Also, the economy of the US

[28] Source: Bloomberg: [NAPMI Index], [EUIPEMUY Index], [ECPMIMOV Index], [JNTGALLI Index], [JPMIGLOB Index], [JPMIINDU Index]
[29] Source: Bloomberg, own table

has been performing better than the European, which is also reflected in the S&P BMI indices shown in figure 2.2. In order to mitigate the potential errors caused by the standardization and moving average adjustments this method only relies on the two binominal variables Level and Change and is unconcerned with the absolute level or the size of the change. While this could be tested through multiple regressions, the results may not prove meaningful due to the adjustments, autocorrelation in returns and violation of the normality assumption.

2.7 Data Considerations

Having shown the data requisition process as well as the methodology applied, a few considerations concerning the validity of the data should be made.

When analyzing historical stock returns in an attempt to uncover the predictive capabilities of different variables, it is important to consider the possible presence of survivorship bias. Contrary to mutual fund analysis, the nature of the bias in studies of individual firms is less clear as firms can be delisted due to either default, mergers or acquisitions. It is likely, however, that non-survivors' overall returns are abnormal, which may cause errors in results.[30] The data used in this paper ought to be free of survivorship bias as FactSet provides data for both listed and de-listed companies.

In order to avoid potential look-ahead biases that occur when predictive inputs are used to form portfolios before they are publically known to investors, the sorting procedure only applies figures when they are publically available. I.e. if FY earnings are reported end March, the sorting of stocks primo January, February and March will rely on last year's earnings figures.

Lastly, a common accusation against studies investigating the predictive power of fundamental factors is that their results are a result of data mining. Among others, Lo and MacKinlay (1990) argue that the results of such studies merely indicate ex-post patterns in the data, as most studies employ empirically motivated indicators on the same markets. As a result, it is impossible to assess the statistical significance of their predictive ability, which depends on the number of attempts made to discover a certain effect. Their arguments are supported by evidence that premiums for some factors have been largely non-existent in samples covering periods outside the original studies. The results of this dissertation, however, coupled with the surge of research on this subject, provide a more nuanced view on the existence of these apparent anomalies as these premiums are shown to exist in cross-regional inter-temporal surveys.[31] Furthermore the data applied in this paper suggest that the observed premiums are dynamic and vary over time. Thus, the argument put forward in this paper is that the disappearance of a premium during a specific period does not

[30] Haugen and Baker (1996)
[31] van Djik (2011), Lakonishok, Shleifer and Vishny (1994)

necessarily indicate that the premium is a statistical fluke but rather that it has disappeared due to changes in external factors as modeled by the economic reference data.

Having presented the data foundation, portfolio formation methodology, statistical properties of the return calculations and macroeconomic reference data, the following chapter will commence the analysis by presenting and analyzing the returns of each factor during the sample period.

3. Factor Return Analysis

This chapter presents an analysis of the returns and premiums of the six investment strategies and their underlying factors on the aggregated developed markets during the period from 1990-2013.

Structurally, this chapter consists of two sub-chapters. First, I examine the returns, risk characteristics, significance and historical development of both long-only and long-short premiums of each of our eighteen factors. Furthermore, I discuss the underlying economic rationales, the interdependence between factors and how these results can be utilized by investors. The second part of this chapter engages in a broader discussion on the explanations of these anomalies to the EMH by examining traditional risk based approaches and behavioral finance. Finally, this chapter concludes the findings by offering a set of recommendations for the long term investor.

Furthermore, this chapter will pave the ground for the style cycle model, in which I examine if changes in the macroeconomic environment, measured through PMI-data as a proxy for the output gap of the aggregated developed markets, may help explain the long term fluctuations in the various premiums as addressed, amongst other, in Risager (2009). Following the construction of the style cycle model examine trading costs of style based strategies in conjunction with the turnover and transition matrixes for each factor.

While hardcore believers in equity style management solely look at fundamental values, it is important to emphasize the importance of thorough analysis of any investment case. As such, while it may seem appealing, the findings in this chapter should by no means by used singlehandedly. Rather, they should provide potential investors with insights as to which factors that appear to drive investment performance, i.e. is it profitable to invest in companies with stable margins or high growth rates? Or should investors instead look for stocks with cheap valuations and rising momentum? This chapter aims to answer such questions.

Panel A in figure 3.1 below shows the geometric average monthly factor returns in USD for each of the 10 baskets and the long/short factor premiums. Panel B shows the monthly standard deviation and Panel C shows the risk reward ratio.

Table 3.1 – Developed Factor Performance Figures[32]

Index	CAGR	Volatility	IR	Max DD
S&P Developed BMI	0,55%	4,23%	0,13	-52,2%

Panel A - Average Monthly Factor Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0,06%	0,11%	0,26%	0,47%	0,55%	0,69%	0,74%	0,90%	0,94%	1,23%	1,30%	(low) - (high)
P/B	0,40%	0,41%	0,28%	0,29%	0,32%	0,45%	0,50%	0,71%	0,45%	0,87%	0,47%	(low) - (high)
Div Yield	-0,15%	0,00%	0,07%	0,26%	0,45%	0,51%	0,85%	0,76%	1,01%	0,93%	1,08%	(high) - (low)
FCF Yield	0,33%	0,25%	0,26%	0,38%	0,68%	0,69%	0,69%	0,73%	0,84%	0,72%	0,39%	(high) - (low)
Asset Growth	0,67%	0,63%	0,52%	0,52%	0,32%	0,42%	0,55%	0,47%	0,49%	0,33%	-0,34%	(high) - (low)
EPS Growth	0,20%	0,44%	0,33%	0,60%	0,67%	0,57%	0,62%	0,60%	0,35%	0,23%	0,02%	(high) - (low)
3M Change in Fwd EPS	-0,05%	0,31%	0,56%	0,43%	0,68%	0,59%	0,65%	0,57%	0,62%	0,46%	0,50%	(high) - (low)
1M Reversal	0,54%	0,63%	0,48%	0,53%	0,55%	0,53%	0,49%	0,45%	0,33%	0,27%	-0,27%	(high) - (low)
EPS Estimates Revisions	0,36%	0,41%	0,38%	0,37%	0,25%	0,13%	0,23%	0,40%	0,73%	0,81%	0,46%	(high) - (low)
Market Beta	0,63%	0,72%	0,59%	0,64%	0,60%	0,48%	0,59%	0,67%	0,39%	0,28%	-0,35%	(high) - (low)
ROIC	-0,09%	-0,10%	0,03%	0,27%	0,34%	0,58%	0,55%	0,73%	0,72%	0,84%	0,93%	(high) - (low)
ROE	-0,04%	-0,19%	-0,02%	0,17%	0,45%	0,48%	0,43%	0,75%	0,76%	0,81%	0,84%	(high) - (low)
Net Margin 5Y Stability	0,26%	0,36%	0,28%	0,41%	0,40%	0,47%	0,62%	0,50%	0,63%	0,41%	0,15%	(low) - (high)
Size	0,56%	0,51%	0,53%	0,47%	0,48%	0,44%	0,52%	0,49%	0,51%	0,77%	0,21%	(low) - (high)
Value	-0,09%	0,01%	0,34%	0,37%	0,56%	0,61%	0,74%	0,91%	0,95%	1,15%	1,24%	(high) - (low)
Growth	0,46%	0,67%	0,52%	0,64%	0,48%	0,29%	0,56%	0,44%	0,44%	0,33%	-0,13%	(high) - (low)
Momentum	0,09%	0,37%	0,40%	0,54%	0,50%	0,46%	0,47%	0,78%	0,59%	0,79%	0,71%	(high) - (low)
Quality	0,08%	-0,10%	0,08%	0,35%	0,26%	0,50%	0,48%	0,54%	0,78%	0,85%	0,77%	(high) - (low)

Panel B - Monthly Standard Deviations	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	5,77%	4,65%	4,43%	4,17%	4,16%	3,92%	4,30%	4,37%	4,99%	5,65%	4,81%	(low) - (high)
P/B	4,55%	4,30%	4,56%	4,53%	4,53%	4,57%	4,59%	4,89%	5,59%	7,11%	6,05%	(low) - (high)
Div Yield	5,17%	4,98%	4,82%	4,79%	4,31%	4,37%	4,16%	4,14%	4,12%	5,05%	4,77%	(high) - (low)
FCF Yield	5,78%	4,74%	4,53%	4,46%	4,21%	4,13%	4,17%	4,37%	4,59%	5,74%	2,79%	(high) - (low)
Asset Growth	4,80%	4,33%	4,24%	3,89%	4,15%	4,46%	4,51%	4,74%	4,96%	6,17%	4,14%	(high) - (low)
EPS Growth	6,59%	4,87%	4,20%	3,90%	3,86%	4,03%	4,36%	5,01%	5,93%	6,16%	2,85%	(high) - (low)
3M Change in Fwd EPS	6,66%	5,36%	4,63%	4,23%	3,86%	3,91%	4,03%	4,66%	5,10%	6,42%	4,51%	(high) - (low)
1M Reversal	7,64%	5,87%	5,14%	4,53%	4,23%	4,16%	4,07%	4,41%	4,59%	5,61%	6,54%	(high) - (low)
EPS Estimates Revisions	5,27%	4,83%	4,47%	4,91%	4,59%	4,39%	3,50%	4,04%	4,21%	4,57%	3,31%	(high) - (low)
Market Beta	2,67%	3,02%	3,14%	3,37%	3,64%	3,96%	4,45%	4,86%	5,89%	7,69%	7,06%	(high) - (low)
ROIC	6,81%	5,87%	5,34%	4,86%	4,60%	4,41%	4,44%	4,10%	4,22%	4,20%	4,69%	(high) - (low)
ROE	6,83%	5,90%	5,18%	5,10%	4,79%	4,41%	4,38%	4,20%	4,39%	4,00%	4,84%	(high) - (low)
Net Margin 5Y Stability	5,68%	5,39%	4,81%	4,89%	4,66%	4,19%	4,55%	4,15%	3,72%	5,85%	3,04%	(low) - (high)
Size	4,24%	4,46%	4,64%	4,74%	4,85%	4,81%	5,03%	5,13%	5,34%	6,23%	4,53%	(low) - (high)
Value	4,93%	4,91%	4,56%	4,34%	4,43%	4,30%	4,54%	4,51%	4,84%	5,84%	5,00%	(high) - (low)
Growth	4,82%	4,36%	4,05%	4,14%	4,03%	4,31%	4,36%	4,59%	5,10%	6,29%	4,38%	(high) - (low)
Momentum	5,25%	4,64%	4,48%	4,31%	4,25%	4,31%	4,45%	4,39%	4,74%	5,64%	4,26%	(high) - (low)
Quality	6,19%	5,77%	5,38%	5,10%	4,58%	4,67%	4,38%	4,24%	4,10%	4,11%	4,48%	(high) - (low)

Panel C - Risk / Reward Ratio	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0,01	0,02	0,06	0,11	0,13	0,18	0,17	0,21	0,19	0,22	0,27	(low) - (high)
P/B	0,09	0,10	0,06	0,06	0,07	0,10	0,11	0,15	0,08	0,12	0,08	(low) - (high)
Div Yield	-0,03	0,00	0,02	0,05	0,10	0,12	0,20	0,18	0,24	0,18	0,23	(high) - (low)
FCF Yield	0,06	0,05	0,06	0,08	0,16	0,17	0,17	0,17	0,18	0,13	0,14	(high) - (low)
Asset Growth	0,14	0,14	0,12	0,13	0,08	0,09	0,12	0,10	0,10	0,05	-0,08	(high) - (low)
EPS Growth	0,03	0,09	0,08	0,15	0,17	0,14	0,14	0,12	0,06	0,04	0,01	(high) - (low)
3M Change in Fwd EPS	-0,01	0,06	0,12	0,10	0,18	0,15	0,16	0,12	0,12	0,07	0,11	(high) - (low)
1M Reversal	0,07	0,11	0,09	0,12	0,13	0,13	0,12	0,10	0,07	0,05	-0,04	(high) - (low)
EPS Estimates Revisions	0,07	0,08	0,09	0,07	0,05	0,03	0,07	0,10	0,17	0,18	0,14	(high) - (low)
Market Beta	0,23	0,24	0,19	0,19	0,17	0,12	0,13	0,14	0,07	0,04	-0,05	(high) - (low)
ROIC	-0,01	-0,02	0,00	0,06	0,07	0,13	0,12	0,18	0,17	0,20	0,20	(high) - (low)
ROE	-0,01	-0,03	0,00	0,03	0,09	0,11	0,10	0,18	0,17	0,20	0,17	(high) - (low)
Net Margin 5Y Stability	0,05	0,07	0,06	0,08	0,09	0,11	0,14	0,12	0,17	0,07	0,05	(low) - (high)
Size	0,13	0,11	0,11	0,10	0,10	0,09	0,10	0,10	0,10	0,12	0,05	(low) - (high)
Value	-0,02	0,00	0,07	0,08	0,13	0,14	0,16	0,20	0,20	0,20	0,25	(high) - (low)
Growth	0,09	0,15	0,13	0,15	0,12	0,07	0,13	0,10	0,09	0,05	-0,03	(high) - (low)
Momentum	0,02	0,08	0,09	0,13	0,12	0,11	0,11	0,18	0,12	0,14	0,17	(high) - (low)
Quality	0,01	-0,02	0,02	0,07	0,06	0,11	0,11	0,13	0,19	0,21	0,17	(high) - (low)

Index: S&P Developed BMI. *Returns:* Monthly, USD, Total return incl. reinvested dividends. *Baskets:* Deciles, Cap-weighted. *Data Range:* Jan 1990 – Jan 2013

[32] Source: FactSet, own calculations

The corresponding tables for the US, European and Japanese markets are shown in appendix 8.5, 8.6 and 8.7. The return/risk ratios are shown in panel C and are defined as follows:

$$Return\text{-}Risk\ ratio\ = \frac{R_A - R_B}{\sqrt{var(R_A - R_B)}} \quad \textbf{(3.1)}$$

$R_A = Average\ return\ of\ asset\ A$
$R_B = Average\ return\ of\ asset\ B$

The return-risk ratio presented in equation 3.1 is very similar to the well-known Sharpe ratio[33], and presents the excess return adjusted for the total risk (standard deviation) of the premium. Contrary to the traditional Sharpe ratio, in which R_B is the return of a benchmark asset such as the risk free rate, the return-risk ratio assumes R_B to be zero when computing the ratio for single baskets. This is done to ensure comparability between regions. For the premiums, the return-risk ratio is equal to the between the high and low baskets and the standard deviation of their monthly return differences. The rightmost column indicates the direction of the factor, i.e. for the P/E ratio the (low) – (high) indicates that basket 10 contains the companies with the lowest value of the factor and that basket 1 contains the companies with the highest.

Before commencing the factor analysis, it should be noted that the return patterns between baskets change direction and appear non-linear for some factors. Although non-linearity has been shown to exist in other studies,[34] the changes in direction may pose a problem. They are most likely caused by inadequate diversification within baskets or are the result of some factor-specific bias. Composite factors mitigate these potential risks as companies are ranked using multiple factors, thereby limiting the effect of such errors.

Furthermore, the key takeaway from table 3.1 is not only the individual basket returns but rather the long-short baskets ("spreads" or "premiums"), as these are not directly affected by market return and show the performance difference between stocks with high- and low factor values. While interesting from a theoretical point of view, some investors may be unable to apply these long/short strategies in practice due to short-sale restrictions and reduced lending capacity in the market. These investors will only be able to profit from the long positions outperforming the market. However, examining the performance of the short legs remains important as it provides insights into which fundamental values investors should seek to avoid. Figure 3.2 and table 3.3 below show a risk/return scatterplot of the premiums and their significance levels calculated through the student's t-test.

[33] Sharpe (1994), appendix 8.8 briefly elaborates on the concept of negative Sharpe ratios.
[34] van Djik (2011) and Fama and French (1992)

Figure 3.2 – Developed Spread Return and Risk[35]

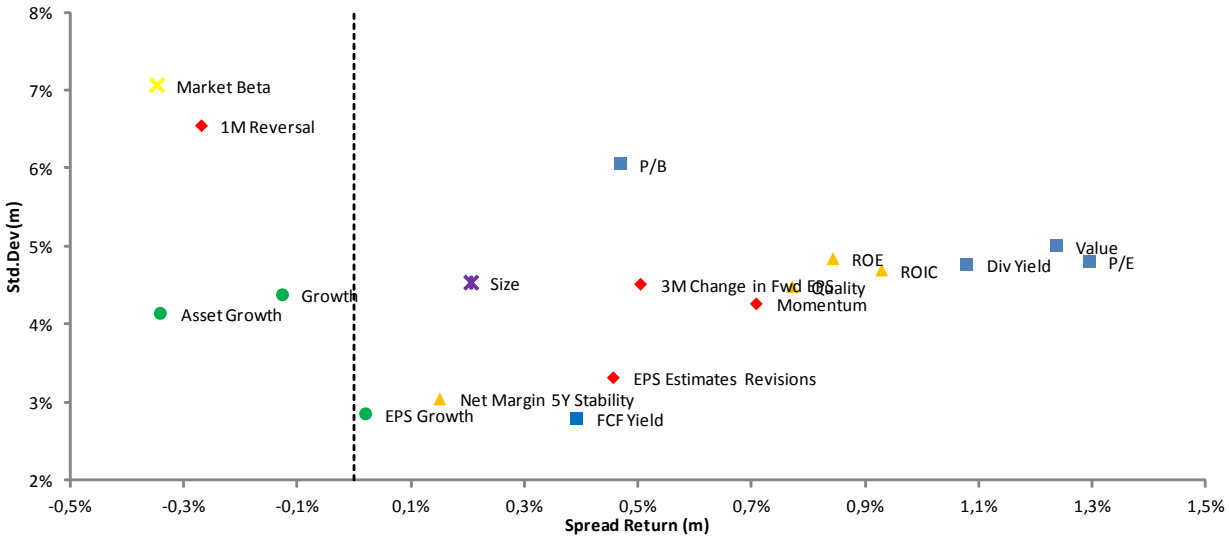


Table 3.3 – Student's t-test on Developed long/short Factor Spreads[36]

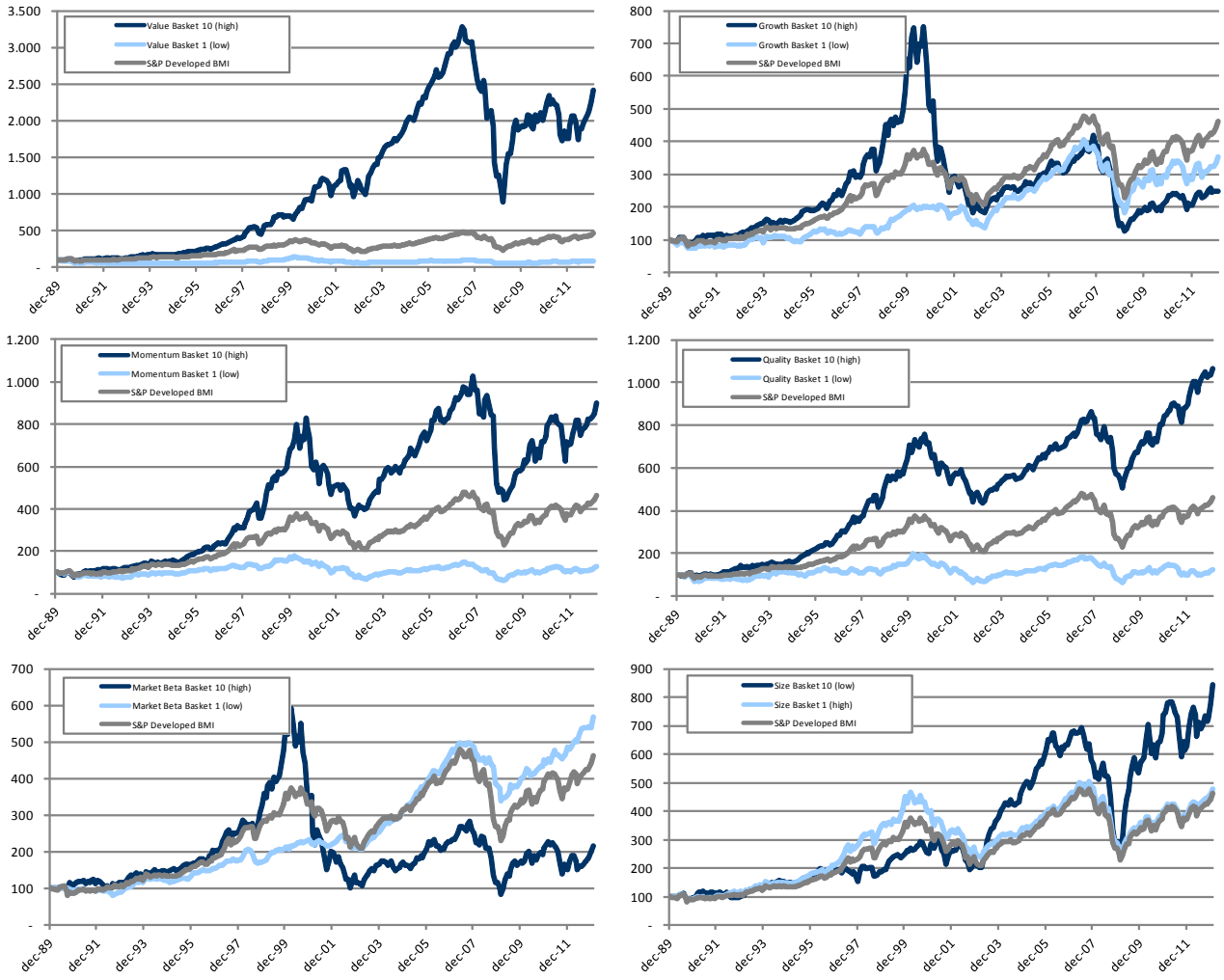
	Average Monthly Return	Monthly Std.Dev	# of Obs	T-test statistic (H0: Spread = 0)	P-Value
P/E	1.3%	4.8%	277	4.47	0.00
P/B	0.5%	6.1%	277	1.35	0.18
Div Yield	1.1%	4.8%	277	3.72	0.00
FCF Yield	0.4%	2.8%	277	2.43	0.02
Asset Growth	-0.4%	4.1%	277	-1.48	0.14
EPS Growth	0.0%	2.9%	277	0.12	0.90
3M Change in Fwd EPS	0.5%	4.5%	277	1.86	0.06
1M Reversal	-0.3%	6.5%	277	-0.73	0.47
EPS Estimates Revisions	0.5%	3.3%	277	2.39	0.02
Market Beta	-0.4%	7.1%	277	-0.88	0.38
ROIC	0.9%	4.7%	277	3.28	0.00
ROE	0.8%	4.8%	277	2.90	0.00
Net Margin 5Y Stability	0.2%	3.0%	277	0.85	0.39
Size	0.2%	4.5%	277	0.81	0.42
Value	1.2%	5.0%	277	4.09	0.00
Growth	-0.1%	4.4%	277	-0.51	0.61
Momentum	0.7%	4.3%	277	2.80	0.01
Quality	0.8%	4.5%	277	2.90	0.00

Figure 3.2 and the corresponding t-tests in table 3.3 show significant differences between the various factors in terms of both average monthly return and monthly standard deviation. This preliminary analysis indicates statistically significant premiums for the composite value (+1.24%), momentum (+0.71%) and quality (+0.77%), indicating potential benefits to investors willing to pursue such strategies. The size (+0.21%), market beta (-0.35%) and growth (-0.12%) premiums are insignificant during the sample period. Thus, any preliminary relationship between those factors and investment performance cannot be confirmed.

[35] Source: FactSet, own calculations
[36] Source: FactSet, own calculations

Before discussing each strategy in depth, the historical performances of the long-short spreads are presented in figure 3.4 below.

Figure 3.4 – Developed Performance Index Graphs of Long- and Short Baskets (Index Year 1990 = 100)[37]



The graphs in figure 3.4 not only confirm the results presented earlier but also emphasize the power of compounded returns. The long value basket reached an index value of 2408 against an index value of just 78 of the low value basket, resulting in an outperformance of more than 2956%[38] during our 22-year sample period. If anything, this highlights the substantial benefits available to investors if they are able to implement these strategies. The specific developments will be discussed in the following.

[37] Source: FactSet, own calculations
[38] Calculated ex. transaction costs, which will be discussed later

3.1 Value

The emergence of the value strategy can be traced back to the work of Graham and Dodd and their book Security Analysis, in which the authors urged investors to seek stocks which trade at a discount to their fair market value.[39] While this approach appears straightforward (buy cheap and sell expensive), a great deal of uncertainty remains with regard to the estimation of fair market value. Intuitively, the market value of equity is equal to the discounted transactions between the firm and its investors along the lines of Gordon's growth formula presented in the methodology section. As such, the fair value of a company depends on its future earnings, profitability and risks.[40] While I will not delve deeper into the delicate science, or art, of various valuation models the majority inherently relies on forecasting a firm's performance into the future. Lakonishok, Shleifer and Vishny (1994) suggest that analysts extrapolate past earnings growth too far into the future and that in doing so they wrongfully drive up the price of these so-called "glamour" stocks. Value investors are contrarian investors who exploit these forecasting errors by betting against the mass psychology and exuberance of market participants. In other words, they aim to identify the value that can be justified by facts that are not affected by psychological biases.

The value phenomenon has been studied rigorously by academics and practitioners. While the literature has not yet reached common ground on why we observe value premiums, little doubt remains of their existence. So how do investors identify value? There is no easy straightforward approach as an evaluation of the fundamental value of a firm requires a thorough analysis of the business. However, both practitioners and scholars apply a series of financial ratios that all include some fundamental value relative to the price of the company, as a proxy for market expectations. This section covers four of the most common value factors: P/E, P/B, Dividend Yield (D/P) and Free Cash Flow Yield (FCF/P).

3.1.1 Price-to-Earnings

Among the value factors, the P/E ratio remains among the most popular within both the academic and especially practical areas of finance. Investors who apply this strategy believe that earnings are a reliable proxy for the fundamental value of a company. As such, companies with high earnings relative to price are considered cheap compared to their underlying value.

So, can the P/E help investors identify companies trading at a discount to their fair value? The results of the analysis shown in table 3.1, 3.3 and figure 3.2 support this hypothesis. The P/E ratio yields a highly significant premium of 1.30% per year, generating the highest shareholder return among all factors during the sample period. The large premium is driven by both the long and short legs of the strategy; thus, short restricted investors will be able to realize a significant portion of this premium as the long P/E strategy basket has yielded the highest return (+1.23%) among all baskets in the sample. Furthermore, the elevated

[39] Risager (2009)
[40] Koller, Goedhart and Wessels (2010)

return-risk ratio of the premium (0.27x) suggests that the premium of the P/E ratio cannot be explained by increased total risk. In comparison, Fama and French (1998) examine the international evidence on the existence of a P/E premium during the time period from 1975 – 1995. In line with our findings, they discover a significant premium of 6.82% pa., which is well below the annualized result of 16.70% found in the analysis. As other studies have shown that the value premium has been soft during the sample period, the discrepancy is likely explained by the wide basket cut-off points used by Fama and French.[41] The results thus highlight a yearly premium of nearly 10% available to investors by looking for deep value stocks.

An examination of the premium within the underlying markets shows that the P/E factor premium is largely nonexistent in the US market from 1990 – 2013. While this finding is supported by the findings of Fama and French (2011) it is a sharp contrast to previous academic results from Basu (1977) and Lakonishok, Shleifer and Vishny (1994) who show that the premium has been higher in the past. As such, the premium does not appear stable over time.

Critics of the P/E approach claim that the ratio is easily affected by non-systemic factors such as variations in institutional depreciation and amortization rules (as seen in Japan), differences in accounting principles, large one-off items on the P&L and temporarily depressed earnings. For example, pharmaceutical companies with large R&D spending can choose to book their research on the balance sheet, which increases share capital, or they can expense the R&D costs on the P&L, thereby affecting earnings.

On the contrary, the results have proved the opposite. Earnings appear to be a strong indicator of the fundamental value of companies, and as such, investing in companies priced too low relative to their realized earnings has been a profitable strategy for investors.

3.1.2 Price-to-Book

The P/B ratio enables investors to compare the amount that the company has raised from shareholders and reinvested on their behalf with the total market value of the firm's shares, thereby indicating investors' willingness to pay for the rights to the future growth and earnings of the company. Conversely, value investors search for companies that are under-valued relative to book-value and they thus invest in companies with low P/B.

Based on recent data from 1990 – 2013 the results in table 3.1 above indicate that P/B has not yielded a statistically significant premium (+0.47%). Moreover, both the premium and the long factor basket show heightened volatility levels (6.05% and 7.11% respectively), and the returns appear non-linear as one progress from basket 1 to 10. Thus, the results question the validity of the P/B's ability to generate attractive returns for investors.

[41] Fama and French (1998) separate the market into three baskets containing the highest 30%, middle 40% and the lowest 30%.

A possible explanation behind the increased volatility of the high basket, and thus also the premium, may be relative distress factors as argued by Chan and Chen (1991) and Fama and French (1992). In their view, firms trading cheaply relative to their book-value of equity are likely to suffer from financial distress as well as a higher cost of capital due to increased risk. Companies within the long-basket are more prone to extreme returns, as they may default (i.e. -100%) or appreciate sharply due to market relief. In their studies, Fama and French (1992) further examine this argument through cross-sectional analysis and find that the P/B factor is capable of explaining a significant part of return variation. From a practical standpoint, the increased volatility in the long-basket stresses the importance of thorough analysis of an investment case in order to avoid value traps. Furthermore, the P/B factor is by no means a "clean" variable as it is affected by discrepancies within capitalization of R&D-costs, off-balance sheet leasing and goodwill.

The insignificance of the P/B factor is surprising given the sheer volume of studies which have confirmed the existence of significant premiums across several regions in the past.[42] As such, the data suggest that the P/B premium has more or less disappeared during the sample period, as argued by Jegadeesh and Titman (2001). The style cycle model, which is developed in the following chapter, indicates that the soft performance of the P/B factor is largely due to under-performance during slowdown periods, which corresponds to the explanation above as financing tend to be stressed during such periods. The P/B index graph appendix 8.4 also show a significant decline in the long-basket during the financial crisis as banks reduced their lending capacity.

In conclusion, the data presented in table 3.1 for the developed markets do not indicate any significant benefits from following a naïve low P/B strategy, and that the P/B premium in the sample is significantly lower than previously, suggesting that the premium is not stable over time. The premium and long baskets show high levels of volatilities despite a high degree of diversification within baskets, which indicates a degree of systematic risk that may be explained by increased risk of distress. However, this does not mean that book-value of equity is a poor predictor of fundamental value but rather that investors should seek to accumulate sufficient knowledge about the company in order to eliminate the risk of investing in a potentially distressed company. The inherent risk of the P/B factor can to some degree be mitigated by applying composite ratios, which will be examined later.

3.1.3 Dividend Yield

The dividend yield factor, measured as the ratio of 12m trailing dividend to price, is well aligned with the contrarian strategies of value investors. Intuitively, paying large dividends is a strong signal to investors that the firm is not planning on using its cash for immediate or future growth. Thus, companies with high dividend yield are considered value stocks. The reverse holds for little- or non-dividend paying firms with

[42] Fama and French (1992, 1998), Lakonishok, Shleifer and Vishny (1994), Bird and Whitaker (2003), Cai (1997), Chan, Hamao and Lakonishok (1991)

high plowback ratios in order to reinvest earnings back into the business to finance further growth initiatives. Thus, the dividend yield factor can be seen as a proxy, along with the P/E and P/B and FCF Yield factors, for the markets' expectations of future performance and growth.

Despite its intuitive appeal, the dividend yield factor has some inherent disadvantages. First, the flow of funds between a company and its shareholders is not limited to dividends and share capital increases, as firms also have the option of share repurchases, thereby paying an indirect dividend by decreasing the amount of outstanding shares with claims on the firm's earnings. While the two approaches are not completely similar, they both capture the effect. As such, one may wrongly classify a company as a growth firm despite large capital outflows from the company to its shareholders.

Regardless of the potential disadvantage, the dividend yield is a strong value indicator. The results in tables 3.1 and 3.3 show that the dividend yield factor yielded the second highest premium (+1.08%) among the non-composite factors, which is driven by both legs of the spread. Furthermore, the spread is also highly significant. Interestingly, basket 1, which contains companies with high growth expectations, has yielded the lowest return of all baskets in the sample. A slight decrease between baskets 9 and 10 can be observed, though the difference is only minor and is likely due to chance. As such, investors should actively seek out stocks with high dividend yield and avoid or short, if possible, low dividend paying stocks. The excess return of the high dividend yield basket and the premium appear stable relative to their excess return. As such, the premium yields the second highest return-risk ratio of all non-composite factors. In other words, the dividend yield premium yields attractive returns to investors without increased total risk.

Examining the results from the underlying markets show positive dividend yield premiums, though the spread is small and insignificant in both the US and European markets. This is confirmed by recent studies of Bird and Whitaker (2003, 2005) on the European markets from 1990-2002, in which they also find limited short term returns on portfolio formed on dividend yield. As such, this strategy appears most viable on the broad developed markets.

At first, positive premiums for dividend paying stocks may come as a surprise. As theorized by Modigliani and Miller, the dividend policy of a company is irrelevant given no taxes or bankruptcy costs. Their divided-irrelevance theory states that investors can affect the yield of their holdings regardless of their dividend payout ratios, as they can buy or sell stocks to replicate the desired cash flow from dividends.[43] Furthermore, as dividends are often taxed at higher rates than capital gains, the common presumption is that dividends are less valuable than capital gains, thus making share repurchases more favorable from an investor perspective.[44] So what may explain the dividend premium? Apart from the contra-growth arguments

[43] Koller, Goedhart and Wessels (2010)
[44] Fama and French (2000)

mentioned above, dividend payments holds strong signaling value. The payment of dividends is considered a confirmation of the operational strength of the underlying business and suggests increased alignment between the interests of management and shareholders, as dividend payments reduced the likelihood that managements will reinvest cash as low returns thereby inducing more discipline in management's investment decision making. Several other compelling arguments for (and against) dividends can be made; however, this subject will not be pursued further due to the size limitations of this paper.

Following the sharp decline in percentage in dividend-paying firms since the late 1970s, the characteristics of dividend-paying firms have received much academic attention. Research suggests three characteristics that affect the dividend payment decision: profitability, size and investment opportunities. Investors who follow the high dividend strategy will tend to invest in large profitable firms with limited new investment opportunities, as small firms with low margins and large investments often do not have the cash flow to support dividend payments. In fact, the investments of firms that have never paid dividends exceed earnings on average. Examining the dividend history of firms provides some interesting results. Former payers yield the lowest returns as they tend to be distressed and have low earnings and few investment opportunities. Firms that have never paid dividends are more profitable than former players and have strong growth opportunities. In support of the results, dividend-payers yield higher returns than both non-paying firms.[45]

In conclusion, the data indicates a large premium for the dividend yield factor without increased volatility. As such, it is an attractive strategy for contrarian value investors. As these results are likely to apply for companies with high buyback ratios, investors should be cautious not to wrongfully reject companies using this approach. Moreover, high dividend yield stocks tend to be large profitable companies with low growth opportunities, which is in line with the contrarian arguments presented above. Lastly, investors should be watchful of their high dividend positions as empirical evidence indicates that firms that halt their dividend payments are potential value traps, and that they may suffer from distress and low profitability.

3.1.4 Cash Flow Yield

The underlying argumentation for cash flow yield as an indicator of expected future growth is in many ways identical to that of the P/E factor. According to Gordon's growth formula, holding discount rates and payout rates constant, companies with a high cash flow yield have a low expected future growth rate and vice versa. Conversely, low cash flow yield stocks are classified as "glamour" stocks with high growth expectations. As such, value investors search for companies with high cash flow yield.

While the P/E and cash flow yield are similar in many ways, there are some differences which suggest an examination of both factors. The difference between the free cash flow from firm (FCFF) and earnings is apparent when examining the differences between the cash flow statement and the P&L. While I do not go

[45] Fama and French (2001)

further into this, the following differences should be noted: The cash flow is unaffected by depreciation and amortization, though it includes capital expenditures (CAPEX) and changes in balance sheet items such as working capital, liabilities etc. Furthermore, the factor may also be affected by accounting differences as previously discussed. Despite the differences, the cash flow yield remains a popular value indicator within the academic literature.[46]

While historical surveys indicate significant cash flow yield premiums from the 1960s to the mid-1990s,[47] the data does not support the existence of a premium in recent data as an insignificant spread of 0.39% is observed. The results indicate relatively minor differences among baskets, which in some cases suffer from unexplained directional changes. Therefore, I remain critical of the predictive power of the factor. The spread is the most stable within the sample with a standard deviation of only 2.79%; however, this is not sufficient to reject the hypothesis that the premium is significantly different from zero. Examining the underlying markets shows much the same results.

The results do not warrant that investors should actively invest based on the cash flow yield factor. This, however, does not mean that cash flow is not a key metric when evaluating potential investments as it is essential for the operations of any firm.

3.1.5 Composite Value

The following sub-section summarizes the findings on the four value factors by examining the performance of the composite value factor.

The composite value strategy has yielded positive returns across all three developed markets and has been highly significant in Europe and Japan. Therefore, it is not surprising that the data for the aggregate developed markets indicate a large and highly significant value premium of 1.24%, driven by both the long leg (+1.15%) and the short leg (-0.09%). As the premium is driven by both legs, short restricted investors may still realize a considerable premium as the long leg has outperformed the S&P Developed BMI by 0.60% per month. Furthermore, the low value baskets 1 and 2 yield substantially lower returns than the remaining baskets which emphasize the importance of avoiding high "glamour" stocks with immensely exuberant growth expectations.

Critics of the value strategies argue that value stocks are cheap for a reason. However, the results presented in table 3.1 indicate that the value premium cannot be justified by adjusting for total risk. An examination of systematic risk (see later) also yields the same results. As such, I can reject the notion that value stocks are fundamentally more risky. As previously discussed, arguments can be made that value stocks carry an

[46] Fama and French (1998), Lakonishok, Shleifer and Vishny (1994)
[47] Fama and French (1998), Lakonishok, Shleifer and Vishny (1994)

inherent risk of financial distress,[48] which are likely to affect companies with high P/B. Furthermore, when investing in value stocks an investor always suffer the risk of value traps, where a stock appears to be trading at inexpensive fundamental values but never improve as companies, or even sectors, can be suffering from increasing competition, inability to generate necessary and consistent profits, lack of new products or earnings growth and ineffective management. This emphasizes the importance of thorough analysis of companies when following value strategies.

Figures 3.4 and 4.1 show the development of the high and low value strategies and the value premium during the sample period. While the long value strategy was roughly unaffected by the bursting of the tech-bubble in the late '90s, it was severely hit by the bursting of the housing bubble and the resulting financial crisis. This can partly be explained by the fact that financial companies are predominately characterized as value companies. As such, when faced with large loan losses, regulation and reduced debt capacities, these companies suffered low returns.

Studies using recent data suggest that the value premium has diminished or even disappeared, and that it is not observable after the sample periods examined in the original studies.[49] As such, some academics have proposed that the value premium is the result of data mining. The results of this paper, along with several other studies, reject this claim as the premium has been observed on several different markets and across varying sample periods. While the data provide strong support for the continued existence of the value premium, I have been able to document declining premiums for the P/B and cash flow yield factors. So why do we observe this? It is possible that over time an increasing amount of investors will become convinced of the value of contrarian investment and consequently the returns of the value strategies will be traded down. In addition, the increased demand for quantitative value investment strategies will increase demand for value stocks and reduce potential agency problems that result in picking of "glamour" stocks.[50]

In conclusion, the data confirm the existence of a large value premium of 1.24% per. As such, contrarian strategies where investors bet against the exuberant and biased growth expectations in the market is an attractive approach, both from an absolute and risk adjusted perspective. However, investors should be careful not to rely on the presented ratios alone. In order to achieve the maximal return, investors should couple the approaches presented above with in-depth industry and firm knowledge in order to identify undervalued companies along the lines legendary investors such as Warren Buffet, Benjamin Graham and David Dodd.

[48] Fama and French (1992), Lakonishok, Shleifer and Vishny (1994)
[49] Jegadeesh and Titman (2001)
[50] Lakonishok, Shleifer and Vishny (1994)

3.2 Growth

The growth strategy is measured by three factors: asset growth, growth in earnings per share (EPS growth) and a composite factor combining the two ratios. This approach examines the stock performance based on prior growth results, and not expected growth, which is captured be the value factors presented in the section above. This approach provides an alternative dimension in analyzing the notions of value and "glamour" stocks.

Advocates of the growth strategy argue that companies with high growth rates will be able to sustain or even improve their growth rates in the future and thus outgrow the market to become the winners of tomorrow. Growth investors, then, extrapolate historical growth rates into the future. Although intuitive, strategy is not without caveats. As shown by Gordon's growth formula and various other valuation models, growth increases the value of a company given that the return on invested capital (ROIC) is higher than the weighted cost of capital (WACC). As such, excessive growth is not, in itself, a source of value. Another problem arises as some investors mistake good companies with good investments as they forget that even the best companies can be bought at too high a price. Research also suggests a tendency of mean reversion in both growth and profitability as businesses mature.[51] An underestimation of this mean reverting behavior will eventually lead to disappointing sales and earnings figures. According to established financial theory growth opportunities also carry an inherent risk, as it is dependent on the future economic circumstances of both financing and potential investment returns. As such, growth companies ought to be a source of both higher total- and systematic risk. Despite potential pitfalls, however, the growth investment style possesses an intuitive appeal to many investors.

The analysis applies two approaches in measuring growth: The asset growth factor measures the effect of returns of corporate asset investments, such as increased CAPEX, acquisitions, public equity and debt offerings and bank loan initiations, as well as disinvestments such as spinoffs, sale of assets, dividends and share repurchases. The EPS growth factor allows an examination of whether growth in earnings yields positive returns to investors or if this has already been discounted or overstated in the current share price.

3.2.1 Asset Growth

The asset growth factor offers some potentially interesting conclusions. By construction, the asset growth factor captures the effect of a firm's total investment and financing activities, such as CAPEX, acquisitions and divestitures, transactions with shareholders etc. Thus, I will be able to evaluate whether large increases in total assets is an attractive property for investors.

The data documents a negative asset growth spread of -0.34%, which is primarily driven by the long basket underperforming the market by -0.22% on a monthly basis. Although the premium appears stable with a low

[51] Lakonishok, Shleifer and Vishny (1994)

volatility (the under-performance is only significant at the 15%-level), it does yield the lowest return-risk ratio among all baskets. This is consistent with the findings of Cooper, Gulen and Schill (2008) who find a negative monthly premium in the year after portfolio formation of -1.05% on the American market during 1968-2003 and Wanatabe, Xu, Yao and Yu (2012) who examine the global market from 1982-2010 and find a negative monthly premium of -0.34%. Surprisingly, they find that the asset growth factor is found to have larger predictive power than other variables such as P/E, P/B, Size and Momentum. The empirical data thus indicates a negative relationship between asset growth and investor returns.

Cooper, Gulen and Schill (2008) decompose the asset growth factor for both the right- and left hand side of the balance sheet. Their analysis documents a significantly negative relationship between investments in non-cash assets, current assets, property, plant and equipment, as well as other assets and returns. On the financing side, the same negative relationship holds between especially debt financing and equity financing to some extent. Thus, according to their results, investors would be wise to avoid companies with high asset growth due to the factors mentioned above.

The question remains: why do we observe this negative relationship? The answer may come from one or both of two approaches. Supporters of the behavioral explanation argue that the mispricing may be due to 1) overinvestment and the empire-building tendency of company management, which leads to unprofitable investments, 2) timing of capital structure changes when increasing or decreasing external financing, 3) earnings management prior to acquisitions or financing activities and 4) excessive growth extrapolation of past growth by investors. The arguments from believers in rational pricing find that the negative relationship is due to either decreasing returns to scale or reduced risk after all real growth options have been exercised. So far, no compelling evidence has been put forth which distinguishes one of the above mentioned explanations and the reality may likely be a combination of all of the above.[52]

A decomposition of the underlying asset growth components such as the effects of either organic growth or acquisitions would prove interesting, though unfortunately it is not possible with the data. However, overwhelming evidence has been put forward, which document that acquisitions, on average, affects shareholder return negatively during the years following the acquisitions. This may be explained by unrealistic assumptions, unrealized synergies and problems with integrations.[53]

Despite the uncertainty as to why this anomaly is observed, the evidence in the data is clear. Investors should actively try to avoid exposure to companies with strong prior asset growth, as evidence from the aggregate developed markets indicate that historical asset growth has a negative effect on shareholder returns.

[52] Watanabe, Xu, Xao and Yu (2011)
[53] Koller, Goedhart and Wessels (2010)

3.2.2 EPS Growth

By examining EPS growth I am able to determine if companies that have been able to increase their earnings yield higher investor returns.

EPS growth is a catch-all variable, which captures the effect of both standard growth measures such as sales growth and margin expansion, which is characteristic of the quality style. In other words, a decomposition of the two value drivers, growth and profitability, is not possible. The EPS growth is inherently linked to the asset growth factor through a company's return on assets (ROA). Thus, if a company is capable of maintaining ROA stable while growing the asset base, earnings should increase proportionally.

The results presented in table 3.1, 3.3 and figure 3.2 indicates a non-existent premium of 0.02% which is highly insignificant. Surprisingly, both the long- (0.23%) and short (0.20%) legs of the spread underperform the S&P Developed BMI. Investors would do well to avoid both companies with high or low EPS growth. However, the differences between baskets appear volatile and no reliable conclusion can be reached at this point.

Why these results are observed remain unexplained; however, it is likely to be the effect of a mixture of underlying variables working in different directions or unbiased growth expectations. The conclusion, therefore, remains somewhat vague as EPS Growth is found to have little explanatory power of stock returns despite its apparent popularity.

3.2.3 Composite Growth

The combined Growth factor does not yield any significant premium, as the EPS growth factor affects the results adversely. Nevertheless, a negative premium of -0.13% is observed, which is largely driven by the high-growth basket under-performing the market by 0.22% each month. Furthermore, as shown in figure 3.4, the premium shows substantial boom-bust characteristics during the dot-com bubble, which is most likely explained by an excessive amount of IT-stocks within the high growth portfolios during that period.

Sales growth has been suggested as a third measure of past growth as it is less volatile than earnings or cash flow. Lakonishok, Shleifer and Vishny (1994) examine the performance of decile baskets formed on average 5-year sales-growth in the NYSE and AMEX markets from 1968 to 1990. They find a significant negative relationship between past sales-growth and future shareholder returns with a monthly average premium of -0.55% during the five years after portfolio formation. Furthermore, they examine two-dimensional approaches by sorting stocks according to two factors, which allows them to specify value and growth stocks more accurately. Their results indicate that combining cash flow yield and sales-growth to sort stocks yield the highest returns to investors with an average monthly premium of 0.85%, which clearly indicates the benefits of exploiting multiple dimensions of the value vs. growth anomaly.

So what does this mean for investors? The growth factors presented in this section provide a different perspective on growth, as they are concerned with realized rather than expected growth, which is indicated by the value factors. Despite the difference, the asset growth factor shows much the same results as the market appears to extrapolate past earnings far into the future, thus underestimating the mean reversion shown in Cooper, Gulen, Schill (2008) or unprofitable asset investments. Another example of the inherent exuberance typical of growth-stocks is the development of high-growth returns during the tech bubble in the late 1990s. As can be seen in figure 3.4, the development of the high-growth basket experienced massive gains during the rise of the tech-bubble as expectations increased beyond what was justifiable by fundamentals. When the exuberance faded the bubble imploded, sending growth stocks plummeting to levels below the market index. As such, investors are recommended to avoid unnecessary exposure to companies with high growth as they are likely to suffer from exuberant expectations and consequently may underperform the market.

3.3 Momentum

Momentum investment involves selecting stocks on the basis of past trends in either returns or market sentiment. This dissertation evaluates two distinct types of momentum strategies: momentum in returns and earnings momentum.

First, evidence of return momentum is analyzed by examining the returns of short-term winners and losers. The second approach is based on changes in earnings estimates. This section will focus on the change in consensus earnings forecasts, measured by the 3M change in forward EPS and the EPS estimates revisions factors. These forecasts have an advantage over reported earnings as they occur earlier in the information cycle and, for the most part, are updated and rebalanced more frequently.

The three momentum factors applied in this analysis enable an examination of the relationship between returns and momentum in shareholder returns as well as momentum in consensus expectations, in order to determine whether these strategies may provide significant returns for investors. The effect of the combined factors through a composite strategy is also examined.

3.3.1 1M Reversal

Traditional return momentum investing suggests that recent trends in returns will be maintained in the future. Thus, momentum investment is a bet that "favor" stocks (which have yielded high returns prior to portfolio formation) will continue to outperform the market. The usual reasoning behind such a strategy is that the performance of stocks and to some extent markets is largely driven by market sentiment.[54] The approach of sorting according to just one-month return is a relatively short term measure compared to other approaches used in the academic literature.

[54] Bird and Whitaker (2003)

The explanatory power of past returns on future performance has, and continues to be, a subject of much scrutiny by practitioners and scholars in their search for exploitable return patterns. At one extreme, this approach has spawned a myriad of trading strategies which aim to continuously exploit even the slightest price movements, whereas the established academic literature, such as De Bondt and Thaler (1985) apply longer horizons of up to 36 months. Another reason for the thorough examination of autocorrelation is its applicability in assessing market efficiency in the weak form, which entails an analysis of whether returns follow a non-random walk stochastic process.

The results in table 3.1 indicate little evidence, if any, of the existence of a short-term price momentum factor. The strategy yields a premium of -0.27%, which is highly volatile and thus insignificant as shown in table 3.3. Interestingly, the entire spread is driven by the long basket, which indicates that companies which have shown strong results mean revert in the following month. The insignificance of the finding is evident when examining the underlying regions. In both the US (+0.22%) and European (-0.22%) markets, low and insignificant returns are observed, though the Japanese markets reveal a surprisingly high degree of mean reversion with a premium of -1.43%, which is highly significant. As can be seen from panel A in table 8.7.1 in the appendix, the premium is driven by a large jump in inter-basket returns between baskets 1 and 2, indicating that the firms with the worst performance in the month prior to portfolio formation outperform the market by 0.80% on average in the following month.

Does this mean that the Japanese market is less efficient than the US and European markets? A closer examination of the premium indicates that the 1M Reversal factor premium has been highly volatile and negative in the periods following the bursting of the stock market bubble in 1990 and the financial crisis in Asia in 1997. The remainder of the data does not show any evidence of significant premiums. It appears that the Japanese market has shown a tendency to inefficiency when market volatility is high.

While the EMH cannot be tested directly due to the joint hypothesis problem,[55] the data do not provide any evidence against the random walk process inherent in the EMH. Despite the statistical insignificance, the slightly negative premium is not surprising as mean reversion is consistent with the overreaction hypothesis of De Bondt and Thaler (1985, 1987): Investors are poor Bayesian decision makers[56] as investors tend to overreact, since they overweight recent information and underweight "base" data. As a consequence, stock markets tend to increase too much relative to fundamental values during good times due to excessive risk-taking and optimism, and undershoot equilibrium values during bad times due to unwarranted pessimism and fear.[57] This leads to a pattern of negative autocorrelation similar to that observed within the data. Other scholars have examined alternative explanations such as variations in bid-ask spreads and lead-lag effects

[55] Campbell, Lo and MacKinlay (1997).
[56] i.e. they fail to correctly adjust their estimates for a hypothesis as additional evidence is learned.
[57] Risager (2009)

between stocks. However, despite the vast amount of research that confirms the existence of these anomalies, the academic literature struggles to provide empirical evidence of why momentum in stock returns is observed.[58]

Based on the results, I cannot confirm the existence of any profitable short-term trading strategies available to investors. However, in accordance to the overreaction hypothesis and the results for the Japanese market, investors should try not to be caught by the paranoia of Mr. Market. In conclusion, as argued by many famous investors such as Keynes,[59] investors should remain unconcerned with short-term movements in the market in order to avoid falling prey to potential excessive optimism and pessimism in the market. I have not reviewed the evidence of medium and long-term momentum in stock returns; however, the interested reader is referred to Bird, Whitaker (2003) for a concise review of the existing empirical data.

3.3.2 Forward EPS and Estimates Revisions

In order to examine the effect of momentum in market sentiment, the two factors: 3M Change in Fwd EPS and EPS Estimates Revisions are analyzed as they measure both the level and the volume of forecast changes.

By examining changes in consensus EPS estimates, I can investigate whether the companies grow their earnings faster than expected in the market, thereby prompting recommendation upgrades, or slower, which will result in downgrades. Although both 3M Change in Fwd EPS and EPS Estimates Revisions are based on analysts' forecasts, the first measure captures the relative power of the signal, while the latter incorporates the fact that analysts tend to herd when adjusting their. Relying on consensus estimates also has its downsides. For instance, estimates and recommendations issued by analysts may be colored by various incentives, such as the desire to promote trading thereby generating increased fees and commissions or by being reluctant to alienate management.[60] As a result, analyst forecasts may not provide an accurate measure of the expectations of investors in the market.

Although behavioral biases may affect analysts' forecasts both the 3M Change in Fwd EPS (+0.50%) and EPS Estimates Revisions (+0.46%) show significant premiums. Interestingly, the 3M Change in Fwd EPS factor is largely driven by the short leg underperforming the market by 0.60%, thereby indicating a very poor investor return for companies which have suffered large EPS downgrades during the last three months. On the other hand, companies which have been favored by analysts do not appear to yield any substantial outperformance relative to the market. Intuitively, this indicates that downgrades have a significantly larger negative impact on returns than upgrades. This pattern is also confirmed in the US and European markets. As

[58] Chan, Jegadeesh and Lakonishok (1996)
[59] Risager (2009)
[60] Chan, Jegadeesh, Lakonishok (1996)

such, investors should actively aim to avoid stocks which have recently fallen out of favor with sell-side analysts.

Surprisingly, stocks which have received a large volume of either up- or downgrades outperform the middle deciles of the EPS Estimates Revisions due to a decline in return between basket 9 and 10. This is unexpected as one would anticipate a smooth increase in returns as the proportion of upgrades increase, assuming that analysts have traction in the market. No direct explanation can be provided for this phenomenon; however, it may be due to the underlying calculation of the ratio, which is presented in the methodology chapter. This observation is unlikely to be a fluke as this relationship is also observed within the separate underlying markets.

Despite the inconsistencies and potential biases, the premiums of the two factors indicate a positive relationship between estimate revisions and future return, suggesting that analysts have some degree of traction in the market. Thus, in conclusion, the data indicates that investment in companies that have experienced positive revisions from sells-side analysts in the month prior to portfolio formation has yielded positive returns, albeit more importantly, investors should avoid companies which have suffered from large downgrades.

3.3.3 Composite Momentum

I now summarize the findings on the momentum strategies by examining the returns of the composite momentum strategy. Contrary to the previous composite factors, I reverse the score for the 1M Reversal factor, which means that a company will receive a high composite momentum score by having a low prior monthly return coupled with high 3M Change in Fwd EPS and EPS Revisions Ratio. This captures the positive earnings drift along with the short term mean reversal in returns.

The composite momentum factor yields a stable and significant monthly spread of 0.71%, which is primarily driven by the short basket underperforming the market by 0.46%. Thus, in line with the previous findings, investors should actively try to avoid companies with a high return coupled with declining EPS revisions in the month prior to portfolio formation.

Although the academic literature has confirmed the existence of significant autocorrelations in returns, no studies have been able to confirm in a reliable way why these premiums are observed.[61] As the excess return of momentum strategies cannot be explained by traditional cross sectional parameters, such as P/B and Size, believers in the EMH argue that momentum must represent an omitted risk-variable of the cross-section of expected returns and they consequently treat it as the fourth factor of the traditional 3-factor model by Fama and French. However tempting, the argument that momentum simply represents some unknown risk factor

[61] Campbell, Lo, MacKinlay (1997), Chan, Jegadeesh, Lakonishok (1996)

does not explain why we observe these anomalies. Founded in behavioral finance and depending on the measurement-horizon, various arguments have been put forward. In the short run, the predominant explanation involves market overreaction to new-flow followed by a reverse adjustment in stock prices, causing mean reversion. In the medium to long run scholars point to the delays in which the market and analysts properly account for new information, causing returns to drift over the course of the following years.[62] The lack of understanding continues to prompt skepticism from practitioners as exemplified by Warren Buffet's statement "*Investors should be skeptical of history based models. Constructed by nerdy-sounding priesthood using esoteric terms such as beta, gamma, sigma and the like, these models tend to look impressive. Too often, though, investors forget to examine the assumptions behind the symbols. Our advice: Beware of geeks bearing formulas".*[63]

There are several caveats in applying momentum-based strategies that require to be mentioned. First, given the constraints that many investors face it may not be possible to establish short positions in low momentum stocks, thereby eliminating the majority of the observed premium. Second, momentum strategies are trading-intensive. The average turnover across the deciles baskets of the composite momentum strategy is 85.8% per month, thereby incurring massive trading costs on investors.

The approach applied in this section has been rather superficial, though a deeper examination of the merits of momentum strategies is beyond the scope of this thesis. However, the academic literature on this subject is vast and interested readers are referred to Chan, Jegadeesh, Lakonishok (1996) and Jegadeesh, Titman (2001) for a thorough review of the existing work.

In conclusion, although I observe a significant positive premium, the potential short-term momentum strategies presented in this may not be readily available to investors due to uncertainty concerning the existence of the premiums and high trading costs. On the other hand, the results do provide some interesting insights. First, although the data do not provide any evidence against the EMH, significant mean reversion in markets dominated by high volatility is observed. Second, revisions of earnings estimates by analysts appear to have traction in the market as prices usually follow up- or downgrades in the following month. Lastly, investors should look out for stocks with high returns and EPS downgrades in recent time as these have been shown to underperform in the short run.

3.4 Market Beta

This section examines the relationship between Market Beta and future performance. As firms within different markets have different total risk loadings, stocks are ranked according to their systematic risk, measured as the raw beta of the company against its home universe calculated as described in the

[62] Chan, Jegadeesh, Lakonishok (1996)
[63] Risager (2009)

methodology section. Investors following this approach believe in leveraging the market return by increasing the market beta of their portfolios, hoping to benefit from increasing markets. As markets in general have yielded nominal returns in the region of 6-8%, this strategy ought to outperform the broad market portfolio. Furthermore, this strategy is inherently more risky as increasing the non-diversifiable systematic risk will increase the total risk of a portfolio.

However, this approach has some severe disadvantages. First, the market beta measure is similar to the beta measure of the widely criticized CAPM, which links the expected return of an asset to its systematic risk through cross-sectional analysis. Another caveat relates to the calculation of the beta-variable. As presented by Bodie, Kane and Marcus (2009), the beta-values are calculated ex ante and rely on past data covering a year. This approach assumes an unchanged business model over time, which may not be the case.[64]

The empirical results in table 3.1 indicate an insignificant but negative spread of -0.35% of the market beta factor, thus yielding the lowest return among all strategies in our sample. This is unexpected as high beta companies are expected to outperform low beta companies in an increasing market. While the negative premium is surprising, the high volatility of the premium and the high beta basket is expected as per the argumentation above. Furthermore, the performance is primarily driven by the high basket (+0.28%) underperforming the market by 0.27%. The index graph in figure 3.4 show much the same pattern as the composite growth factor, as it is also severely affected by the tech-bubble in the late 1990s. The underlying markets all indicate the same pattern, thus eliminating probability of this being a chance result.

In summary, I am unable to confirm the existence of a market beta premium, thereby supporting the arguments presented by Fama and French (1992) and Basu (1977) that the beta-relationship embedded in the CAPM disappeared in the early 1960s. I discuss this in detail later.

This has several implications for investors. First, increasing the market beta of one's has not been a profitable strategy from 1990 to 2013. At most, investors have achieved elevated risk levels without compensation by increased returns. As such, investors would do well to avoid high beta companies using the definition of this paper. However, institutional investors may have an interest in maintaining some degree of correlation between portfolio and market returns, since this decreases the risk of markedly underperforming their benchmark.

[64] The average monthly turnover of the baskets is 38.0% as shown in table 5.3, thereby indicating some degree of shift in beta values among firms over time.

3.5 Quality

The quality investment style entails investing in large and stable companies with high profitability ratios, such as return on invested capital (ROIC) and return on equity (ROE). These factors provide a measure of the strength of the underlying business, the competitive position and the degree in which its managers perform their basic task of investing capital. Moreover, the quality strategy is often considered a defensive strategy as companies with high profitability are often more robust to economic shocks.

Critics of the quality strategy argue that the value added by high profitability ratios is already reflected in the stock price, which means that investors will not benefit from high quality indicators. This analysis will test this claim. More naïve critics argue that the ROIC and ROE measures do not account for growth, and that they thereby do not fairly represent the value of the company. Although it is true that value is created by both growth and profitability, increases in ROIC or ROE will often lead to an increased firm value, whereas growth can be negative if ROIC is below WACC.[65] If the stock markets are efficient and we hold a firm's WACC constant, a rise in ROIC increase the market value of the firm, which leads to a higher P/B ratio. Following this argumentation, some scholars argue that quality companies are inherently low-value.[66]

In order to properly asses the quality of a firm's operations, two measures of profitability are employed: ROIC and ROE. While these are closely linked, they do have differences which make a separate analysis worthwhile. ROIC enables an analysis of the operating efficiency of the firm without accounting for the source of capital. ROE, on the other hand, also captures the effect of gearing. The relationship between the two ratios can be seen from the formula below: [67]

$$ROE = ROIC + [ROIC - (1 - T)k_d]\frac{D}{E} \quad \textbf{(3.2)}$$

$(1 - T)k_D = After\ tax\ cost\ of\ debt$
$\frac{D}{E} = Debt\text{-}to\text{-}equity\ ratio$

Equation 3.2 shows that ROE can be increased by either improving ROIC or taking on more debt. However, increasing leverage also increases the sensibility to changes in operating performance.

The last factor, Net Margin 5Y Stability, is not expected to have any explanatory power of future returns. Although margin stability is a key metric, it does not disclose any information on the profitability of the firm as a company could achieve a high score by maintaining a low and even unprofitable operating efficiency over an extended period of time. However, when combined with the composite factor it becomes a strong

[65] Bodie, Kane and Marcus (2009)
[66] Fama and French (2006)
[67] Koller, Goedhart and Wessels (2010)

indicator as it enables identification of companies with high and sustainable margins. Due to size constraints, this paper will not discuss the Net Margin 5Y Stability factor separately.

3.5.1 Return on Invested Capital

By analyzing ROIC I am able to investigate whether market prices properly reflect the underlying drivers of a firm's profitability, such as stronger pricing power due to competitive advantages, efficient cost control, favorable market conditions, high productivity levels etc. As per the previous argument, high ROIC firms are expected to have low-value indicators.[68] According to the 3-factor framework of Fama and French (1992), a negative premium and reduced risk for high ROIC companies is expected due to their low-value exposure.

Surprisingly, the evidence rejects this argumentation. Despite the negative value tilt, the results show a highly significant spread (+0.93%) between the high and low ROIC baskets. Although the majority of the spread is generated by the low basket underperforming the market by 0.64%, a smooth increase in return between baskets is observed, suggesting a uniform relationship between ROIC and future return. Furthermore, basket volatility declines as ROIC increases, thereby supporting the claim that highly profitable companies are indeed less risky. The high return and low volatility of the high ROIC basket yield the second highest return-risk ratio within our sample (0.20x). As such, the evidence shows that the market has systematically undervalued the effect of high profitability levels, which in turn has led to high shareholder returns for high quality investors.

In line with the results, Brown and Rowe (2007) examine the productivity premium in returns by measuring both the performance of quintile baskets sorted according to ROIC and the cross section in returns. In their survey of the 1000 largest US firms from 1970 – 2005 they are able to identify a significant alpha of 0.48% per month from high quality companies, which cannot be explained by common risk factors such as P/B, size, momentum and market beta. Their data also suggest that the alpha generation in selecting between high and low ROIC firms is unaffected by their value or growth tilts.

As the patterns within the data cannot fully be explained through conventional risk-based models this anomaly may be explained through mispricing. Following these arguments, the observed premiums may be caused by an underestimation of the value creation generated by profitability, overestimation of the mean reverting nature of the ROIC measure or because overlooked information slowly diffuse into the market. Another possible explanation is that the profitability levels of firms within sectors co-vary, and that this has been overlooked by investors. As such, they do not compare ROIC across sectors and they thereby fail to capture inter-sector changes in profitability. Brown and Rowe (2007) also examine this explanation but find little differences in future return and thus reject the hypothesis.

[68] Koller, Goedhart and Wessels (2010), Brown and Rowe (2007)

In summary, the data reveal a high and statistically significant ROIC premium within the sample period, which cannot be explained by total risk. The ROIC spread appears to be an exploitable anomaly caused by systematic mispricing of the value proposition of this factor. The results indicate that portfolio managers have an opportunity to enhance their expected return by increasing the exposure to in high ROIC companies.

3.5.2 Return on Equity

Although ROIC has several practical advantages when valuating companies, ROE is favored as quality indicator because of its ability to capture both operating profitability and the effect of financial gearing as shown in the formula above. As such, high ROE companies are likely to have both a high ROIC and a high D/E ratio. Thus, a comparison between both return and risk levels of ROE and ROIC provides insights into whether the market penalizes or rewards the shareholders of companies with high leverage ratios.

The ROE factor yields a large and highly significant monthly premium of 0.84%, which is primarily driven by basket 1 underperforming the S&P Developed BMI by 0.51%. Furthermore, the return appears to increase linearly as we move to higher ROE baskets. The premium is also significant within both the US and European markets. Thus, the empirical evidence shows an almost identical return pattern between ROE and ROIC, suggesting little differences in their ability to explain future shareholder returns. The conclusion is the same for both factors: Investing in highly profitable companies is likely to yield substantial outperformance in the long run. The similarity in the results suggests that the market properly adjusts its pricing for differences in leverage, which is likely due to increased risk of equity along the lines of Modigliani and Miller's proposition II.[69]

In terms of return predictability, the ROE factor has received considerably more academic attention than the ROIC indicator. Through an in-depth cross sectional analysis of returns on the American markets from 1963-2003, Fama and French (2006) find considerable persistence in the ROE factor, which cannot be explained by adjusting for P/B or size risk factors. In line with the results of this paper, they also verify a negative relationship between P/B and ROE, which indicates that value companies are likely to have lower levels of profitability. Further support of the results is also found in Haugen and Baker (1995). In their study of stocks in the Russel 3000 index from 1933 – 1979 they provide evidence that companies which have yielded high returns also have substantially higher ROE ratios than the remainder of the market.

In conclusion, the data confirm a continued high and significant ROE premium across the aggregate developed markets despite a negative tilt against the large value premium. Due to the smooth increase in returns across baskets it is highly likely that investors will be able to benefit from improving the average ROE of their portfolios, irrelevant of the starting point. Furthermore, the data indicate a high commonality with the ROIC factor, which is expected given their resemblance. The limited difference in returns across

[69] Ross, Westerfield and Jordan (2008).

baskets also provides some indication that market pricing does account for the increased profitability and risk of equity achieved by increasing the financial gearing.

3.5.3 Composite Quality

When constructing the composite factor the ratios are combined such that firms with high ROIC, ROE and net margin 5Y stability achieve a high rank and vice versa, thereby enabling the measurement of returns for both the level and sustainability of the underlying drivers of profitability.

Despite the value headwinds the quality strategy yields the second highest premium (+0.77%) of all the composite factors. Adjusting for total risk yields a return-risk ratio of 0.17x, which is above the market ratio. Thus, a total risk-based approach cannot explain the full premium. As with ROIC and ROE the majority of the premium is driven by the low leg underperforming the S&P Developed BMI by 0.47%, whereas the high leg outperform by 0.30%. The return improvements are not as smooth as observed for the two profitability factors, though volatility declines smoothly as we move from the low to high baskets. Although similar patterns within the US, European and Japanese markets is observed, the quality premium across the aggregated developed markets is substantially higher and more significant, and the quality strategy is thus more reliable on the global market. The data indicate, then, that the market systematically undervalues the effect of high profitability on the global market, which in turn leads to higher shareholder returns for high quality investors.

Figure 3.4 and 4.1 show that the historical outperformance of the high quality premiums has been rather stable over time and has only been negative during post-crisis periods where market risk sentiment increases and more risky stocks such as growth and momentum recover.

In conclusion, the empirical evidence shows that market prices do not properly reflect the value generating effects of high profitability ratios, as investing in high quality stocks with high and stable ROIC or ROE has yielded abnormal returns for investors. The potential gain from increasing the average profitability of a portfolio is roughly linear, and investors and managers should actively try to improve the quality ratios in order to maximize shareholder returns. The question remains whether these results are robust and will continue to exist going forward. Despite the scarcity, the available academic research confirms the results and provides sustenance to the idea that this is not due to data-mining. Moreover, the recent empirical data shown in this dissertation does not indicate that the premium has deteriorated since the 1960s as shown by Fama and French (2006), Haugen and Baker (1996) and Brown and Row (2007). As such, this anomaly appears robust. As traditional risk-based measures such as total risk and systematic risk are unable to explain the existence of this anomaly, these premiums are likely to be explained through commonalities in investment behavior across market participants, such as overestimating the mean reverting behavior of profitability, failing to properly adjust estimates for new news-flow etc., though it has not been possible to

test this hypothesis properly. In summary, the data suggest that portfolio managers have an opportunity to enhance their alpha and reduce systematic risk by increasing their exposure to high quality firms.

3.8 Size

The last investment style in the analysis is size in which investors believe that smaller companies offer a significant return premium relative to large cap companies in the long run.

Contrary to the vast academic literature supporting the existence of a size premium the results do not indicate any persistence of the factor during the sample period. The size factor yields an insignificant spread of 0.21% which is primarily caused by the high leg slightly outperforming the market. In fact, baskets 1 through 9 appear to be performing roughly in line with each other, thereby indicating that the premium is only available by investing in the smallest decile of stocks within the universe. Contrary to the findings of previous papers on the subject,[70] significant differences in the size premium within regions is observed. The premium is largely non-existent in the Japanese market (+0.32%), significantly negative within the European markets (-0.52%) and highly significant within the US market (+0.93%). Thus returns to investors following the strategy have thus been highly dependent on their universe. Another interesting characteristic shown by the results is that volatility increases proportionally as firms decrease in size, thereby indicating that smaller companies are more risky. Thus, the evidence suggests that investors have not been able to earn a significant premium on small stocks outside the US markets during the period from 1990 - 2013.

Since the original paper by Banz (1981), a vast amount of literature examining the size effect has emerged. Among those, several academic papers confirm significant size premiums in the American markets during various time periods spanning from 1936 – 1989.[71] This anomaly is also confirmed to exist within the majority of the non-US markets, though the results are methodologically weaker due to limited data history and narrow sample space.[72] Although many of the early studies identify significant and consistent size premiums on a global scale, more recent papers have, in line with findings of this analysis, shown that the size effect may not be as robust as previously assumed, as the premium has been non-existent since the early 1980 followed by a comeback in the 2000s. Furthermore, despite several appealing theories, researchers have not yet reached common ground in terms of explaining why the anomaly exists.

The possible explanations for the existence of a size premium fall with three categories. Led by the articles of Fama and French, supporters of the EMH claim that size is a proxy for several underlying, yet unexplained risk factors. These theories claim that the size factor has a strong cross-sectional explanatory power of future returns when implemented in multi-factor models; they do this by arguing that size captures

[70] van Djik (2011)
[71] Banz (1981), Fama and French (1992), van Djik (2011)
[72] van Djik (2011)

omitted risk loadings in the models. The argument goes as follows: If two firms have identical future cash flows, the firm with the highest risk will have a lower value and by definition a higher expected return. Thus, if there is an omitted risk factor, the market value will have increased significance in cross-sectional tests. Other potential risks include startup costs and difficulties in attracting attractive financing. The notion that small companies are indeed riskier is also supported by the results discussed earlier, as volatility is found to decrease as firm size increases.

The second approach, led by Lakonishok, Shleifer and Vishny (1994), claims that the premium can be explained through behavioral finance and non-rational pricing by investors. The primary argument is that small firms are "fallen angels" which have shown poor performance in the past.[73] Other possible behavioral explanations are based on either agency problems, as discussed in the value section or incomplete information and less coverage of small firms, causing low investor demand and delayed price reactions to news-flow.[74]

The third explanation is based on market microstructure. The key argument is that investors require compensation for the difficult trading conditions of small stocks due to illiquidity, bid-ask spreads and larger transaction costs. These properties make it hard for investors to move their funds freely between investments and increase the risk of hitting so called "mines". For further reading on the subject, the interested reader is referred to van Djik (2011) for an in-depth review on this field.

Surprisingly little research on the possible institutional drivers of the sudden dis- and reappearance of the size premium is available. I can be argued that the size anomaly disappeared around the time of its discovery because practitioners began to use investment vehicles to exploit the anomaly. However, the underlying reason for its reappearance remains unresolved and could prove valuable insights if properly analyzed.

In summary, the data do not provide any evidence for the continued existence of a size premium on the aggregate developed markets. Does this indicate that the value premium has died? The graph in figures 3.4 and 4.1 suggests otherwise. While the premium has been negative throughout the 1990s it has recovered in the 2000s, albeit taking a major hit during the financial crisis, which is likely due to the credit constraints faced by smaller companies during that period. Also, the academic literature has provided several possible explanations for why the premium exists and why we ought to see a premium for smaller stocks. As such, the existence of the size premium cannot be completely rejected.

[73] Chan and Chen (1991)
[74] van Djik (2011)

3.9 Correlations

This chapter examines the correlations between the investment strategies and the S&P Developed BMI. This is done for two reasons. First, I examine whether the data provide any quantitative support for the interdependence between factors. Second, I elaborate on the potential diversification benefits available to investors due to imperfect correlation between factors. Table 3.5 below shows the correlation matrix between the six strategies and the aggregated developed market. The full correlation tables for all four markets are presented in tables 8.4.4, 8.5.4, 8.6.4 and 8.7.5 in the appendix.

Table 3.5 – Developed Factor Spread Correlations[75]

Spread Correlations	Market Beta	Size	Value	Growth	Momentum	Quality
S&P Developed BMI	0,72	0,11	0,05	0,31	0,12	-0,38
Market Beta	1,00	0,14	0,02	0,39	0,01	-0,39
Size		1,00	0,31	-0,22	-0,15	-0,56
Value			1,00	-0,21	-0,31	-0,15
Growth				1,00	0,32	0,24
Momentum					1,00	0,22
Quality						1,00

Both the market beta and growth premiums are highly correlated with the S&P Developed BMI. This is not unexpected, as the fulfillment and value of a company's growth expectations are likely to be linked to the future economic development. As such, news-flow and changes in markets' perception of the future states of the economy have a larger impact on growth stocks, thereby increasing their sensitivity to market movements. The quality premium is negatively correlated with the returns of the S&P Developed BMI, thus providing a hedge against fluctuations in the market. Again, this is expected, as highly profitable firms with stable high margins are more robust against macroeconomic shocks. The premiums of the remaining factors, value, momentum and size, do not appear to depend on the direction of the S&P Developed BMI.

In line with the findings of Fama and French (1998, 2000) the data shows that value and size correlate strongly, indicating that small companies tend to be value biased and vice versa. Theoretically, this relation can be explained through the definition of the value and size factors, as low price level leads to both high value and high-size scores. Other arguments that support this claim have also been put forward, such as the previously mentioned "fallen angels" proposition.

The premiums of the growth, momentum and quality strategies also show signs of interdependency. A significant negative correlation between the quality premium against size and value spreads can be seen, indicating that high quality firms are predominantly larger firms trading at elevated multiples. The same arguments apply for the momentum and growth factors. Especially momentum appears to correlate negatively with value. In order to explain this phenomenon, Bird and Whitaker (2004) refer to several other

[75] Source: FactSet, own calculations

papers that have identified a value/momentum cycle in stock returns, which is closely linked to the economic cycle. This is also confirmed by the style cycle model developed later in the dissertation.

The correlations presented in this chapter suggest that the strategies generally fall within one of two negatively correlated groups. The first group, value and size, correlate negatively with the second group consisting of growth, momentum and quality. Thus, investors in a given strategy will achieve increased exposure against the other factors within the group, while reducing the exposure towards the factors in the opposing group.

3.9.1 Combining Factors

Although the results in table 3.1 indicate that some strategies, such as value, momentum and quality, outperform in the long run, it is also apparent from figures 3.4 and 4.1 that the premiums are not stable over time. Thus, investors may face periods where the indicators hold little explanatory power and may even recommend stocks which underperform. In order to overcome these deficiencies, investors may diversify their risks by combining negatively correlated styles. The correlations presented in table 3.6 provide pleasing news for investors, as several factors show imperfect and even negative correlations, thereby increasing potential diversification benefits.

Arguably, the most prominent papers on combining factors to construct potential value enhancing strategies are Bird and Whitaker (2003, 2004). In their study of the European markets from 1990 – 2002 they examine the potential benefits from combining the counter-cyclical value strategy with a price momentum strategy, i.e. buying cheap stocks with low P/B and positive 6m price momentum. Through both a simple and a four basket stepwise sorting procedure, they find that the addition of the momentum strategy enhances the monthly return of the value strategy by 0.3% to 0.5%, which can be further expanded if investors are able to take short positions. Thus, their study verifies that investors are able to profit from combining uncorrelated factors. These results are also supported by Lakonishok, Shleifer and Vishny (1994). In their study of contrarian strategies, they show that combining value and growth factors enhance the performance of simple value strategies substantially, as the combined strategy is capable of capturing the value through both realized and expected growth rates.

According to the correlations in table 3.5 and the premiums from table 3.1, investors would do well by exploiting the negative correlations between value and either momentum, quality or asset growth,[76] as all four strategies yield substantial absolute premiums. But how can investors achieve this in practice? Two general approaches exist. The first approach involves treating the various strategies as distinct assets. Investors will then be able to construct a portfolio by allocating their investment funds among the desired

[76] As the premium is negative, investors should apply this factor reversely.

strategies. Based on modern portfolio theory, this approach will enable investors to determine an efficient frontier and optimize their portfolios based on their risk sensitivity by using the classical Markowitz model.[77]

The second approach attempts to diversify risks by selecting stocks with desirable exposures to several factors by adding multiple dimensions to the sorting procedures used to rank stocks into baskets, thereby achieving diversification of factors within companies rather than between portfolios. One method involves stepwise sorting procedures using several indicators as shown in the articles of Fama and French (1992), Lakonishok, Shleifer and Vishny (1994), Bird and Whitaker (2003, 2004) and several others, which confirm the previous results that combining factors enhance the return-risk ratios of the strategies. A second method of sorting stocks according to multiple fundamental factors is through composite scores as described in the methodology section. Although this approach has not received much academic attention, it is favored by practitioners as it allows for more flexibility: First, investors may freely include several characteristics, which would not be possible using stepwise sorting as the use of several factors would increase the amount of baskets, thereby reducing diversification. Second, investors are capable of weighting the importance of each factor according to their wishes (for the sake of simplicity I have used equal weighting when constructing the composite factors). This approach thus has several properties which make it an attractive method for practical screenings models, as shown later in this paper.

In conclusion, both the data of this analysis and other empirical research[78] suggest that factors premiums are not constant over time but rather move in cycles. Investors can mitigate these risks and potentially enhance their return by diversifying their exposures against multiple fundamental factors. To do so, investors may apply two approaches to diversify their factor exposures in order to enhance their return-risk ratios. While the first approach applies a simplified method by treating the factor premiums as independent assets, the second approach aims to diversify the factor exposures at the company level. This approach provides investors with the ability to look for several combinations of factors such as cheap growth stocks (GARP stocks) or small high quality firms, thereby providing a detailed multi-dimensional method of evaluating the potential value generated by factor exposures. Although the level of detail within the data prevents a quantitative analysis of the merits of these approaches, several empirical papers confirm the hypothesis that investors may enhance their returns by diversifying their factor exposures.[79] I discuss the optimal selection of factors based on the economic cycle in the style cycle chapter.

3.10 Explaining the Premiums

While there is widespread support in the academic literature for the existence of various factor premiums, supported by the findings of this paper, the interpretation of why these premiums are observed is more

[77] Bodie, Kane and Marcus (2009)
[78] Risager (2009)
[79] Haugen and Baker (1996)

controversial. The subsequent section will address these issues through modern finance theory and behavioral finance.

First, this section briefly presents the EHM and elaborates on the joint hypothesis problem. Then, traditional risk based explanations using either total- or systematic risk are discussed in order to examine whether the results presented in this paper can be explained by these arguments. Subsequently, a review of the literature covering the behavioral finance is conducted.

3.10.1 The Efficient Market Hypothesis

The efficient markets hypothesis (EMH), as presented in Campbell, Lo and MacKinlay (1997) is a key assumption of many theoretical models within modern finance and has been the object of much scrutiny from scholars and practitioners. While academics have provided several definitions of the content of the EMH, Malkiel (1992) offers a rather explicit definition:

"A capital market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices. Formally, the market is said to be efficient with respect to some information set (...) if security prices would be unaffected by revealing that information to all participants. Moreover, efficiency with respect to an information set implies that it is impossible to make economic profits by trading on the basis of [that information set]"[80]

The third sentence in the quote above is key in discussing the findings. Malkiel (1992) states that, given markets are efficient, investors should not be able to generate profits above the market rate of return. If an investor is capable of achieving a superior risk-adjusted premium, the market is not efficient with respect to the information set available to investors. Another property of the EMH is that security prices must fluctuate randomly as price changes must be unforecastable if they are properly anticipated based on the available information set.[81] Thus, security prices are expected to reflect a random walk process.

Although the insignificance of the 1M Reversal factor supports a random walk, significant mean reversion (negative autocorrelation) within the Japanese market during periods of high market volatility is observed. One may be tempted to conclude that the weak-form efficiency of stock markets decrease during periods of high volatility such as bubbles and crises. Although scholars and professionals have tried to present arguments supporting inefficiency, one cannot reject the EMH. Questioning the EMH also includes a questioning of the pricing of assets, thus testing the EMH is also the testing of the equilibrium pricing models. Any evidence against the EMH could therefore theoretically be due to incorrect pricing models. As the two hypotheses cannot be separated, one cannot truly reject market efficiency. This is also known as the *Joint Hypothesis* problem.

[80] Campbell, Lo and Mackinlay (1997)
[81] Samuelson (1965)

The results on the premiums for the eighteen factors still challenge the notion of the EMH, as the empirical evidence suggest investors are able to generate statistically significant outperformance by investing in value, quality and momentum styles. The question remains whether the observed premiums can be explained by conventional risk measures or if they are, in fact, anomalies from the EMH.

3.10.2 Explaining Premiums by Modern Finance Theory

Supporters of the EMH claim that the historical style premiums can be justified by increased risk loadings. In accordance with conventional capital markets theory, this section will examine the involved risks in terms of total risk (standard deviations) and market risk (betas). Furthermore, this sub-chapter will include a brief discussion on and evaluation of the presented pricing models.

3.10.2.1 Adjusting for Total Risk

This sub-section examines the total-risk explanation of the observed premiums by examining the return-risk ratios for the factor baskets and premiums presented in panel C in tables 3.1.

Panel C in table 3.1 shows that the return-risk ratios between the baskets 10 and 1 are highly unequal. This is especially true for the P/E, Div Yield, FCF Yield, EPS Estimates Revisions, ROIC, ROE, Value, Momentum and Quality factors, where basket 10 yield higher return-risk ratios than the S&P Developed BMI (0.13x), despite increased diversification within the market portfolio. An examination of the return/risk ratios of the premiums shows the same picture.

The unequal return-risk ratios are a violation of the capital market line, as substantial deviations from the risk-reward ratio of the broad and capitalization weighted index is observed.[82] Thus, when comparing average return relative to total risk, the conclusions based on the observed factors, are clear and unambiguous: the value, momentum and quality style factors yield a substantial return which cannot be justified by adjusting for their total risk.

3.9.2.2 Adjusting for Market Risk

A common approach in explaining the excess return of various investment strategies is through systematic, non-diversifiable risk loadings of the CAPM developed by Sharpe, Litner and Mossin.[83] Their version of the CAPM is defined as follows:[84]

$$R_i - R_f = \beta_{i,m}(R_m - R_f) \quad \textbf{(3.3)}$$

$R_i = Return\ of\ asset\ i$
$R_f = Risk\ free\ rate$

[82] Bodie, Kane and Marcus (2009), as previously discussed, the return-risk ratio does not account for the risk free rate, which may distort the results.
[83] Bodie, Kane and Marcus (2009)
[84] Campbell, Lo and MacKinlay (1997)

$R_m = Return\ of\ the\ market\ portfolio$

The $\beta_{i,m}$-values of the baskets are calculated by comparing monthly basket returns against the return of the underlying index. Furthermore, as described earlier, this dissertation assumes a constant interest rate of 0% which effectively eliminates the R_f term.

In testing whether the observed premiums is explained by differences in systematic risk, the beta-adjusted returns are calculated.

$$Beta\ Adjusted\ Return_i = \frac{R_i}{\beta_{i,m}} \quad \textbf{(3.4)}$$

This is equal to the popular Treynor measure with the exception of no risk free rate. If the excess returns can be explained by differences in systematic risk, the beta-adjusted returns are expected to be roughly equal. Table 3.6 below presents the observed β-values covering the entire sample period. These results indicate elevated beta values for the high and low baskets while the neutral baskets showed reduced market exposure. Table 3.7 presents the beta-adjusted returns for the developed market. The factor betas and beta-adjusted returns for the remaining markets are shown in panels H and I in tables 8.5.1, 8.6.1 and 8.7.1 in the appendix.

Table 3.6 – Basket Betas in the Developed Market[85]

Beta	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	1,18	0,97	0,92	0,87	0,88	0,82	0,89	0,87	0,97	1,11	-0,08	(low) - (high)
P/B	0,94	0,94	0,98	0,98	0,97	0,99	0,94	0,99	1,07	1,24	0,30	(low) - (high)
Div Yield	1,08	1,04	0,97	0,96	0,90	0,90	0,88	0,83	0,79	0,90	-0,18	(high) - (low)
FCF Yield	1,17	1,01	0,99	0,93	0,93	0,90	0,91	0,94	0,96	1,14	-0,03	(high) - (low)
Asset Growth	1,00	0,88	0,89	0,82	0,90	0,97	1,00	1,04	1,09	1,28	0,28	(high) - (low)
EPS Growth	1,31	1,02	0,89	0,82	0,83	0,87	0,95	1,07	1,25	1,30	-0,01	(high) - (low)
3M Change in Fwd EPS	1,32	1,09	0,98	0,88	0,81	0,84	0,86	0,99	1,05	1,27	-0,05	(high) - (low)
1M Reversal	1,47	1,21	1,10	0,97	0,93	0,91	0,89	0,94	0,93	1,03	-0,44	(high) - (low)
EPS Estimates Revisions	1,11	1,04	0,98	1,14	1,10	0,98	0,62	0,89	0,92	0,96	-0,15	(high) - (low)
Market Beta	0,32	0,46	0,54	0,64	0,72	0,78	0,92	1,04	1,27	1,56	1,20	(high) - (low)
ROIC	1,39	1,23	1,13	1,03	1,01	0,97	0,95	0,89	0,93	0,87	-0,52	(high) - (low)
ROE	1,40	1,22	1,05	1,09	1,03	0,96	0,94	0,92	0,97	0,84	-0,56	(high) - (low)
Net Margin 5Y Stability	1,22	1,15	1,05	1,07	1,03	0,92	0,97	0,91	0,81	1,25	0,03	(low) - (high)
Size	0,99	1,00	1,02	1,01	1,01	0,98	1,01	1,00	1,02	1,11	0,11	(low) - (high)
Value	1,03	1,03	0,99	0,94	0,98	0,93	0,96	0,92	0,97	1,09	0,06	(high) - (low)
Growth	0,98	0,93	0,87	0,90	0,87	0,93	0,96	1,02	1,11	1,31	0,32	(high) - (low)
Momentum	1,05	0,99	0,96	0,94	0,94	0,93	0,96	0,95	1,02	1,17	0,12	(high) - (low)
Quality	1,28	1,21	1,13	1,11	1,00	1,03	0,95	0,91	0,90	0,88	-0,40	(high) - (low)

[85] Source: FactSet, own calculation

Table 3.7 – Beta-Adjusted Returns in the Developed Market[86]

Beta-Adjusted Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0,05%	0,12%	0,28%	0,54%	0,62%	0,84%	0,83%	1,04%	0,97%	1,12%	1,17%	(low) - (high)
P/B	0,42%	0,44%	0,28%	0,30%	0,33%	0,46%	0,53%	0,72%	0,43%	0,70%	0,28%	(low) - (high)
Div Yield	-0,14%	0,00%	0,08%	0,27%	0,50%	0,57%	0,97%	0,91%	1,28%	1,03%	1,17%	(high) - (low)
FCF Yield	0,28%	0,25%	0,26%	0,40%	0,73%	0,77%	0,76%	0,77%	0,88%	0,63%	0,35%	(high) - (low)
Asset Growth	0,68%	0,71%	0,58%	0,64%	0,35%	0,43%	0,56%	0,45%	0,45%	0,26%	-0,41%	(high) - (low)
EPS Growth	0,16%	0,43%	0,37%	0,73%	0,81%	0,65%	0,65%	0,56%	0,28%	0,17%	0,02%	(high) - (low)
3M Change in Fwd EPS	-0,04%	0,28%	0,57%	0,49%	0,84%	0,70%	0,75%	0,58%	0,59%	0,36%	0,40%	(high) - (low)
1M Reversal	0,36%	0,52%	0,44%	0,55%	0,59%	0,58%	0,55%	0,48%	0,35%	0,26%	-0,10%	(high) - (low)
EPS Estimates Revisions	0,32%	0,39%	0,39%	0,32%	0,23%	0,13%	0,38%	0,45%	0,79%	0,85%	0,53%	(high) - (low)
Market Beta	1,95%	1,56%	1,09%	1,00%	0,84%	0,61%	0,64%	0,64%	0,31%	0,18%	-1,77%	(high) - (low)
ROIC	-0,06%	-0,09%	0,02%	0,26%	0,34%	0,60%	0,58%	0,82%	0,77%	0,97%	1,03%	(high) - (low)
ROE	-0,03%	-0,15%	-0,02%	0,15%	0,43%	0,49%	0,46%	0,81%	0,79%	0,96%	0,99%	(high) - (low)
Net Margin 5Y Stability	0,21%	0,31%	0,26%	0,39%	0,39%	0,51%	0,64%	0,55%	0,78%	0,33%	0,12%	(low) - (high)
Size	0,57%	0,51%	0,52%	0,46%	0,47%	0,45%	0,52%	0,49%	0,50%	0,70%	0,13%	(low) - (high)
Value	-0,08%	0,01%	0,34%	0,39%	0,58%	0,66%	0,77%	0,99%	0,98%	1,05%	1,14%	(high) - (low)
Growth	0,46%	0,72%	0,59%	0,71%	0,55%	0,32%	0,58%	0,43%	0,39%	0,25%	-0,21%	(high) - (low)
Momentum	0,08%	0,37%	0,41%	0,57%	0,54%	0,50%	0,49%	0,82%	0,57%	0,68%	0,59%	(high) - (low)
Quality	0,06%	-0,09%	0,07%	0,31%	0,26%	0,48%	0,50%	0,60%	0,86%	0,97%	0,91%	(high) - (low)

Figure 3.7 shows that the beta-adjusted returns are not equal and that they vary substantially between the high and low-factor baskets and the market portfolio (0.55%)[87]. Unsurprisingly, the low Market Beta basket yields the highest modified beta-adjusted return due to its low inherent systematic risk. Furthermore, a rather constant increase in beta-adjusted returns from baskets 1 to 10 for the Value, Quality and Momentum strategies and their underlying factors is observed, with the only exception being the 1M Reversal factor. The reverse is observed for the Market Beta and Asset Growth factors, where the adjusted returns decrease though baskets 1 to 10. Figure 3.7 also indicate continued substantial spreads in the beta-adjusted returns.

The results challenge the argument that the observed returns and premiums can be fully explained by adjusting for systematic risk as the results are in violation of the security market line (SML). Theoretically, it is difficult to reject the predictive power of the CAPM model as the market portfolio is not directly observable. However, as the aggregate developed market is highly diversified, the results greatly question the merits of the model. Surprisingly, the premiums of the *Market Beta* factor are negative in the US, Europe and Developed markets despite positive market returns. This is unexpected if we accept the relationship described above; these results, then, provide further evidence against the accuracy of the CAPM framework. The merits of the CAPM have also been the subject of much research centered on two propositions: 1) That the intercept (α) is equal to zero and 2) that beta completely captures the cross sectional variation of expected excess return. Despite its widespread usage, the data presented in this chapter and other empirical research have been unable able to find empirical support for both propositions in recent data.[88]

3.9.2.3 Multiple Cross-Sectional Regressions

In order to improve the explanatory power of the original CAPM setup discussed above, scholars have tried to identify factors which may proxy for exposures against various types of systematic risk. Arguably, the

[86] Source: FactSet, own calculation
[87] As the market portfolio per definition has a β-value of 1, the simple and beta-adjusted returns are unanimous.
[88] Fama and French (1992, 1998). Bodie, Kane and Marcus (2009), Basu (1977)

most well-known multifactor model is the 3-factor model developed by Fama and French.[89] In their model, they incorporate two additional explanatory variables which proxy for the systematic risk associated with firm size and P/B ratio:

$$E(R_i) - R_f = \beta_{i,m}\big(E(R_m) - R_f\big) + \beta_{i,SMB}E(SMB) + \beta_{i,HML}E(HML) \quad \textbf{(3.5)}$$

$\beta_{i,SMB} = \beta\ against\ the\ return of\ a\ portfolio\ of\ small\ stocks\ in\ excess\ of\ large\ stocks$
$\beta_{i,HML} = \beta\ against\ the\ return\ of\ a\ portfolio\ of\ high\ ^{B}/_{P}\ in\ excess\ of\ low\ ^{B}/_{P}$

This approach effectively captures the unexplained excess return of the P/B and size factors within the model. While firm size and B/P may not be obvious candidates as proxies for unidentified risk factors, the addition of these factors has improved the explanatory power of the model substantially. Fama and French justify the inclusion of the SMB and HML factors empirically, though, as previously discussed, ambiguity exist on which risks these factors act as a proxy for,[90] as tangible and unambiguous methods to quantify such risk exposures are still to be further developed and researched upon. Despite the increased explanatory power of the three-factor model, several papers have shown severe limitations in the models descriptive capabilities. Among others, Jegadeesh and Titman (2001) show that the model does not sufficiently explain the excess return generated by momentum strategies. In response, some scholars have suggested to add momentum as a fourth factor in the model.[91] Furthermore, Brown and Rowe (2007) examines whether the 3- and 4-factor models of Fama and French (1992) and Carhart (1997) explain the excess return of highly profitable companies (quality firms). Their results indicate that these models fail to explain the premium. Lastly, the data on the developed market does not provide any evidence of differences in returns between high and low baskets of the *Size* and *P/B* factors. Thus, the data do not appear to provide evidence for the explanatory power of the SMB and HML factors on returns, though one would need to perform cross-sectional analyses in order to confirm this suspicion. As such, the empirical results of this paper cannot confirm the risk-based explanation provided by the empirically inspired three-factor model, as there is ambiguity about the robustness and the causes of the parameters that it incorporates.

In conclusion, the common risk-based models within modern finance theory are unable to fully explain the observed premiums. I therefore reject the statement that the premiums are solely a function of higher quantifiable risk. The data does not support the CAPM as substantial differences in risk-adjusted returns are observed, which cannot be justified by the omission of a risk-free rate. I have also elaborated on the 3-factor model of Fama and French, and while I have not examined the model's ability to explain the observed premiums, the results do not appear to provide any support for the explanatory power of the SMB and HML

[89] Fama and French (1996)
[90] Bodie, Kane and Marcus (2009). Chan and Chen (1991)
[91] Carhart (1997)

variables. Lastly, although the findings may appear as anomalies to the EMH, the joint hypothesis problem eliminates the possibility of rejecting the notion of market efficiency.

3.10.3 Explaining Premiums by Behavioral Finance

Contrary to the risk-based arguments above, the behavioral finance school argues that factor premiums cannot be explained by increased risk loadings. Instead, it is suggested that the anomalies are caused by mispricing of financial assets driven by irrational behavior among market participants.

Studies that attempt to explain these deviations from the EMH through behavioral finance have primarily focused on the formation and structure of expectations in the market. While there is broad agreement in the academic literature that the key drivers of profit, growth and profitability, mean revert as businesses and markets mature,[92] the results of this dissertation suggest that investors underestimate the mean reversion of growth and undervalue profitability measures when forming their expectations. In other words, the naïve investors in the market have a tendency erroneously to extrapolate past performance too far into the future. As time proceeds, the materialized performance of these so-called "glamour" stocks fail to meet expectations and market participants downgrade their expectations and prices decline. On the other hand, the results of this paper indicate that cheap, profitable, out-of-favor stocks with low future growth prospects are often undervalued, which, in turn, leads to improved performance as their results normalize faster than expected. This implies that following a contrarian strategy, buying cheap under favored stocks and selling high priced "glamour" stocks will yield above average returns.[93] While it is difficult to quantify the degree of overestimation, which results from exuberant behavior, several papers have tried to measure the returns of contrarian investment strategies by examining growth rates before and after portfolio formation and how earnings announcements affect returns.

Arguably, the most cited and referred articles supporting the behavioral finance approach in explaining the performance of "glamour" and value stocks is Lakonishok, Shleifer, Vishny (1994). In their paper, evidence is found to support contrarian strategies which exploit the irrationality of market participants. Their conclusion is based on a survey of US data from 1963 – 1990, in which they compare past growth in sales, earnings and cash flow with expected performance measured by P/E and Cash-Flow yield. Using both one- and two dimensional sorting procedures they find that "glamour" stocks with high historical growth rates are expected to yield superior growth in relative to value stocks for many years. However, these "glamour" stocks are unable to maintain their historical growth rates, and beyond the first couple of years growth rates are virtually the same for both value and "glamour" stocks. Thus, their evidence suggests that forecasts based on historical growth rates are too optimistic.

[92] Koller, Goedhart and Wessels (2010)
[93] This approach has been advocated by, amongst others, De Bondt and Thaler (1985), La Porta, Lakonishok, Shleifer and Vishny (1997), Lakonishok, Shleifer and Vishny (1994).

Building on the overreaction hypothesis of De Bondt and Thaler (1985, 1987) and the contrarian models of Lakonishok, Shleifer and Vishny (1994), several studies examine equity returns in the days before and after earnings announcements. Among the first to take this approach in explaining factor premiums is La Porta, Lakonishok, Shlefier and Vishny (1997). They find further support for the outperformance of contrarian strategies and show that post-announcement returns for cheap stocks is significantly higher than the returns of "glamour" stocks, even at a risk-adjusted basis. They conclude that the earnings announcements of "glamour" stocks, on average, fall short of expectations.

Finally, a growing body of research focuses on sub-optimal behavior amongst certain types of investors. Although professional money-managers and institutional investors ought to be freer of judgmental errors, they are biased against contrarian investments. This is, in part, because it is easier to defend investments in "glamour" stocks to their sponsors. Furthermore, money managers often have shortened time horizons as their sponsors are likely to withdraw funds if the managers underperform the market or their peers over a few years. As such, the fear of losing their job will bias money managers away from value stocks.[94]

In conclusion, the question of why systematic premiums for various fundamental factors are observed remains unresolved. In order to address this question both traditional risk-based explanations and arguments from behavioral finance literature have been discussed. The results shown in the previous sections and recent evidence from the academic literature suggest that the traditional measures fail in fully explaining the existence of these anomalies. In response, I discussed whether the premiums are driven by exuberance and irrational investor behavior, which support the findings of this paper. Although the arguments seem intuitive and, to some extent, have been proved empirically, further research is needed to confirm the causality.

3.11 Recommendations for Investors

I conclude the findings of this chapter by providing a series of recommendations for investors willing to pursue style based strategies.

This chapter has examined and discussed the returns and premiums of six fundamental investment strategies, value, growth, momentum, quality, market beta and size, and their underlying factors within the S&P Developed BMI from January 1990 to January 2013. By analyzing the data, multiple anomalies have been identified as several fundamental firm characteristics have proven to yield significant excess shareholder returns, even when adjusted for simple risk measures. The financial market appears to suffer from systematic under- and overestimation of these indicators. This decoupling from fundamental value provides an opportunity for the contrarian investor, which is willing to exploit these anomalies.

[94] Lakonishok, Shleifer and Vishny (1994), van Djik (2011)

The strongest of the observed anomalies is the value strategy, which yielded an impressive monthly shareholder return of 1.24%. Thus, the empirical evidence suggest that contrarian investments exploiting the erroneous and biased growth expectations in the market by investing in companies trading at low P/E and high dividend yield is a highly attractive strategy, both from an absolute and a risk adjusted perspective. The second best strategy within the sample is quality. The results shown in table 3.1 indicate a significant premium of 0.77% between highly profitable firms and companies with low returns on invested capital. The data indicate that market prices do not fully reflect the value-generation caused by high and stable ROIC and ROE ratios, thereby presenting potential benefits to investors in highly profitable firms. The premium is largely driven by unprofitable firms yielding returns below the market. Albeit this limits the accessible premium for short-restricted investors, it remains a strong signal for investors to avoid companies with low levels of profitability. Finally, a significant premium of 0.71% for the momentum strategy is observed. While the data did not provide any evidence against the EMH significant spreads between firms which have recently experienced consensus EPS estimate up- or downgrades were found. Furthermore, data imply that sell-side analysts have significant traction in the market, especially when downgrading their estimates. Thus, investors should actively aim to avoid companies which have recently fallen out of favor among consensus analysts.

Contrary to the factors mentioned above, the data provide little evidence of a growth premium. Although the composite factor is insignificant, the results suggest a negative contribution from the asset growth factor, which is likely to be driven by unprofitable investments due to empire building tendencies of managers. Thus, investors may profit from betting against companies with high realized asset growth rates. The worst performing strategy in the sample has been systematic risk. Albeit being insignificant, the negative performance questions the merits of the CAPM and indicates that investing in high beta companies has been an unprofitable strategy in the period from 1990 – 2013. Contrary to past academic research, the data do not support the existence of a size premium in recent data. However, a closer examination reveals that the premium has reemerged in the latter half of the sample period and has differed substantially among the underlying markets.

This chapter discussed possible explanations for the observed anomalies. The results showed little support for the traditional risk-based explanations that the premiums were compensation for increased risk loadings. Conversely, alternative explanations founded in behavioral finance were reviewed. Although the data did not allow for verification of the proposed causalities, the results fit the arguments presented by De Bondt and Thaler (1985, 1987) and Lakonishok, Shlefier and Vishny (1994). Despite the increasingly large body of literature addressing the existential background of style premiums, the possible explanations remain a source of heated debate among scholars.

Although the results of the analysis are supported by recent empirical research, previous papers have found substantially different results for several of the underlying factors. This suggests, as argued in Risager (2009), that the premiums are not constant but rather a dynamic anomaly which varies over time. The data suggest that conclusions such as "*size is dead*" and *"Value always outperform"* are premature. In fact, empirical evidence suggests that these premiums move in cycles which may last for decades.[95] In reaction to this observation, I have suggested two methods of diversifying one's exposure to single fundamental factors in order to mitigate the apparent risks. As the anomalies are still not fully understood, researchers struggle to predict what drives these large fluctuations in premiums. In order to provide further insights into the seemingly unsystematic fluctuations, the following chapter will examine the performance of each strategy during phases of an economic cycle.

In conclusion, this chapter has, based on recent empirical evidence, provided a detailed examination of the existence of several style-factor strategies and discussed the underlying rationales and explanations driving these premiums. Given that the observed patterns within the empirical data continue in the future, investors are advised to exploit the observed spreads in table 3.1 and figure 3.2 by investing in companies with high value, momentum and quality rating while avoiding or shorting companies with low scores within these factors.[96]

[95] Risager (2009), van Djik (2011)
[96] So far, I have ignored the effects of transaction costs. This will be introduced in the implementation chapter. Furthermore, investors are advised to consult the relevant subsections for a more detailed description of the underlying factors of each investment style.

4. The Style Cycle

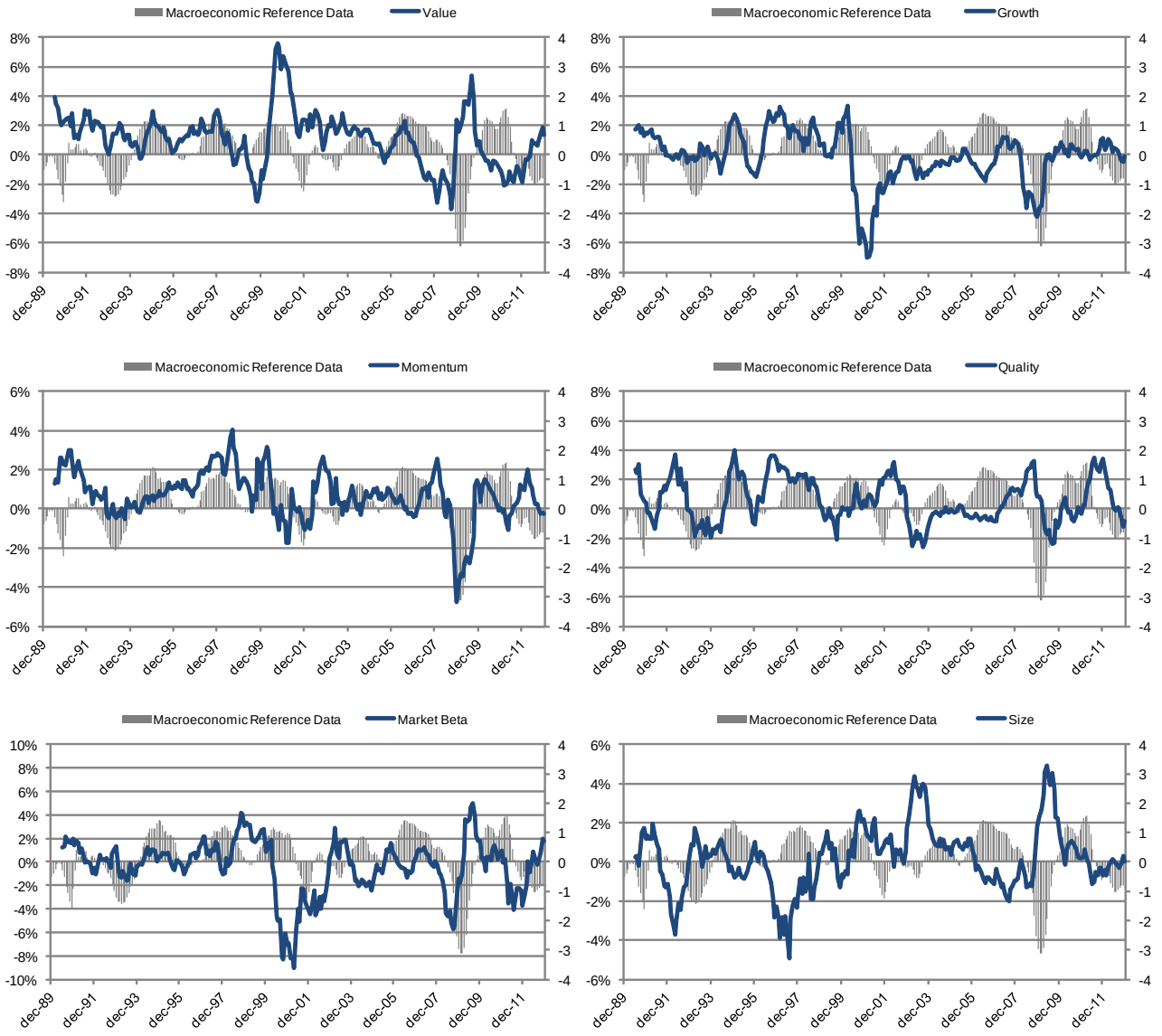
This chapter aims to link the performance of the investment styles with the phases of the economic cycle by examining returns and significance levels of the premiums during the four phases of the economic cycle based on input from the macroeconomic reference data. Contrary to other academic literature, such as Arshanapalli, Switzer and Panju (2006) and Cooper, Gulen and Vassalou (2001), who employ advanced multi-nominal logistic models with a variety of input factors in order to device timing strategies, this analysis is not concerned with forecasting spreads as this is not an attempt at market timing. Rather, the aim of this section is to study the historical return patterns of the investment styles in order to examine the dis- and reappearances of their premiums. Thus, the style cycle analysis is intended to provide a level of insight as to which factors investors should look for given their expectations of the future macroeconomic development.

This chapter commences with a review of the historical premium levels during the sample period. Then, the factor returns during each phase are presented and aggregated into the style cycle model. Lastly, this section briefly elaborates on possible implementation methodologies.

4.1 Style Performance during the Economic Phases

Before commencing the analysis of the premiums during the macroeconomic phases, this section briefly presents the historical development of the style premiums. These are shown in figure 4.1 below.

Figure 4.1 – Historical Style Premiums in the Developed Markets[97]



Left axis: 12MA Monthly compounded factor spreads. Right axis: Standardized macroeconomic reference data index level

The blue lines in figure 4.1 show the 12m moving average compounded factor premium and the grey bars indicate the level of the underlying reference data. The panels in figure 4.1 above confirm the previous conclusion that the premiums are highly dynamic and change over time.

As can be seen from the panels in figure 4.1 above, the premiums do not respond similarly to the two tail events: the dot-com bubble from 1997 – 2000 and the financial crisis from 2006 – 2008. Although both growth and market beta decline heavily during both crises, value soars during the dot-com while declining

[97] Source: FactSet, Bloomberg, own calculations

into negative territory during the financial crisis.[98] Furthermore, the momentum factor appears largely unaffected by first crisis, though it drops significantly during the latter.

This suggests that premiums do not act in a predefined manner during tail events despite macroeconomic indicators decreasing substantially in both cases. However, this diversity in responses to macroeconomic shocks should not be interpreted as a weak relationship between premiums and the state of the economy. Instead, the differences are likely due to specific variables which may interact with the fluctuations of the premiums. Thus, investors should be careful to rely on these results blindly as other factors may cause adverse effects in returns.

With this caveat in mind, table 4.2 presents the average premiums and their significance levels during each of the predefined macroeconomic phases.

Table 4.2 Developed Factor Premiums and P-values During the Economic Cycle[99]

Factor Premium and P-Values	Recession		Recovery		Boom		Slowdown	
P/E	1,98%	*0,04*	2,79%	*0,01*	1,58%	*0,00*	0,34%	*0,47*
P/B	0,71%	*0,46*	2,63%	*0,13*	0,89%	*0,06*	-0,73%	*0,20*
Div Yield	1,83%	*0,04*	1,62%	*0,15*	0,71%	*0,09*	0,96%	*0,04*
FCF Yield	1,19%	*0,03*	0,55%	*0,37*	0,13%	*0,61*	0,25%	*0,34*
Asset Growth	-0,76%	*0,40*	0,38%	*0,63*	-0,23%	*0,51*	-0,47%	*0,24*
EPS Growth	-0,11%	*0,88*	-0,30%	*0,58*	0,21%	*0,37*	-0,04%	*0,89*
3M Change in Fwd EPS	-0,79%	*0,33*	-0,55%	*0,58*	0,85%	*0,02*	1,01%	*0,03*
1M Reversal	-1,64%	*0,33*	0,25%	*0,83*	-0,86%	*0,07*	0,70%	*0,25*
EPS Estimates Revisions	-0,38%	*0,61*	0,11%	*0,88*	0,32%	*0,21*	1,00%	*0,00*
Market Beta	-0,23%	*0,89*	-0,23%	*0,88*	0,70%	*0,21*	-1,64%	*0,01*
ROIC	1,92%	*0,03*	0,13%	*0,90*	0,38%	*0,36*	1,37%	*0,00*
ROE	2,42%	*0,01*	-0,72%	*0,52*	0,20%	*0,63*	1,36%	*0,00*
Net Margin 5Y Stability	0,47%	*0,51*	0,55%	*0,28*	-0,05%	*0,85*	0,07%	*0,81*
Size	-0,21%	*0,81*	-0,21%	*0,83*	0,30%	*0,43*	-0,45%	*0,30*
Value	2,33%	*0,02*	2,76%	*0,04*	1,43%	*0,00*	0,11%	*0,80*
Growth	-0,88%	*0,38*	-0,49%	*0,55*	0,29%	*0,41*	-0,12%	*0,79*
Momentum	0,78%	*0,35*	-0,23%	*0,82*	1,02%	*0,00*	0,64%	*0,12*
Quality	1,83%	*0,03*	-0,42%	*0,68*	0,09%	*0,83*	1,41%	*0,00*
Avg. Return of the S&P Developed BMI	0,00%		0,64%		1,56%		-0,26%	
# of Months	40		32		102		101	

The results presented in table 4.2 above shows that both premiums and the average return of the S&P Developed BMI vary significantly between phases, thereby proposing significant advantages to investors who are capable of exploiting these patterns. The results are briefly reviewed in the following paragraphs, after which the results are combined in the style cycle mode.

The average returns of the S&P Developed BMI shown in table 4.2 above indicate that the returns of the S&P Developed BMI is driven by the direction rather than the level of the reference data, as the index shows above average returns (+0.55%) during the recovery and boom phases. Surprisingly, the worst period is the slowdown phase (-0.26%), where the direction of the indicators have turned but remain in positive territory. This emphasizes the importance of keeping a close eye on the potential turning points in the cycle.

[98] This can primarily be attributed to an overweight of financial stocks within the high value baskets
[99] Source: FactSet, Bloomberg, own calculations

The value strategies deliver significant positive premiums during the recession, recovery and boom phases of the economy. In line with the findings of Cooper, Gulen and Vassalou (2001), the premium appears to be strongest when macroeconomic indicators are below base level, as the composite value factors posts yields returns substantially above its long-term average of 1.24%. This is likely caused by companies with high growth expectations underperforming during periods of sluggish economic growth and vice-versa. A deeper analysis of the results (not shown) shows that premiums are primarily driven by both the long- and short legs of the spread. Thus, a proportion of the potential benefits are available to short-restricted investors.

The growth spread yield returns below the long term average during recessions and recovery months. However, due the size and volatility of the spreads, the premiums cannot be confirmed statistically. An examination of the historical development of the premium, as shown in figure 4.1, indicates that the growth factor has been predominantly negative following the bursting of the dot-com bubble, albeit being significantly affected by the outburst of the financial crisis in 2007.

Although the momentum strategy yields positive premiums in months where economic indicators are above base level, it is not possible to draw any reliable inference during the boom phase due to the reverse effect of the 1M return factor. When examined separately, the revision estimates yield significantly positive results during the boom and slowdown phases, indicating a positive relationship with the level of the indicator. Furthermore, a high degree of mean reversion is observed during the boom phase. Although substantial mean reversion are observed within the recession phase, the heightened volatility of the estimates precludes a significant conclusion.

The market beta strategy is only significant and negative during the slowdown phase, though the style yields a barely significant positive premium during the boom phase. These results are primarily due to the extreme observations during the collapse of the dot-com bubble in 1997 and the financial crisis in 2007. As such, the potential benefits from betting against high beta stocks may only prove relevant during tail events, where such a strategy would yield substantial downside protection.

As discussed previously in the analysis, the quality factor shows defensive characteristics, as the composite strategy yields a significant premium above the long term average (+0.77%) during both the recession and slowdown phases. As with value, the spread appears to be driven by both the long and short legs, thereby limiting the portion of the premium available to short restricted investors. Interestingly, the quality premium remains positive throughout both crises; however, as indicators turn and risk aversion fades from the markets, a revaluation of high quality stocks set in, leading to brief periods with depressed premiums. These results further support the ability of the quality style to act as a hedge against fluctuations in the index.

Lastly, the data on the size premium remain inconclusive throughout each of the four phases. This is also supported by the underlying markets, which show insignificant results pointing in different directions.

Despite the uncertainty of the estimates, the size strategy appears yield returns below long term average in the recession, recovery and slowdown phases. Furthermore, the development of the premium shown in figure 4.1 support the claim that the value premium has been absent during the 1990s, followed by a reappearance in the 2000s and early 2010s.

Having briefly reviewed the performance of the premiums during the macroeconomic phases, the next section presents the style cycle model.

4.2 Style Cycle Model

This section combines the previous results into the style cycle model, which links phases of the economic cycle with the performance of investment styles. As indicated by table 4.2, the potential for abnormal returns of the investment strategies are dependent on favorable positioning within the cycle at a particular point in time. Figure 4.3 below presents the results.

Figure 4.3 – The Developed Market Style Cycle Model[100]

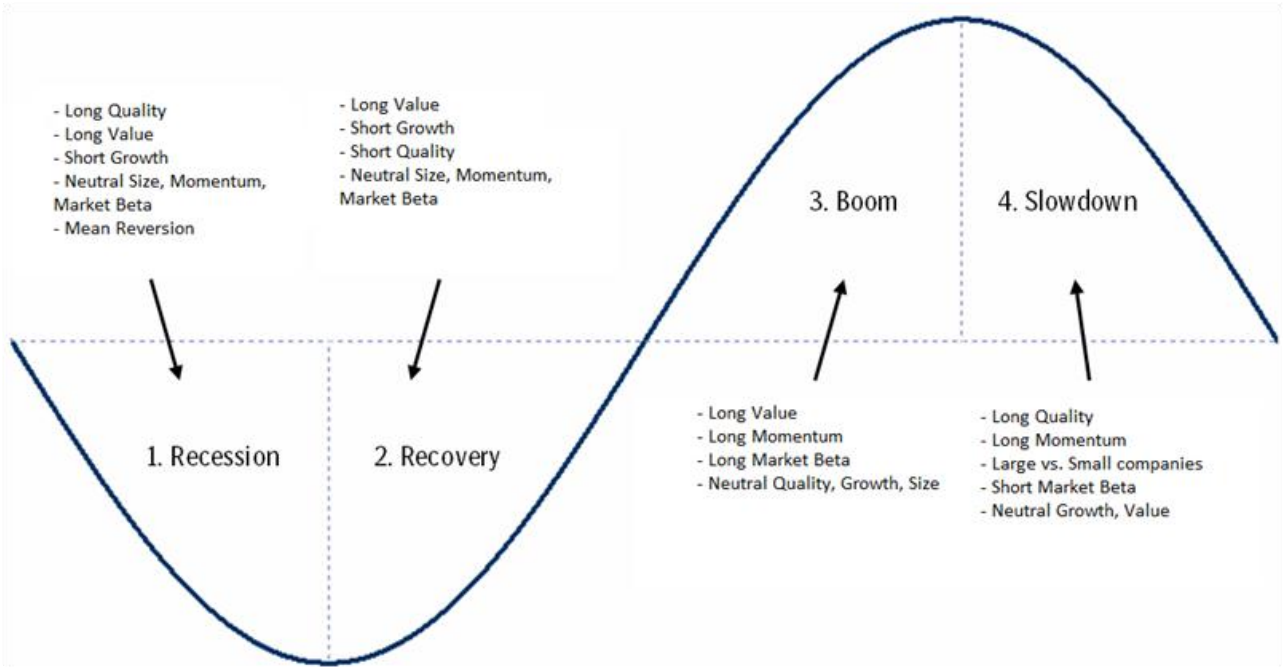


Figure 4.3 summarizes the previous findings and presents the suggested style strategies depending on the current state of the economy. For instance, if an investor believes that the global economy will be in a recovery during the next months, the style cycle would advise her to look for low-quality value stocks and avoid stocks with high past growth and high recent price appreciation.

[100] Source: Own construction

As suggested by Bird and Whitaker (2004), investors can exploit the discrepancies in cyclicality to form cycle-robust strategies. As indicated by the model, value outperforms when indicators are increasing or below base level, and quality outperforms when they are decreasing. As such, investors may hedge their positions by combing the quality and value factors to construct a strategy which can be expected to outperform on average across the cycle.

The model is based on spreads between long and short positions in the high and low baskets of a given factor. Thus, when the model recommends a long position in a factor, it should be understood as a long position in the high basket and a short position in the low basket. Because of this, short restricted investors should be aware that the premium may be due to low-factor companies underperforming rather than high companies outperforming, thereby limiting the accessibility to the full premium.

Naturally, the potential outcome of the strategy outlined by the style cycle setup hinges on investors' ability to properly forecast the state of the economy. Although this paper does not delve deeper into the merits of cycle forecasting, several prominent academics and practitioners such as Warren Buffet, Keynes, Graham and Dodd etc. have proclaimed skepticism on the merits of market timing and frequent trading.[101][102] Despite the criticism, Risager (2009) concludes that diligent investors may anticipate these broad swings in the economy, although the exact timing and effect may be very difficult to forecast reliably. Alternatively, investors can rely on leading indicators, such as the OECD's acknowledged system of composite leading indicators (CLI)[103] which apply multiple indicators in order to forecast the economic cycle, such as IIP, bond yield spreads, consumer confidence metrics, previous index returns, change in GDP forecasts etc. in order to predict changes in the macro economy.

4.2.1 Implementing the Style Cycle Framework

Investors may potentially enhance their long term returns by exploiting the cyclical nature of the premiums in two ways. First, investors may apply the style cycle methodology using traditional asset allocation strategies, in which the premiums are considered distinct assets. In the second, investors aim to exploit the systematic fluctuations of the style premiums in their stock selection process in which stocks are selected based on their style tilts. This section briefly discusses both approaches.

4.2.1.1 Asset Allocation Strategies

By applying a traditional asset allocation approach, investors control their exposure against the desired factors by allocating funds to style portfolios as outlined by Arshanapalli, Switzer and Panju (2007). Thus, the style cycle model is used to determine whether a long or short position should be taken in a single style portfolio, based on the expected macroeconomic development. The application of such strategies also

[101] Risager (2009)
[102] Barber and Odean (2000)
[103] OECD, 2012

provides a potential hedge against the volatility of the premiums and can help investors avoid consecutive periods of underperformance if applied in a thoughtful manner.

In their study of the Russel style indices from 1984-2000, Arshanapalli, Switzer and Panju (2007) show that rotation-based style allocation strategies are indeed capable of outperforming even the strongest long-term strategies by more than 6% on an annualized basis. Although their results are also driven by the predictive power of their model in forecasting the economic cycle, the evidence presented in their study confirms substantial rewards available to investors capable of exploiting the style rotations shown in this chapter. Cooper, Gulen and Vassalou (2001) apply the same procedure; however, their results are less significant.

Despite the apparent appeal of the asset allocation approach, it does contain some inherent disadvantages. First, the approach entails heavy transaction costs related to both maintaining the individual portfolios and the allocations between factors. Second, this asset allocation approach does not properly exploit potential benefits achievable from combining factors in the stock selection, as shown by Bird and Whitaker (2004) and Lakonishok, Shleifer and Vishny (1994).

4.2.1.2 Security Selection Strategies

In order to avoid the potential shortcomings of the asset allocation approach, investors may apply the style cycle methodology within the stock selection procedure. Based on the inter-stock diversification arguments presented in the Factor Return Analysis chapter, this approach suggests investing in stocks with multiple attractive style tilts by applying either stepwise sorting procedures or the use of composite scores. By using these procedures, investors can screen their respective universes for stocks with multiple style exposures which are expected to perform well during a given state of the economy. Rather than holding two separate portfolios containing quality and value stocks, investors may benefit from finding stocks which possess both characteristics, i.e. cheap quality stocks. This approach applies a rotation-based dimension to the work of Fama and French (1992), Lakonishok, Shleifer and Vishny (1994), Bird and Whitaker (1994) and several others.

Rather than providing a complete trading strategy and contrary to the asset allocation approach presented above, this approach is ideally better suited as input in the investor's selection process as this approach can be applied in multidimensional screening processes, which can isolate stocks with attractive style tilts for further in-depth qualitative analysis.

In order to preview how this approach may be applied, the subsection below presents a screening of the S&P Developed BMI for stocks, which possess attractive style tilts.

4.2.1.3 Style Factor Recommendations

The following will recommend a series of stocks pick recommendations based on the framework developed in this chapter. In order to do so, the universe is screened for stocks with style exposures which are expected to perform well during a given state of the economy. I will not undertake a long discussion about the direction of the global economy but instead rely on the latest OECD Economic Outlook published in May 2013 as an example. The report concludes:

"*(…) growth in advanced economies should strengthen gradually after the middle of 2013 and through 2014, helped by on-going support from accommodative monetary policies, improving financial market conditions and a gradual restoration of confidence.*" OECD (2013)

Although the report points to diverging economic growth between Europe and USA, a continued gradual improvement following the debt-issues of the European Union in 2013 is expected. Thus, the economy is considered to be in the recovery phase. According to the results in figure table 4.2 and figure 4.3, this section screens for stocks with high-value indicators and low growth and quality indicators.

Table 4.4 – Recovery Screen[104]

Rank	Company	Bloomberg Ticker	Industry	Price (Local)	Mkt.Cap (USDm)	12M Return (USD)	Value Rank	Quality Rank	Growth Rank	Recovery Rank
1	Heijmans NV	HEIJM NA Equity	Construction & Engineering	7.89	164.47	14.7%	0.99	0.02	0.03	**1.000**
2	Deoleo SA	OLE SQ Equity	Food Products	0.30	329.37	10.9%	0.97	0.02	0.01	**1.000**
3	Asian Bamboo AG	5AB GY Equity	Food Products	6.51	31.02	-61.1%	1.00	0.05	0.04	**1.000**
4	Uniden Corp	6815 JT Equity	Communications Equipment	228.0	116.04	22.2%	0.99	0.03	0.06	**0.999**
5	Tsudakoma Corp	6217 JT Equity	Machinery	185.0	83.58	11.8%	0.94	0.01	0.03	**0.999**
6	Best Denki Co Ltd	8175 JT Equity	Specialty Retail	137.0	204.09	1.5%	0.95	0.03	0.03	**0.999**
7	SSAB AB	SSABB SS Equity	Metals & Mining	45.45	1597.97	-14.5%	0.98	0.05	0.04	**0.999**
8	Nippon Yakin Kogyo Co Ltd	5480 JT Equity	Metals & Mining	132.0	130.89	-3.8%	0.98	0.02	0.07	**0.999**
9	Tokyo Steel Manufacturing Co L	5423 JT Equity	Metals & Mining	478.0	395.34	-25.3%	0.96	0.07	0.00	**0.999**
10	Godo Steel Ltd	5410 JT Equity	Metals & Mining	184.0	205.14	-14.3%	1.00	0.09	0.02	**0.998**
11	Renewable Energy Corp ASA	REC NO Equity	Semiconductors & Semiconductor	1.06	744.26	109.6%	0.95	0.03	0.04	**0.998**
12	Sasebo Heavy Industries Co Ltd	7007 JT Equity	Machinery	107.0	116.53	-7.0%	0.98	0.10	0.01	**0.998**
13	Kloeckner & Co SE	KCO GY Equity	Trading Companies & Distributo	9.32	940.94	9.5%	0.94	0.05	0.02	**0.998**
14	Rautaruukki OYJ	RTRKS FH Equity	Metals & Mining	5.30	669.44	-10.6%	0.96	0.09	0.02	**0.998**
15	AOC Holdings Inc	5017 JT Equity	Oil, Gas & Consumable Fuels	389.0	182.20	-26.0%	1.00	0.12	0.03	**0.997**
16	Nippon Thompson Co Ltd	6480 JT Equity	Machinery	360.0	251.77	17.6%	0.97	0.08	0.05	**0.997**
17	Commerzbank AG	CBK GY Equity	Commercial Banks	12.07	8569.54	-24.7%	1.00	0.06	0.11	**0.997**
18	NH Hoteles SA	NHH SQ Equity	Hotels Restaurants & Leisure	2.90	633.81	2.7%	0.94	0.05	0.05	**0.997**
19	Ulvac Inc	6728 JT Equity	Semiconductors & Semiconductor	812.0	337.74	13.4%	0.92	0.08	0.01	**0.997**
20	Bure Equity AB	BURE SS Equity	Diversified Financial Services	23.50	217.22	11.2%	0.89	0.03	0.04	**0.997**
5539	Francesca's Holdings Corp	FRAN UW Equity	Specialty Retail	28.40	909.82	11.9%	0.08	0.91	0.98	**0.002**
5540	AFC Enterprises Inc	AFCE UW Equity	Hotels Restaurants & Leisure	29.06	637.40	42.0%	0.05	0.99	0.90	**0.002**
5541	Altisource Portfolio Solutions	ASPS UW Equity	Real Estate Management & Devel	87.87	1654.87	10.7%	0.10	1.00	0.97	**0.001**
5542	COOKPAD Inc	2193 JT Equity	Media	1513.0	600.70	95.4%	0.01	0.95	0.94	**0.001**
5543	MonotaRO Co Ltd	3064 JT Equity	Trading Companies & Distributo	1683.0	1137.86	74.5%	0.00	0.99	0.92	**0.001**
5544	Michael Kors Holdings Ltd	KORS UN Equity	Textiles, Apparel & Luxury Goo	56.13	9428.03	25.2%	0.02	0.94	0.99	**0.001**
5545	3-D Matrix Ltd	7777 JQ Equity	Biotechnology	2545.0	616.02	174.8%	0.02	0.94	1.00	**0.001**
5546	Jin Co Ltd	3046 JQ Equity	Specialty Retail	3950.0	862.67	49.0%	0.02	1.00	0.99	**0.001**
5547	ServiceNow Inc	NOW UN Equity	Software	27.72	3727.99	24.5%	0.03	1.00	1.00	**0.000**
5548	AbbVie Inc	ABBV UN Equity	Pharmaceuticals	36.69	52053.06	29.8%	0.00	1.00	0.98	**0.000**

Table 4.4 is the result of a screening of the S&P Developed BMI constituents at 05/31/2013. The last four columns in table 4.4 show the composite value, quality and growth rankings, as well as the recovery composite ranking. The model has screened for companies with high value and low quality and growth

[104] Source: Bloomberg, FactSet

indicators using the same methodology as applied in the analysis. In other words, the model has identified stocks which score well on factors which are recommended by the style cycle during the recovery phase. The model recommends *Heijmans NV*, a Dutch construction company engaged in infrastructure projects and *Deoleo SA*, a Spanish food manufacturer. Short positions (if allowed) should be taken in the bottom companies. It should be emphasized that these recommendations should not be used singlehandedly but rather in conjunction with thorough analysis in order to avoid potential value traps.

A point of critique against this methodology is presented by Klein and Lederman (1995). They rightfully argue that although the potential diversification of style tilts is advantageous, investors risk compromising the exposure against deep factor returns as stocks with multiple extreme tilts are scarce. Table 4.4 indicates that such stocks do in fact exist; however, this is likely due to the large size of the applied universe. Thus, investors will need to balance the level of detail against the depth of the individual factors.

4.3 Summarizing

This chapter has examined the fluctuations in the premiums of the six equity style strategies during the economic cycle. The empirical evidence of this paper confirms the hypothesis put forward in the previous chapter as style premiums are found to be both volatile and inherently linked to the economic cycle.

In short, the analysis indicated that the value premium is most prominent in periods of low economic growth, with quality outperforming amid declining economic indicators. Furthermore, the estimates revisions strategies outperform during the slowdown phase. The data on growth, size and market beta was largely inconclusive.

The results have two implications. First, the ongoing debate on whether premiums do or do not exist appear premature as the results of this chapter suggest that premiums are highly dynamic in nature and that they respond differently to macroeconomic shocks as seen during the dot-com bubble and the financial crisis. Although the data confirm a link between the premiums and the macroeconomic cycle, the question of *why* the cyclicality in these anomalies exists is more ambiguous.[105] The academic literature on this topic is scarce and unclear. On the one hand, risk-based explanations argue that changes in market risk sentiment, as measured by interest rates and yields, explain a large degree of the fluctuations in premiums. On the other hand, the fluctuations may be caused by sector or country biases. Predictive models, as employed by Arshanapalli, Switzer and Panju (2007) and Cooper, Gulen and Vassalou (2001), apply an array of predictive factors such as T-bill returns, stock dividend yield, corporate yield spreads, consumer confidence indices, inflation etc.; however, the majority of these are inherently linked to the economic cycle. Lastly, the interdependence and valuation-gaps between factors are also likely to provide some explanatory power.

[105] Bird and Whitaker (2004)

Unfortunately, the dataset used in this dissertation does not contain the detail needed to properly examine this relationship.

Second, the seasonality in style premiums suggests substantial benefits to investors willing to exploit the cyclical rotations in spreads. The observed spreads during each phase were aggregated into the style cycle model, which can be used as a tool to identify advantageous style exposures given investors' expectations of the future economic development. Two ways of capitalizing on these phenomena were suggested. First, investors may capture the premiums by treating the styles as distinct assets. Second, investors may apply the recommendations of the style cycle in conjunction with other in-depth valuation techniques in order to isolate stocks which include multiple attractive style tilts. Whichever active approach is selected, the excess return relative to the passive strategies is indisputably linked to the accuracy of investors' ability to properly forecast the macroeconomic development. As such, this is by no means a free lunch.

Thus far, this dissertation has not considered the effects of transaction costs. These will be examined in the following chapter.

5. Transaction Costs

So far, this paper has examined the performance of style investment strategies in the absence of transaction costs. In order to assess the viability of style investment for practitioners, this chapter briefly examines the transaction costs of the equity style strategies applied in this dissertation. This section addresses two sources of transaction costs: 1) investors need to maintain the individual factor baskets as the style alignment of firms change over time, and 2) one needs to account for transaction costs related to the reallocation of capital according to changes in the macroeconomic cycle.

Given that transaction costs, arising from commission fees, stamp costs and bid-ask spreads, have declined during the sample period[106] and vary depending on investors, brokers, exchanges, securities and the level of service provided by brokerage firms, it is difficult to estimate a reliable transaction cost. For the sake of simplicity, this paper assumes uniform transaction costs among investors over time. Based on the prices quoted at Nordnet, this paper applies a round trip transaction cost amounting to 0.30%, ie. 0.15% for each buy and sell order. Furthermore, it is assumed that uniform transaction costs apply to all baskets, independent of the size of the transactions. This assumption is likely to be violated in practice as smaller companies and low P/B stocks tend to face larger transaction costs and elevated bid-ask spreads.[107] However, the size of the differences in transaction costs is not clear or constant over time, and these are thus not easily modeled.

Before commencing the analysis, it is important to emphasize that the effect of transaction costs on returns as shown above is very much dependent on the depth, weighting scheme and frequency by which the premiums are measured. Rebalancing portfolios yearly or sorting stocks into quintiles is therefore likely to reduce transaction costs significantly.

5.1 Portfolio Maintenance Costs

In order to calculate the transaction costs related to portfolio maintenance, the monthly turnover ratios for each basket has been calculated. These turnover rates reflect transactions related to companies entering and leaving the baskets due to changes in indicators and adjustment of the market capitalization based weights. The average monthly turnover and the associated transaction costs are presented in tables 5.1 and 5.2 below

[106] Barber and Odean (2000)
[107] Cooper, Gulen and Vassalou (2001)

Table 5.1 – Developed Average Monthly Turnover[108]

Monthly Turnover	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	21.1%	30.1%	36.7%	40.3%	42.8%	44.0%	44.4%	40.3%	33.9%	22.9%	44.0%	(low) - (high)
P/B	9.3%	20.7%	27.1%	33.0%	37.3%	39.1%	37.6%	35.4%	29.7%	19.0%	28.3%	(low) - (high)
Div Yield	10.2%	22.5%	28.2%	33.3%	33.2%	32.7%	29.9%	28.2%	22.6%	15.4%	25.6%	(high) - (low)
FCF Yield	10.8%	14.0%	13.7%	13.9%	15.8%	21.8%	25.8%	25.2%	21.1%	10.4%	21.1%	(high) - (low)
Asset Growth	8.8%	11.4%	12.7%	13.4%	14.2%	13.6%	12.3%	11.4%	10.1%	7.0%	15.8%	(high) - (low)
EPS Growth	21.7%	28.3%	36.8%	39.2%	38.6%	37.6%	37.9%	34.9%	30.2%	21.5%	43.2%	(high) - (low)
3M Change in Fwd EPS	41.3%	54.3%	59.9%	61.5%	59.7%	57.9%	58.6%	57.7%	51.3%	36.4%	77.7%	(high) - (low)
1M Reversal	92.6%	92.8%	91.9%	90.8%	89.8%	87.8%	89.0%	89.1%	90.9%	91.4%	184.0%	(high) - (low)
EPS Estimates Revisions	82.3%	84.1%	83.8%	87.5%	88.0%	87.4%	77.4%	77.6%	80.1%	81.4%	163.7%	(high) - (low)
Market Beta	17.9%	29.0%	33.5%	37.2%	39.0%	38.5%	36.1%	28.6%	23.0%	13.4%	31.3%	(high) - (low)
ROIC	10.5%	12.0%	14.1%	15.7%	15.9%	15.6%	14.0%	13.1%	10.0%	5.1%	15.6%	(high) - (low)
ROE	10.4%	13.0%	15.1%	15.5%	16.1%	15.9%	14.6%	12.7%	9.8%	5.0%	15.4%	(high) - (low)
Net Margin 5Y Stability	9.1%	11.3%	12.7%	14.3%	14.4%	15.3%	13.5%	12.5%	9.3%	10.0%	19.2%	(low) - (high)
Size	2.1%	9.5%	14.1%	18.2%	21.8%	24.3%	25.9%	26.1%	24.0%	16.8%	18.9%	(low) - (high)
Value	14.6%	34.4%	42.0%	45.4%	45.3%	45.7%	41.7%	42.2%	33.6%	18.3%	32.8%	(high) - (low)
Growth	18.9%	28.1%	33.8%	34.9%	36.5%	34.6%	33.8%	31.0%	24.7%	14.9%	33.8%	(high) - (low)
Momentum	78.0%	85.7%	88.1%	89.1%	87.7%	90.2%	89.7%	88.6%	84.8%	76.4%	154.4%	(high) - (low)
Quality	11.5%	15.3%	17.4%	18.2%	18.1%	17.4%	17.2%	14.7%	11.5%	4.8%	16.3%	(high) - (low)

Table 5.2 Developed Monthly Transaction Costs[109]

Monthly Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0,06%	-0,09%	-0,11%	-0,12%	-0,13%	-0,13%	-0,13%	-0,12%	-0,10%	-0,07%	-0,13%	(low) - (high)
P/B	-0,03%	-0,06%	-0,08%	-0,10%	-0,11%	-0,12%	-0,11%	-0,11%	-0,09%	-0,06%	-0,09%	(low) - (high)
Div Yield	-0,03%	-0,07%	-0,08%	-0,10%	-0,10%	-0,10%	-0,09%	-0,08%	-0,07%	-0,05%	-0,08%	(high) - (low)
FCF Yield	-0,03%	-0,04%	-0,04%	-0,04%	-0,05%	-0,07%	-0,08%	-0,08%	-0,06%	-0,03%	-0,06%	(high) - (low)
Asset Growth	-0,03%	-0,03%	-0,04%	-0,04%	-0,04%	-0,04%	-0,04%	-0,03%	-0,03%	-0,02%	-0,05%	(high) - (low)
EPS Growth	-0,07%	-0,08%	-0,11%	-0,12%	-0,12%	-0,11%	-0,11%	-0,10%	-0,09%	-0,06%	-0,13%	(high) - (low)
3M Change in Fwd EPS	-0,12%	-0,16%	-0,18%	-0,18%	-0,18%	-0,17%	-0,18%	-0,17%	-0,15%	-0,11%	-0,23%	(high) - (low)
1M Reversal	-0,28%	-0,28%	-0,27%	-0,27%	-0,27%	-0,26%	-0,27%	-0,27%	-0,27%	-0,27%	-0,55%	(high) - (low)
EPS Estimates Revisions	-0,25%	-0,25%	-0,25%	-0,18%	-0,06%	-0,01%	-0,04%	-0,19%	-0,24%	-0,24%	-0,49%	(high) - (low)
Market Beta	-0,05%	-0,08%	-0,10%	-0,11%	-0,11%	-0,11%	-0,10%	-0,08%	-0,07%	-0,04%	-0,09%	(high) - (low)
ROIC	-0,03%	-0,04%	-0,04%	-0,05%	-0,05%	-0,05%	-0,04%	-0,04%	-0,03%	-0,02%	-0,05%	(high) - (low)
ROE	-0,03%	-0,04%	-0,05%	-0,05%	-0,05%	-0,05%	-0,04%	-0,04%	-0,03%	-0,02%	-0,05%	(high) - (low)
Net Margin 5Y Stability	-0,03%	-0,03%	-0,04%	-0,04%	-0,04%	-0,05%	-0,04%	-0,04%	-0,03%	-0,03%	-0,06%	(low) - (high)
Size	-0,01%	-0,03%	-0,04%	-0,05%	-0,07%	-0,07%	-0,08%	-0,08%	-0,07%	-0,05%	-0,06%	(low) - (high)
Value	-0,04%	-0,10%	-0,13%	-0,14%	-0,14%	-0,14%	-0,13%	-0,13%	-0,10%	-0,05%	-0,10%	(high) - (low)
Growth	-0,06%	-0,08%	-0,10%	-0,10%	-0,11%	-0,10%	-0,10%	-0,09%	-0,07%	-0,04%	-0,10%	(high) - (low)
Momentum	-0,23%	-0,26%	-0,26%	-0,27%	-0,26%	-0,27%	-0,27%	-0,27%	-0,25%	-0,23%	-0,46%	(high) - (low)
Quality	-0,03%	-0,05%	-0,05%	-0,05%	-0,05%	-0,05%	-0,05%	-0,04%	-0,03%	-0,01%	-0,05%	(high) - (low)

Where:

$$Turnover = \frac{(V_{buy}+V_{sell})*0.5}{VP_t} \quad \textbf{(5.1)}$$

$V_{buy} = Value\ of\ stocks\ bought\ at\ portfolio\ formation$
$V_{sell} = Value\ of\ stocks\ sold\ at\ portfolio\ formation$
$VP_t = Value\ of\ portfolio\ at\ portfolio\ formation$

In order to correctly capture the effects of compounding and time-variation in turnover, the total monthly fees shown in table 5.2 are calculated as the difference between gross returns (as shown in table 3.1) and the average monthly net returns. Naturally, the transaction costs are higher for the premiums, as investors need to maintain both the long and short legs of the spreads.

[108] Source: FactSet, own calculation
[109] Source: FactSet, own calculations

Tables 5.1 and 5.2 show highly elevated turnovers for the one-month based momentum measures 1M Reversal and EPS Estimates Revisions, resulting in monthly premium transaction costs of -0.55% and -0.49% respectively. Effectively, these transaction costs eliminate the majority of the observed monthly momentum premiums, thereby making the strategy unsuitable for practical implementation. The value factors also suffer from heightened transaction costs; however, these are primarily limited to the central baskets. Although the resulting costs of -0.10% appear minor compared to a monthly value premium of 1.24%, the effect is apparent when one accounts for compounding effects. The terminal value of the spread during the sample period (given an initial investment of USD 100) declines from USD 2964.65 to USD 2231.93, a drop of USD 723.80 or -24.5%. The growth and market beta premiums incur trading costs in line with value of -0.10%, while size is characterized by low basket turnover, although the costs may be larger than presented in table 5.2 due to illiquidity and widened bid-ask spreads. Lastly, the turnover of the quality baskets is the lowest within the sample due to indicators being relatively stable over time and relying on yearly reported data. This results in a monthly average transaction cost of -0.05% for the quality premium and a corresponding loss of -14.3% during the entire sample period.

5.2 Transitions and Factor Stability

In order to properly assess the stability of firm specific indicators, the inter-basket transition matrixes for each strategy are calculated. These are shown in table 5.3 below.

Table 5.3 Developed Transition Matrixes[110]

Value 1 (low)	Value 2	Value 3	Value 4	Value 5	Value 6	Value 7	Value 8	Value 9	Value 10 (high)
83%	13%	2%	1%	1%	0%	0%	0%	0%	0%
12%	67%	16%	2%	1%	1%	0%	0%	0%	0%
2%	16%	59%	18%	3%	1%	1%	0%	0%	0%
1%	2%	17%	56%	18%	3%	1%	1%	0%	0%
1%	1%	3%	18%	54%	18%	3%	1%	0%	0%
0%	1%	1%	3%	18%	54%	19%	3%	1%	0%
0%	0%	0%	1%	3%	18%	55%	18%	2%	1%
0%	0%	0%	1%	1%	3%	18%	59%	16%	1%
0%	0%	0%	0%	0%	1%	2%	16%	68%	12%
0%	0%	0%	0%	0%	0%	1%	1%	11%	85%

Growth 1 (high)	Growth 2	Growth 3	Growth 4	Growth 5	Growth 6	Growth 7	Growth 8	Growth 9	Growth 10 (low)
84%	8%	2%	1%	1%	0%	0%	1%	1%	2%
8%	74%	10%	2%	1%	1%	1%	0%	0%	0%
2%	10%	69%	11%	3%	1%	1%	1%	0%	0%
1%	2%	12%	66%	12%	3%	1%	1%	1%	0%
1%	2%	3%	13%	65%	12%	4%	1%	1%	0%
1%	1%	2%	3%	13%	64%	10%	3%	1%	1%
1%	1%	1%	1%	3%	13%	67%	11%	2%	1%
1%	0%	1%	1%	1%	3%	12%	68%	10%	2%
1%	0%	0%	1%	1%	1%	2%	12%	73%	8%
1%	0%	0%	0%	0%	1%	2%	2%	9%	84%

Momentum 1 (low)	Momentum 2	Momentum 3	Momentum 4	Momentum 5	Momentum 6	Momentum 7	Momentum 8	Momentum 9	Momentum 10 (high)
26%	17%	12%	9%	8%	6%	6%	5%	5%	5%
16%	14%	12%	10%	9%	9%	8%	8%	7%	6%
11%	12%	12%	11%	11%	10%	10%	9%	8%	6%
9%	10%	11%	11%	11%	11%	10%	10%	8%	6%
7%	9%	10%	11%	12%	12%	11%	10%	9%	7%
7%	8%	10%	11%	12%	12%	12%	11%	9%	8%
6%	8%	9%	11%	11%	12%	12%	11%	11%	9%
6%	8%	9%	10%	10%	11%	11%	12%	12%	11%
6%	7%	8%	8%	9%	9%	11%	12%	14%	15%
6%	5%	6%	6%	7%	8%	9%	12%	16%	26%

Quality 1 (low)	Quality 2	Quality 3	Quality 4	Quality 5	Quality 6	Quality 7	Quality 8	Quality 9	Quality 10 (high)
91%	4%	1%	1%	1%	0%	0%	0%	0%	0%
5%	87%	5%	1%	0%	0%	0%	0%	0%	0%
1%	5%	85%	6%	1%	0%	0%	0%	0%	0%
1%	1%	6%	84%	6%	1%	0%	0%	0%	0%
1%	1%	1%	6%	84%	6%	1%	0%	0%	0%
0%	0%	0%	1%	6%	84%	6%	1%	0%	0%
0%	0%	0%	0%	1%	6%	85%	6%	1%	0%
0%	0%	0%	0%	0%	1%	5%	87%	5%	0%
0%	0%	0%	0%	0%	0%	1%	5%	90%	3%
0%	0%	0%	0%	0%	0%	0%	0%	3%	95%

Market Beta 1 (high)	Market Beta 2	Market Beta 3	Market Beta 4	Market Beta 5	Market Beta 6	Market Beta 7	Market Beta 8	Market Beta 9	Market Beta 10 (low)
84%	10%	1%	0%	0%	0%	0%	0%	0%	0%
10%	70%	14%	1%	0%	0%	0%	0%	0%	0%
1%	14%	64%	15%	2%	0%	0%	0%	0%	0%
0%	1%	16%	60%	16%	2%	0%	0%	0%	0%
0%	0%	2%	17%	59%	17%	0%	0%	0%	0%
0%	0%	0%	2%	17%	59%	2%	2%	0%	0%
0%	0%	0%	0%	2%	17%	15%	15%	1%	0%
0%	0%	0%	0%	0%	2%	66%	66%	13%	0%
0%	0%	0%	0%	0%	0%	13%	13%	73%	9%
0%	0%	0%	0%	0%	0%	0%	0%	9%	87%

Size 1 (high)	Size 2	Size 3	Size 4	Size 5	Size 6	Size 7	Size 8	Size 9	Size 10 (low)
97%	3%	0%	0%	0%	0%	0%	0%	0%	0%
3%	91%	5%	0%	0%	0%	0%	0%	0%	0%
0%	6%	87%	7%	0%	0%	0%	0%	0%	0%
0%	0%	8%	83%	9%	0%	0%	0%	0%	0%
0%	0%	0%	10%	79%	10%	0%	0%	0%	0%
0%	0%	0%	0%	11%	77%	11%	0%	0%	0%
0%	0%	0%	0%	0%	12%	75%	12%	0%	0%
0%	0%	0%	0%	0%	0%	12%	75%	12%	0%
0%	0%	0%	0%	0%	0%	0%	12%	78%	10%
0%	0%	0%	0%	0%	0%	0%	0%	9%	88%

Transitions are measured from row to column, i.e. of the stocks in the high value basket (top panel, rightmost figures) 85% of the stocks (measured by value) remain in the high basket, 12% flow to basket 9, 1% to basket 8 etc. The columns do not sum to 100% due to distortion caused by new entrants in the universe.

[110] Source: FactSet, own calculations

The transitions shown in table 5.3 provide an extension of the turnover metric shown above by allowing an examination of inter-basket movements of constituents. As this metric excludes turnover due to rebalancing of the portfolios, one is able to determine the relative volatility of the underlying fundamental ratios, thereby assessing the likelihood that a firm will remain within a given factor decile.

As shown in Table 5.3, the transitions appear muted for the majority of factors. Thus, companies are likely to maintain their style tilts for prolonged periods of time. The two most stable factors are size and quality, followed by value and growth, i.e. high-quality firms are likely to remain high quality. The momentum indicators appear volatile as only a limited proportion of stocks tend to remain within a decile in consecutive periods. These results are comforting for non-momentum investors, as stocks tend to remain within their style baskets for consecutive periods, thus reducing the need for rebalancing.

5.3 Style Rotation Costs

This section addresses the costs associated with style-rotation strategies. As this paper does not engage in forecasting these fluctuations and as trading costs are inherently linked to the implementation and frequency of style-switching maneuvers of investors, the costs of style rotations cannot be estimated directly. However, in order to justify increased trading costs and remain a viable investment option for practitioners, style-switching strategies need to earn a higher return that the single style equivalents.

A conservative estimation of transaction costs arising from style rotations is achieved by assuming that investors rebalance their full portfolios at the same frequency as implied by the macroeconomic reference data. Given an average length of an economic phase of 3.22 months, investors would face an additional 30% turnover resulting in an additional -0.09% in transaction costs. Although the assumptions are strict and likely to overstate the realized transaction costs, the question remains whether the added performance from applying the style cycle is able to compensate for the increased fees.

While this is not testable within the data set, Arshapanalli, Switzer and Panju (2007) and Cooper, Gulen and Vassalou (2001) both examine the effects of transaction costs in cycle-based models. Both studies find that such strategies remain profitable in the presence of transaction costs, though the effect on terminal wealth compared to simple buy-and-hold strategies is substantial.

In summary, this chapter has briefly discussed the trading costs arising from style investment strategies. The results show that even though the performance gap of the value and quality spreads are narrower than if transaction costs are ignored, the premiums remain significant. Generally, the trading costs of both singly- and rotation-based style strategies are highly dependent on the implementation. However, in line with the findings of Barber and Odean (2000) and the infamous quote by Benjamin Graham: "*The investor's chief*

problem – and even his worst enemy – is likely to be himself."[111], the results indicate that frequent trading due to rebalancing erode a significant proportion of the observed premiums. Luckily, the transaction matrixes in figure 5.3 indicate that non-momentum stocks maintain their style tilts for prolonged periods of time. In order to minimize transaction costs, investors may reduce rotation-based rebalancing, relaxing their search for deep factor stocks or utilizing the growing availability of low cost style-based ETFs.

[111] Barber and Odean (2000)

6. Conclusion

The purpose of this thesis was to investigate whether recent empirical evidence support the existence of premiums within the *Value*, *Growth*, *Momentum*, *Systematic Risk*, *Quality* and *Size* style strategies, as well as to examine how these strategies perform during phases of the economic cycle.

Based on recent empirical evidence, multiple anomalies were identified as certain style factors have proven to yield significant excess returns to investors, as the financial markets appear to systematically under- or overestimate the value generated by several fundamental characteristics. This decoupling from fundamental value suggests substantial benefits to investors who are willing to exploit these anomalies.

Driven by the underlying P/E and Div Yield factors, the contrarian value strategy, which exploits market irrationality and exuberance, yielded the highest monthly premium (+1.24%) throughout the sample period. Two other strategies were also found to yield significant spreads. The quality factor, which measures the effects of firm profitability and stability in margins, showed a significant premium of 0.77%. Momentum strategies that are based on mean reversion in returns and momentum in consensus estimates also yielded a substantial premium of 0.71%. For the remaining style based strategies, growth, systematic risk and size, the empirical evidence was found to be inconclusive.

In order to assess the viability of the observed premiums, it was examined whether the premiums could be explained by adjusting for total- and systematic risk. An analysis of the volatility, return-risk ratio and beta adjusted returns showed considerable discrepancies between premiums and factor portfolios versus the market, thereby rejecting risk based explanations. In response, several arguments founded in behavioral finance such as the extrapolation and overreaction hypotheses and institutional biases were discussed. Although difficult to quantify, these arguments supported the results of the analysis.

In examining the return premiums and through reviewing other academicals research, it is evident that style premiums are not constant over time. In order to address this, the premiums were measured during the phases of the economic cycle through global PMI data. The analysis showed clear signs of cyclicality within premiums, suggesting substantial benefits to investors capable of correctly adjusting their style exposures relative to the economic environment. These results are summarized in figure 4.3. In addition, two ways of implementing multi-factor strategies in order to exploit the interdependence and cyclicality of the strategies were addressed: a traditional asset allocation approach or the application of style-based screening models to support the stock-picking process. An example of the screening model is presented in table 4.4.

The confirmation of a link between the economic cycle and the magnitude of the style premiums suggests that the ongoing academic debate on whether style premiums exist or not is premature. Instead, it is

hypothesized that the premiums are likely to be driven by several exogenous variables. As the academic literature on the subject is scarce and unclear, further research is needed to investigate these relationships.

Accounting for transaction costs effectively eliminates the trading intensive momentum strategy. Although the average monthly transaction costs of to 0.05% to 0.10% for the remaining strategies do not affect the previous conclusions, the compounded effects over longer periods were found to be substantial. Rebalancing of portfolios due to rotation changes were also shown to have a sizeable impact and investors are thus advised to refrain from excessive reallocation. In addition, an examination of transition matrixes indicated that the style indicators remain remarkably stable over time.

The results presented in this paper show that style-based strategies are a viable investment option for investors and that thoughtful application of such strategies can be applied in order to outperform the market. Although the results are based on recent data, the historical performance does not necessarily equal future performance. Thus, the question remains whether investors can expect the identified patterns to persist. If the EMH holds and the observed premiums are indeed due to increased risk, then the patterns may be expected to continue as long as the risks remain. On the other hand, it is possible that investors will realize and subsequently correct the irrationality and exuberance present in the financial markets, thereby reducing mispricing. The surge in conventional and style-based exchange traded products (ETPs) and the recent move into more disciplined quantitative investment strategies may also increase demand for undervalued stocks and likely reduce potential agency problems which result in picking "glamour" stocks.[112] However, such changes are unlikely to materialize rapidly. Conversely, the results of this dissertation contribute to the expanding evidence confirming and explaining the behavior of equity style factor premiums, thereby supporting the pervasiveness and continued existence of equity style investment strategies.

[112] Lakonishok, Shleifer and Vishny (1994)

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7.1 Databases

- FactSet, FactSet Research Systems Inc, Access provided by SEB Asset Management and Deutsche Bank
- Bloomberg, Bloomberg LP, Access provided by SEB Asset Management

8. Appendix

8.1 Factor Overview

Strategy	Factor (Indicator)	Premium	Measurement (figures calculated at portfolio formation)
Value	P/E	1.30%	Price / trailing 12m EPS
	P/B	0.47%	Price / trailing 12m BVPS
	Div Yield	1.08%	Trailing 12m Div / price
	FCF Yield	0.39%	Trailing 12m FCF per share / price
	Value	1.24%	Composite [P/E, P/B, FCF Yield, Div Yield]
Growth	Asset Growth	-0.34%	YoY chg. in trailing 12m total assets
	EPS Growth	0.02%	YoY chg. in trailing 12m EPS
	Growth	-0.13%	Composite [Asset Growth, EPS Growth]
Momentum	3M Change in Fwd EPS	0.50%	%-chg in consensus 12m fwd EPS
	1M Reversal	-0.27%	1m total return
	EPS Estimates Revisions	0.46%	EPS Revision ratio
	Momentum	0.71%	Composite [3M chg. in Fwd EPS, 1M Reversal, EPS est. rev.]
Market Beta	Market Beta	-0.35%	CAPM Beta
Quality	ROIC	0.93%	Trailing 12m NOPAT / trailing 12m invested capital
	ROE	0.84%	Trailing 12m net earnings / trailing 12m book value of equity
	Net Margin 5Y Stability	0.15%	5Y net margin coefficient of variation
	Quality	0.77%	Composite [ROIC, ROE, Net Margin 5Y Stability]
Size	Size	0.21%	Market Capitalization

8.2 Test for Normality

Jarque-Bera Test (Test Score, α-level)	Basket 1		Basket 2		Basket 3		Basket 4		Basket 5		Basket 6		Basket 7		Basket 8		Basket 9		Basket 10		Basket 10 - Basket 1	
P/E	15.6	*0.0%*	34.9	*0.0%*	51.1	*0.0%*	57.6	*0.0%*	75.7	*0.0%*	83.9	*0.0%*	97.6	*0.0%*	55.5	*0.0%*	62.4	*0.0%*	118.8	*0.0%*	25.1	*0.0%*
P/B	28.2	*0.0%*	20.0	*0.0%*	63.2	*0.0%*	36.3	*0.0%*	37.4	*0.0%*	102.5	*0.0%*	104.6	*0.0%*	63.3	*0.0%*	119.6	*0.0%*	392.9	*0.0%*	472.6	*0.0%*
Div Yield	21.1	*0.0%*	50.1	*0.0%*	40.0	*0.0%*	64.9	*0.0%*	23.9	*0.0%*	75.0	*0.0%*	52.7	*0.0%*	35.1	*0.0%*	70.7	*0.0%*	677.1	*0.0%*	48.7	*0.0%*
FCF Yield	211.1	*0.0%*	71.8	*0.0%*	37.7	*0.0%*	22.4	*0.0%*	14.5	*0.1%*	20.9	*0.0%*	50.9	*0.0%*	61.4	*0.0%*	51.7	*0.0%*	234.2	*0.0%*	12.5	*0.2%*
Asset Growth	30.4	*0.0%*	6.2	*4.4%*	38.8	*0.0%*	11.4	*0.3%*	24.9	*0.0%*	59.2	*0.0%*	53.8	*0.0%*	74.8	*0.0%*	47.8	*0.0%*	89.2	*0.0%*	128.3	*0.0%*
EPS Growth	5.7	*5.7%*	106.6	*0.0%*	78.0	*0.0%*	71.4	*0.0%*	50.9	*0.0%*	21.6	*0.0%*	57.1	*0.0%*	57.3	*0.0%*	48.5	*0.0%*	45.5	*0.0%*	26.8	*0.0%*
3M Change in Fwd EPS	30.0	*0.0%*	120.5	*0.0%*	99.5	*0.0%*	161.3	*0.0%*	59.9	*0.0%*	58.7	*0.0%*	18.4	*0.0%*	38.6	*0.0%*	26.9	*0.0%*	27.9	*0.0%*	78.1	*0.0%*
1M Reversal	59.8	*0.0%*	39.1	*0.0%*	68.0	*0.0%*	89.1	*0.0%*	23.3	*0.0%*	83.4	*0.0%*	51.2	*0.0%*	28.6	*0.0%*	25.9	*0.0%*	115.5	*0.0%*	103.4	*0.0%*
EPS Estimates Revisions	35.3	*0.0%*	51.7	*0.0%*	39.6	*0.0%*	26.2	*0.0%*	1.3	*52.9%*	6.4	*4.1%*	0.7	*70.1%*	79.7	*0.0%*	24.0	*0.0%*	23.3	*0.0%*	49.2	*0.0%*
Market Beta	80.8	*0.0%*	128.7	*0.0%*	32.4	*0.0%*	35.6	*0.0%*	29.6	*0.0%*	113.2	*0.0%*	112.7	*0.0%*	83.7	*0.0%*	33.8	*0.0%*	28.2	*0.0%*	75.7	*0.0%*
ROIC	12.9	*0.2%*	22.7	*0.0%*	49.0	*0.0%*	47.9	*0.0%*	102.6	*0.0%*	76.2	*0.0%*	40.5	*0.0%*	27.8	*0.0%*	16.3	*0.0%*	15.7	*0.0%*	2.7	*26.1%*
ROE	62.8	*0.0%*	56.3	*0.0%*	39.4	*0.0%*	9.7	*0.8%*	80.8	*0.0%*	128.7	*0.0%*	32.4	*0.0%*	35.6	*0.0%*	29.6	*0.0%*	113.2	*0.0%*	22.0	*0.0%*
Net Margin 5Y Stability	16.0	*0.0%*	23.4	*0.0%*	49.9	*0.0%*	35.7	*0.0%*	50.9	*0.0%*	59.8	*0.0%*	59.3	*0.0%*	19.0	*0.0%*	41.6	*0.0%*	39.5	*0.0%*	366.2	*0.0%*
Size	26.9	*0.0%*	87.1	*0.0%*	94.2	*0.0%*	71.2	*0.0%*	76.8	*0.0%*	80.0	*0.0%*	71.8	*0.0%*	45.3	*0.0%*	67.4	*0.0%*	148.4	*0.0%*	194.5	*0.0%*
Value	39.4	*0.0%*	24.9	*0.0%*	39.5	*0.0%*	39.4	*0.0%*	29.6	*0.0%*	55.7	*0.0%*	43.6	*0.0%*	88.5	*0.0%*	115.3	*0.0%*	310.6	*0.0%*	107.8	*0.0%*
Growth	11.3	*0.4%*	55.1	*0.0%*	44.6	*0.0%*	35.4	*0.0%*	25.5	*0.0%*	54.2	*0.0%*	39.9	*0.0%*	62.0	*0.0%*	56.7	*0.0%*	102.1	*0.0%*	160.3	*0.0%*
Momentum	117.6	*0.0%*	71.8	*0.0%*	30.4	*0.0%*	52.0	*0.0%*	73.1	*0.0%*	51.6	*0.0%*	31.1	*0.0%*	27.2	*0.0%*	19.7	*0.0%*	73.2	*0.0%*	167.9	*0.0%*
Quality	10.6	*0.5%*	20.2	*0.0%*	34.8	*0.0%*	65.8	*0.0%*	28.8	*0.0%*	72.2	*0.0%*	62.8	*0.0%*	56.3	*0.0%*	39.4	*0.0%*	9.7	*0.8%*	53.1	*0.0%*

Jarque-Bera test for normality on the developed markets. H_0 = Data is normally distributed. To be read as [JB-test statistic] [α-level (JB ~χ^2 (df = 2))].

8.3 Macroeconomic Indicator Correlations

Macroeconomic Indicator Correlations	JPM Global Manufacturing PMI	JPM Global Composite PMI	ISM Manufacturing PMI	Eurostat Industrial Production	Eurozone Manufacturing PMI	Eurostat Industrial Production	Ifo Pan Germany Business Clima	Japan Tankan Business Condition
JPM Global Manufacturing PMI	1.00	0.91	0.93	0.63	0.93	0.53	0.57	0.28
JPM Global Composite PMI		1.00	0.86	0.72	0.88	0.54	0.58	0.51
ISM Manufacturing PMI			1.00	0.46	0.82	0.36	0.34	-0.08
Eurostat Industrial Production				1.00	0.84	0.36	0.68	0.31
Eurozone Manufacturing PMI					1.00	0.56	0.82	0.48
Eurostat Industrial Production						1.00	0.23	0.02
Ifo Pan Germany Business Clima							1.00	0.56
Japan Tankan Business Condition								1.00

8.4 Developed Data Output

Table 8.4.1 - Developed Return Data Output (Panels A – C)

Index	CAGR	Volatility	IR	Max DD
S&P Developed BMI	0.55%	4.23%	0.13	-52.2%

Panel A - Average Monthly Factor Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.06%	0.11%	0.26%	0.47%	0.55%	0.69%	0.74%	0.90%	0.94%	1.23%	1.30%	(low) - (high)
P/B	0.40%	0.41%	0.28%	0.29%	0.32%	0.45%	0.50%	0.71%	0.45%	0.87%	0.47%	(low) - (high)
Div Yield	-0.15%	0.00%	0.07%	0.26%	0.45%	0.51%	0.85%	0.76%	1.01%	0.93%	1.08%	(high) - (low)
FCF Yield	0.33%	0.25%	0.26%	0.38%	0.68%	0.69%	0.69%	0.73%	0.84%	0.72%	0.39%	(high) - (low)
Asset Growth	0.67%	0.63%	0.52%	0.52%	0.32%	0.42%	0.55%	0.47%	0.49%	0.33%	-0.34%	(high) - (low)
EPS Growth	0.20%	0.44%	0.33%	0.60%	0.67%	0.57%	0.62%	0.60%	0.35%	0.23%	0.02%	(high) - (low)
3M Change in Fwd EPS	-0.05%	0.31%	0.56%	0.43%	0.68%	0.59%	0.65%	0.57%	0.62%	0.46%	0.50%	(high) - (low)
1M Reversal	0.54%	0.63%	0.48%	0.53%	0.55%	0.53%	0.49%	0.45%	0.33%	0.27%	-0.27%	(high) - (low)
EPS Estimates Revisions	0.36%	0.41%	0.38%	0.37%	0.25%	0.13%	0.23%	0.40%	0.73%	0.81%	0.46%	(high) - (low)
Market Beta	0.63%	0.72%	0.59%	0.64%	0.60%	0.48%	0.59%	0.67%	0.39%	0.28%	-0.35%	(high) - (low)
ROIC	-0.09%	-0.10%	0.03%	0.27%	0.34%	0.58%	0.55%	0.73%	0.72%	0.84%	0.93%	(high) - (low)
ROE	-0.04%	-0.19%	-0.02%	0.17%	0.45%	0.48%	0.43%	0.75%	0.76%	0.81%	0.84%	(high) - (low)
Net Margin 5Y Stability	0.26%	0.36%	0.28%	0.41%	0.40%	0.47%	0.62%	0.50%	0.63%	0.41%	0.15%	(low) - (high)
Size	0.56%	0.51%	0.53%	0.47%	0.48%	0.44%	0.52%	0.49%	0.51%	0.77%	0.21%	(low) - (high)
Value	-0.09%	0.01%	0.34%	0.37%	0.56%	0.61%	0.74%	0.91%	0.95%	1.15%	1.24%	(high) - (low)
Growth	0.46%	0.67%	0.52%	0.64%	0.48%	0.29%	0.56%	0.44%	0.44%	0.33%	-0.13%	(high) - (low)
Momentum	0.09%	0.37%	0.40%	0.54%	0.50%	0.46%	0.47%	0.78%	0.59%	0.79%	0.71%	(high) - (low)
Quality	0.08%	-0.10%	0.08%	0.35%	0.26%	0.50%	0.48%	0.54%	0.78%	0.85%	0.77%	(high) - (low)

Panel B - Monthly Standard Deviations	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	5.77%	4.65%	4.43%	4.17%	4.16%	3.92%	4.30%	4.37%	4.99%	5.65%	4.81%	(low) - (high)
P/B	4.55%	4.30%	4.56%	4.53%	4.53%	4.57%	4.59%	4.89%	5.59%	7.11%	6.05%	(low) - (high)
Div Yield	5.17%	4.98%	4.82%	4.79%	4.31%	4.37%	4.16%	4.14%	4.12%	5.05%	4.77%	(high) - (low)
FCF Yield	5.78%	4.74%	4.53%	4.46%	4.21%	4.13%	4.17%	4.37%	4.59%	5.74%	2.79%	(high) - (low)
Asset Growth	4.80%	4.33%	4.24%	3.89%	4.15%	4.46%	4.51%	4.74%	4.96%	6.17%	4.14%	(high) - (low)
EPS Growth	6.59%	4.87%	4.20%	3.90%	3.86%	4.03%	4.36%	5.01%	5.93%	6.16%	2.85%	(high) - (low)
3M Change in Fwd EPS	6.66%	5.36%	4.63%	4.23%	3.86%	3.91%	4.03%	4.66%	5.10%	6.42%	4.51%	(high) - (low)
1M Reversal	7.64%	5.87%	5.14%	4.53%	4.23%	4.16%	4.07%	4.41%	4.59%	5.61%	6.54%	(high) - (low)
EPS Estimates Revisions	5.27%	4.83%	4.47%	4.91%	4.59%	4.39%	3.50%	4.04%	4.21%	4.57%	3.31%	(high) - (low)
Market Beta	2.67%	3.02%	3.14%	3.37%	3.64%	3.96%	4.45%	4.86%	5.89%	7.69%	7.06%	(high) - (low)
ROIC	6.81%	5.87%	5.34%	4.86%	4.60%	4.41%	4.44%	4.10%	4.22%	4.20%	4.69%	(high) - (low)
ROE	6.83%	5.90%	5.18%	5.10%	4.79%	4.41%	4.38%	4.20%	4.39%	4.00%	4.84%	(high) - (low)
Net Margin 5Y Stability	5.68%	5.39%	4.81%	4.89%	4.66%	4.19%	4.55%	4.15%	3.72%	5.85%	3.04%	(low) - (high)
Size	4.24%	4.46%	4.64%	4.74%	4.85%	4.81%	5.03%	5.13%	5.34%	6.23%	4.53%	(low) - (high)
Value	4.93%	4.91%	4.56%	4.34%	4.43%	4.30%	4.54%	4.51%	4.84%	5.84%	5.00%	(high) - (low)
Growth	4.82%	4.36%	4.05%	4.14%	4.03%	4.31%	4.36%	4.59%	5.10%	6.29%	4.38%	(high) - (low)
Momentum	5.25%	4.64%	4.48%	4.31%	4.25%	4.31%	4.45%	4.39%	4.74%	5.64%	4.26%	(high) - (low)
Quality	6.19%	5.77%	5.38%	5.10%	4.58%	4.67%	4.38%	4.24%	4.10%	4.11%	4.48%	(high) - (low)

Panel C - Risk / Reward Ratio	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.01	0.02	0.06	0.11	0.13	0.18	0.17	0.21	0.19	0.22	0.27	(low) - (high)
P/B	0.09	0.10	0.06	0.06	0.07	0.10	0.11	0.15	0.08	0.12	0.08	(low) - (high)
Div Yield	-0.03	0.00	0.02	0.05	0.10	0.12	0.20	0.18	0.24	0.18	0.23	(high) - (low)
FCF Yield	0.06	0.05	0.06	0.08	0.16	0.17	0.17	0.17	0.18	0.13	0.14	(high) - (low)
Asset Growth	0.14	0.14	0.12	0.13	0.08	0.09	0.12	0.10	0.10	0.05	-0.08	(high) - (low)
EPS Growth	0.03	0.09	0.08	0.15	0.17	0.14	0.14	0.12	0.06	0.04	0.01	(high) - (low)
3M Change in Fwd EPS	-0.01	0.06	0.12	0.10	0.18	0.15	0.16	0.12	0.12	0.07	0.11	(high) - (low)
1M Reversal	0.07	0.11	0.09	0.12	0.13	0.13	0.12	0.10	0.07	0.05	-0.04	(high) - (low)
EPS Estimates Revisions	0.07	0.08	0.09	0.07	0.05	0.03	0.07	0.10	0.17	0.18	0.14	(high) - (low)
Market Beta	0.23	0.24	0.19	0.19	0.17	0.12	0.13	0.14	0.07	0.04	-0.05	(high) - (low)
ROIC	-0.01	-0.02	0.00	0.06	0.07	0.13	0.12	0.18	0.17	0.20	0.20	(high) - (low)
ROE	-0.01	-0.03	0.00	0.03	0.09	0.11	0.10	0.18	0.17	0.20	0.17	(high) - (low)
Net Margin 5Y Stability	0.05	0.07	0.06	0.08	0.09	0.11	0.14	0.12	0.17	0.07	0.05	(low) - (high)
Size	0.13	0.11	0.11	0.10	0.10	0.09	0.10	0.10	0.10	0.12	0.05	(low) - (high)
Value	-0.02	0.00	0.07	0.08	0.13	0.14	0.16	0.20	0.20	0.20	0.25	(high) - (low)
Growth	0.09	0.15	0.13	0.15	0.12	0.07	0.13	0.10	0.09	0.05	-0.03	(high) - (low)
Momentum	0.02	0.08	0.09	0.13	0.12	0.11	0.11	0.18	0.12	0.14	0.17	(high) - (low)
Quality	0.01	-0.02	0.02	0.07	0.06	0.11	0.11	0.13	0.19	0.21	0.17	(high) - (low)

Table 8.4.1 - Developed Return Data Output (Panels D – F)

Panel D - Max Drawdown	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-68.2%	-51.7%	-49.7%	-45.7%	-45.9%	-49.4%	-52.9%	-53.9%	-59.6%	-65.3%	-33.5%	(low) - (high)
P/B	-62.1%	-46.8%	-50.5%	-50.6%	-53.3%	-59.4%	-60.7%	-57.3%	-70.5%	-74.7%	-59.6%	(low) - (high)
Div Yield	-70.0%	-54.8%	-48.7%	-53.2%	-46.1%	-47.8%	-53.6%	-51.1%	-53.0%	-73.9%	-47.5%	(high) - (low)
FCF Yield	-72.1%	-56.5%	-55.3%	-63.8%	-52.7%	-48.9%	-47.6%	-53.1%	-59.1%	-69.6%	-36.6%	(high) - (low)
Asset Growth	-52.9%	-42.1%	-46.7%	-48.2%	-50.0%	-55.6%	-56.5%	-56.5%	-57.6%	-81.2%	-79.8%	(high) - (low)
EPS Growth	-68.1%	-57.9%	-55.9%	-49.3%	-46.6%	-46.7%	-51.5%	-56.8%	-71.6%	-68.8%	-44.1%	(high) - (low)
3M Change in Fwd EPS	-74.4%	-64.2%	-56.0%	-59.7%	-52.3%	-43.6%	-44.9%	-55.8%	-61.7%	-73.6%	-56.2%	(high) - (low)
1M Reversal	-75.2%	-61.5%	-57.0%	-51.2%	-47.6%	-46.5%	-52.8%	-55.0%	-57.7%	-66.7%	-89.7%	(high) - (low)
EPS Estimates Revisions	-62.6%	-56.8%	-52.9%	-58.3%	-35.8%	-20.2%	-16.4%	-43.0%	-46.5%	-52.0%	-39.8%	(high) - (low)
Market Beta	-31.9%	-36.4%	-42.8%	-42.7%	-48.7%	-53.8%	-56.9%	-59.1%	-68.3%	-85.8%	-90.7%	(high) - (low)
ROIC	-83.1%	-69.7%	-69.3%	-63.1%	-58.0%	-47.9%	-50.0%	-45.3%	-46.2%	-47.6%	-42.9%	(high) - (low)
ROE	-83.9%	-69.9%	-56.2%	-61.6%	-53.0%	-54.4%	-53.0%	-54.2%	-48.1%	-46.7%	-38.5%	(high) - (low)
Net Margin 5Y Stability	-62.1%	-58.2%	-57.0%	-55.4%	-56.3%	-51.1%	-51.4%	-49.1%	-45.6%	-75.5%	-46.1%	(low) - (high)
Size	-51.0%	-55.8%	-56.9%	-57.0%	-57.9%	-58.4%	-56.1%	-60.6%	-61.6%	-63.1%	-58.6%	(low) - (high)
Value	-66.9%	-60.4%	-49.1%	-46.7%	-44.6%	-52.0%	-56.3%	-54.1%	-60.8%	-72.9%	-45.3%	(high) - (low)
Growth	-54.5%	-45.3%	-50.0%	-52.0%	-48.4%	-50.6%	-55.3%	-52.1%	-58.8%	-83.0%	-81.7%	(high) - (low)
Momentum	-66.3%	-56.2%	-58.1%	-52.9%	-45.8%	-59.3%	-55.2%	-45.3%	-50.0%	-57.2%	-41.4%	(high) - (low)
Quality	-67.3%	-64.4%	-61.0%	-61.9%	-55.0%	-56.4%	-56.0%	-54.9%	-48.5%	-42.3%	-38.2%	(high) - (low)

Panel E - Monthly Turnover	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	21.1%	30.1%	36.7%	40.3%	42.8%	44.0%	44.4%	40.3%	33.9%	22.9%	44.0%	(low) - (high)
P/B	9.3%	20.7%	27.1%	33.0%	37.3%	39.1%	37.6%	35.4%	29.7%	19.0%	28.3%	(low) - (high)
Div Yield	10.2%	22.5%	28.2%	33.3%	33.2%	32.7%	29.9%	28.2%	22.6%	15.4%	25.6%	(high) - (low)
FCF Yield	10.8%	14.0%	13.7%	13.9%	15.8%	21.8%	25.8%	25.2%	21.1%	10.4%	21.1%	(high) - (low)
Asset Growth	8.8%	11.4%	12.7%	13.4%	14.2%	13.6%	12.3%	11.4%	10.1%	7.0%	15.8%	(high) - (low)
EPS Growth	21.7%	28.3%	36.8%	39.2%	38.6%	37.6%	37.9%	34.9%	30.2%	21.5%	43.2%	(high) - (low)
3M Change in Fwd EPS	41.3%	54.3%	59.9%	61.5%	59.7%	57.9%	58.6%	57.7%	51.3%	36.4%	77.7%	(high) - (low)
1M Reversal	92.6%	92.8%	91.9%	90.8%	89.8%	87.8%	89.0%	89.1%	90.9%	91.4%	184.0%	(high) - (low)
EPS Estimates Revisions	82.3%	84.1%	83.8%	87.5%	88.0%	87.4%	77.4%	77.6%	80.1%	81.4%	163.7%	(high) - (low)
Market Beta	17.9%	29.0%	33.5%	37.2%	39.0%	38.5%	36.1%	28.6%	23.0%	13.4%	31.3%	(high) - (low)
ROIC	10.5%	12.0%	14.1%	15.7%	15.9%	15.6%	14.0%	13.1%	10.0%	5.1%	15.6%	(high) - (low)
ROE	10.4%	13.0%	15.1%	15.5%	16.1%	15.9%	14.6%	12.7%	9.8%	5.0%	15.4%	(high) - (low)
Net Margin 5Y Stability	9.1%	11.3%	12.7%	14.3%	14.4%	15.3%	13.5%	12.5%	9.3%	10.0%	19.2%	(low) - (high)
Size	2.1%	9.5%	14.1%	18.2%	21.8%	24.3%	25.9%	26.1%	24.0%	16.8%	18.9%	(low) - (high)
Value	14.6%	34.4%	42.0%	45.4%	45.3%	45.7%	41.7%	42.2%	33.6%	18.3%	32.8%	(high) - (low)
Growth	18.9%	28.1%	33.8%	34.9%	36.5%	34.6%	33.8%	31.0%	24.7%	14.9%	33.8%	(high) - (low)
Momentum	78.0%	85.7%	88.1%	89.1%	87.7%	90.2%	89.7%	88.6%	84.8%	76.4%	154.4%	(high) - (low)
Quality	11.5%	15.3%	17.4%	18.2%	18.1%	17.4%	17.2%	14.7%	11.5%	4.8%	16.3%	(high) - (low)

Panel F - Monthly Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.06%	-0.09%	-0.11%	-0.12%	-0.13%	-0.13%	-0.13%	-0.12%	-0.10%	-0.07%	-0.13%	(low) - (high)
P/B	-0.03%	-0.06%	-0.08%	-0.10%	-0.11%	-0.12%	-0.11%	-0.11%	-0.09%	-0.06%	-0.09%	(low) - (high)
Div Yield	-0.03%	-0.07%	-0.08%	-0.10%	-0.10%	-0.10%	-0.09%	-0.08%	-0.07%	-0.05%	-0.08%	(high) - (low)
FCF Yield	-0.03%	-0.04%	-0.04%	-0.04%	-0.05%	-0.07%	-0.08%	-0.08%	-0.06%	-0.03%	-0.06%	(high) - (low)
Asset Growth	-0.03%	-0.03%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.03%	-0.03%	-0.02%	-0.05%	(high) - (low)
EPS Growth	-0.07%	-0.08%	-0.11%	-0.12%	-0.12%	-0.11%	-0.11%	-0.10%	-0.09%	-0.06%	-0.13%	(high) - (low)
3M Change in Fwd EPS	-0.12%	-0.16%	-0.18%	-0.18%	-0.18%	-0.17%	-0.18%	-0.17%	-0.15%	-0.11%	-0.23%	(high) - (low)
1M Reversal	-0.28%	-0.28%	-0.27%	-0.27%	-0.27%	-0.26%	-0.27%	-0.27%	-0.27%	-0.27%	-0.55%	(high) - (low)
EPS Estimates Revisions	-0.25%	-0.25%	-0.25%	-0.18%	-0.06%	-0.01%	-0.04%	-0.19%	-0.24%	-0.24%	-0.49%	(high) - (low)
Market Beta	-0.05%	-0.08%	-0.10%	-0.11%	-0.11%	-0.11%	-0.10%	-0.08%	-0.07%	-0.04%	-0.09%	(high) - (low)
ROIC	-0.03%	-0.04%	-0.04%	-0.05%	-0.05%	-0.05%	-0.04%	-0.04%	-0.03%	-0.02%	-0.05%	(high) - (low)
ROE	-0.03%	-0.04%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.04%	-0.03%	-0.02%	-0.05%	(high) - (low)
Net Margin 5Y Stability	-0.03%	-0.03%	-0.04%	-0.04%	-0.04%	-0.05%	-0.04%	-0.04%	-0.03%	-0.03%	-0.06%	(low) - (high)
Size	-0.01%	-0.03%	-0.04%	-0.05%	-0.07%	-0.07%	-0.08%	-0.08%	-0.07%	-0.05%	-0.06%	(low) - (high)
Value	-0.04%	-0.10%	-0.13%	-0.14%	-0.14%	-0.14%	-0.13%	-0.13%	-0.10%	-0.05%	-0.10%	(high) - (low)
Growth	-0.06%	-0.08%	-0.10%	-0.10%	-0.11%	-0.10%	-0.10%	-0.09%	-0.07%	-0.04%	-0.10%	(high) - (low)
Momentum	-0.23%	-0.26%	-0.26%	-0.27%	-0.26%	-0.27%	-0.27%	-0.27%	-0.25%	-0.23%	-0.46%	(high) - (low)
Quality	-0.03%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.03%	-0.01%	-0.05%	(high) - (low)

Table 8.4.1 - Developed Return Data Output (Panels G – I)

Panel G - Average Monthly Returns - Net of Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.12%	0.02%	0.15%	0.35%	0.42%	0.56%	0.61%	0.78%	0.84%	1.17%	1.16%	(low) - (high)
P/B	0.37%	0.35%	0.20%	0.19%	0.20%	0.33%	0.39%	0.61%	0.37%	0.81%	0.38%	(low) - (high)
Div Yield	-0.18%	-0.07%	-0.01%	0.16%	0.35%	0.42%	0.76%	0.68%	0.94%	0.88%	1.00%	(high) - (low)
FCF Yield	0.30%	0.21%	0.22%	0.33%	0.63%	0.63%	0.61%	0.65%	0.78%	0.69%	0.33%	(high) - (low)
Asset Growth	0.65%	0.59%	0.48%	0.48%	0.27%	0.38%	0.52%	0.44%	0.46%	0.31%	-0.39%	(high) - (low)
EPS Growth	0.14%	0.36%	0.21%	0.48%	0.55%	0.46%	0.51%	0.50%	0.26%	0.16%	-0.11%	(high) - (low)
3M Change in Fwd EPS	-0.17%	0.15%	0.38%	0.25%	0.50%	0.41%	0.47%	0.40%	0.47%	0.35%	0.27%	(high) - (low)
1M Reversal	0.26%	0.35%	0.21%	0.26%	0.28%	0.27%	0.23%	0.19%	0.06%	-0.01%	-0.82%	(high) - (low)
EPS Estimates Revisions	0.11%	0.15%	0.13%	0.19%	0.19%	0.12%	0.19%	0.20%	0.49%	0.57%	-0.03%	(high) - (low)
Market Beta	0.57%	0.64%	0.49%	0.53%	0.49%	0.37%	0.48%	0.58%	0.32%	0.24%	-0.44%	(high) - (low)
ROIC	-0.12%	-0.14%	-0.02%	0.23%	0.29%	0.54%	0.51%	0.69%	0.69%	0.83%	0.88%	(high) - (low)
ROE	-0.07%	-0.22%	-0.07%	0.12%	0.40%	0.43%	0.39%	0.71%	0.73%	0.79%	0.80%	(high) - (low)
Net Margin 5Y Stability	0.23%	0.32%	0.24%	0.37%	0.36%	0.43%	0.58%	0.47%	0.60%	0.38%	0.09%	(low) - (high)
Size	0.56%	0.48%	0.48%	0.41%	0.41%	0.37%	0.44%	0.41%	0.44%	0.72%	0.15%	(low) - (high)
Value	-0.13%	-0.09%	0.21%	0.23%	0.43%	0.48%	0.61%	0.79%	0.85%	1.10%	1.14%	(high) - (low)
Growth	0.40%	0.58%	0.41%	0.54%	0.37%	0.19%	0.46%	0.35%	0.36%	0.29%	-0.23%	(high) - (low)
Momentum	-0.15%	0.11%	0.13%	0.27%	0.24%	0.19%	0.20%	0.51%	0.33%	0.57%	0.25%	(high) - (low)
Quality	0.05%	-0.15%	0.03%	0.29%	0.20%	0.44%	0.42%	0.50%	0.75%	0.84%	0.72%	(high) - (low)

Panel H - Beta	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	1.18	0.97	0.92	0.87	0.88	0.82	0.89	0.87	0.97	1.11	-0.08	(low) - (high)
P/B	0.94	0.94	0.98	0.98	0.97	0.99	0.94	0.99	1.07	1.24	0.30	(low) - (high)
Div Yield	1.08	1.04	0.97	0.96	0.90	0.90	0.88	0.83	0.79	0.90	-0.18	(high) - (low)
FCF Yield	1.17	1.01	0.99	0.93	0.93	0.90	0.91	0.94	0.96	1.14	-0.03	(high) - (low)
Asset Growth	1.00	0.88	0.89	0.82	0.90	0.97	1.00	1.04	1.09	1.28	0.28	(high) - (low)
EPS Growth	1.31	1.02	0.89	0.82	0.83	0.87	0.95	1.07	1.25	1.30	-0.01	(high) - (low)
3M Change in Fwd EPS	1.32	1.09	0.98	0.88	0.81	0.84	0.86	0.99	1.05	1.27	-0.05	(high) - (low)
1M Reversal	1.47	1.21	1.10	0.97	0.93	0.91	0.89	0.94	0.93	1.03	-0.44	(high) - (low)
EPS Estimates Revisions	1.11	1.04	0.98	1.14	1.10	0.98	0.62	0.89	0.92	0.96	-0.15	(high) - (low)
Market Beta	0.32	0.46	0.54	0.64	0.72	0.78	0.92	1.04	1.27	1.56	1.20	(high) - (low)
ROIC	1.39	1.23	1.13	1.03	1.01	0.97	0.95	0.89	0.93	0.87	-0.52	(high) - (low)
ROE	1.40	1.22	1.05	1.09	1.03	0.96	0.94	0.92	0.97	0.84	-0.56	(high) - (low)
Net Margin 5Y Stability	1.22	1.15	1.05	1.07	1.03	0.92	0.97	0.91	0.81	1.25	0.03	(low) - (high)
Size	0.99	1.00	1.02	1.01	1.01	0.98	1.01	1.00	1.02	1.11	0.11	(low) - (high)
Value	1.03	1.03	0.99	0.94	0.98	0.93	0.96	0.92	0.97	1.09	0.06	(high) - (low)
Growth	0.98	0.93	0.87	0.90	0.87	0.93	0.96	1.02	1.11	1.31	0.32	(high) - (low)
Momentum	1.05	0.99	0.96	0.94	0.94	0.93	0.96	0.95	1.02	1.17	0.12	(high) - (low)
Quality	1.28	1.21	1.13	1.11	1.00	1.03	0.95	0.91	0.90	0.88	-0.40	(high) - (low)

Panel I - Beta-Adjusted Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.05%	0.12%	0.28%	0.54%	0.62%	0.84%	0.83%	1.04%	0.97%	1.12%	1.17%	(low) - (high)
P/B	0.42%	0.44%	0.28%	0.30%	0.33%	0.46%	0.53%	0.72%	0.43%	0.70%	0.28%	(low) - (high)
Div Yield	-0.14%	0.00%	0.08%	0.27%	0.50%	0.57%	0.97%	0.91%	1.28%	1.03%	1.17%	(high) - (low)
FCF Yield	0.28%	0.25%	0.26%	0.40%	0.73%	0.77%	0.76%	0.77%	0.88%	0.63%	0.35%	(high) - (low)
Asset Growth	0.68%	0.71%	0.58%	0.64%	0.35%	0.43%	0.56%	0.45%	0.45%	0.26%	-0.41%	(high) - (low)
EPS Growth	0.16%	0.43%	0.37%	0.73%	0.81%	0.65%	0.65%	0.56%	0.28%	0.17%	0.02%	(high) - (low)
3M Change in Fwd EPS	-0.04%	0.28%	0.57%	0.49%	0.84%	0.70%	0.75%	0.58%	0.59%	0.36%	0.40%	(high) - (low)
1M Reversal	0.36%	0.52%	0.44%	0.55%	0.59%	0.58%	0.55%	0.48%	0.35%	0.26%	-0.10%	(high) - (low)
EPS Estimates Revisions	0.32%	0.39%	0.39%	0.32%	0.23%	0.13%	0.38%	0.45%	0.79%	0.85%	0.53%	(high) - (low)
Market Beta	1.95%	1.56%	1.09%	1.00%	0.84%	0.61%	0.64%	0.64%	0.31%	0.18%	-1.77%	(high) - (low)
ROIC	-0.06%	-0.09%	0.02%	0.26%	0.34%	0.60%	0.58%	0.82%	0.77%	0.97%	1.03%	(high) - (low)
ROE	-0.03%	-0.15%	-0.02%	0.15%	0.43%	0.49%	0.46%	0.81%	0.79%	0.96%	0.99%	(high) - (low)
Net Margin 5Y Stability	0.21%	0.31%	0.26%	0.39%	0.39%	0.51%	0.64%	0.55%	0.78%	0.33%	0.12%	(low) - (high)
Size	0.57%	0.51%	0.52%	0.46%	0.47%	0.45%	0.52%	0.49%	0.50%	0.70%	0.13%	(low) - (high)
Value	-0.08%	0.01%	0.34%	0.39%	0.58%	0.66%	0.77%	0.99%	0.98%	1.05%	1.14%	(high) - (low)
Growth	0.46%	0.72%	0.59%	0.71%	0.55%	0.32%	0.58%	0.43%	0.39%	0.25%	-0.21%	(high) - (low)
Momentum	0.08%	0.37%	0.41%	0.57%	0.54%	0.50%	0.49%	0.82%	0.57%	0.68%	0.59%	(high) - (low)
Quality	0.06%	-0.09%	0.07%	0.31%	0.26%	0.48%	0.50%	0.60%	0.86%	0.97%	0.91%	(high) - (low)

Figure 8.4.2 - Developed Return-Risk Scatterplot

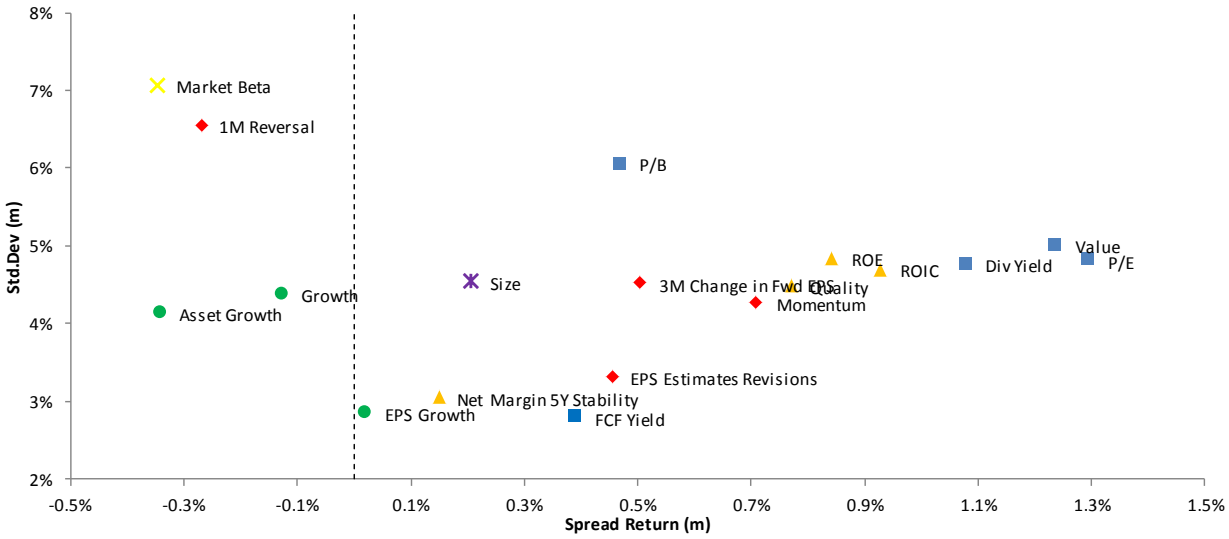


Table 8.4.3 - Developed Students T-test on long/short factor spreads

Students t-test	Average Monthly Return	Monthly Std.Dev	# of Obs	T-test statistic (H0: Spread = 0)	P-Value
P/E	1.3%	4.8%	277	4.47	0.00
P/B	0.5%	6.1%	277	1.35	0.18
Div Yield	1.1%	4.8%	277	3.72	0.00
FCF Yield	0.4%	2.8%	277	2.43	0.02
Asset Growth	-0.4%	4.1%	277	-1.48	0.14
EPS Growth	0.0%	2.9%	277	0.12	0.90
3M Change in Fwd EPS	0.5%	4.5%	277	1.86	0.06
1M Reversal	-0.3%	6.5%	277	-0.73	0.47
EPS Estimates Revisions	0.5%	3.3%	277	2.39	0.02
Market Beta	-0.4%	7.1%	277	-0.88	0.38
ROIC	0.9%	4.7%	277	3.28	0.00
ROE	0.8%	4.8%	277	2.90	0.00
Net Margin 5Y Stability	0.2%	3.0%	277	0.85	0.39
Size	0.2%	4.5%	277	0.81	0.42
Value	1.2%	5.0%	277	4.09	0.00
Growth	-0.1%	4.4%	277	-0.51	0.61
Momentum	0.7%	4.3%	277	2.80	0.01
Quality	0.8%	4.5%	277	2.90	0.00

Table 8.4.4 - Developed Factor Spread Correlations

Correlation Matrix	P/E	P/B	Div Yield	FCF Yield	Asset Growth	EPS Growth	3M Change in Fwd EPS	1M Reversal	EPS Estimates Revisio	Market Beta	ROIC	ROE	Net Margin 5Y Stability	Size	Value	Growth	Momentum	Quality
S&P Developed BMI	-0.07	0.21	-0.16	-0.04	0.28	-0.01	-0.05	-0.28	-0.19	0.72	-0.47	-0.49	0.04	0.11	0.05	0.31	0.12	-0.38
P/E	1.00	0.49	0.68	0.31	-0.06	-0.01	-0.33	-0.17	-0.39	-0.13	0.18	0.13	-0.05	0.20	0.82	-0.13	-0.20	0.05
P/B		1.00	0.47	-0.02	-0.23	-0.27	-0.56	-0.24	-0.56	0.23	-0.40	-0.46	-0.25	0.67	0.70	-0.37	-0.35	-0.55
Div Yield			1.00	0.22	-0.15	0.01	-0.39	-0.09	-0.37	-0.23	0.16	0.11	-0.04	0.17	0.82	-0.23	-0.30	0.05
FCF Yield				1.00	0.03	0.17	-0.05	-0.04	-0.10	-0.03	0.31	0.31	0.01	-0.28	0.37	0.06	0.02	0.28
Asset Growth					1.00	0.09	0.21	-0.12	0.15	0.38	0.02	0.02	0.21	-0.11	-0.12	0.81	0.25	0.17
EPS Growth						1.00	0.40	0.09	0.35	-0.15	0.32	0.34	0.12	-0.32	-0.09	0.40	0.30	0.31
3M Change in Fwd EPS							1.00	0.15	0.71	-0.12	0.22	0.21	0.21	-0.32	-0.47	0.37	0.62	0.29
1M Reversal								1.00	0.28	-0.20	0.18	0.13	-0.02	-0.28	-0.16	-0.02	-0.52	0.13
EPS Estimates Revisions									1.00	-0.26	0.34	0.33	0.15	-0.35	-0.52	0.25	0.50	0.38
Market Beta										1.00	-0.49	-0.54	0.16	0.14	0.02	0.39	0.01	-0.39
ROIC											1.00	0.94	0.12	-0.42	-0.02	0.11	0.12	0.85
ROE												1.00	0.11	-0.45	-0.09	0.08	0.16	0.86
Net Margin 5Y Stability													1.00	-0.19	-0.11	0.28	0.21	0.40
Size														1.00	0.31	-0.22	-0.15	-0.56
Value															1.00	-0.21	-0.31	-0.15
Growth																1.00	0.32	0.24
Momentum																	1.00	0.22
Quality																		1.00

Figure 8.4.5 - Developed Performance Index Graphs (Index Year 1990 = 100) (part 1 of 2)

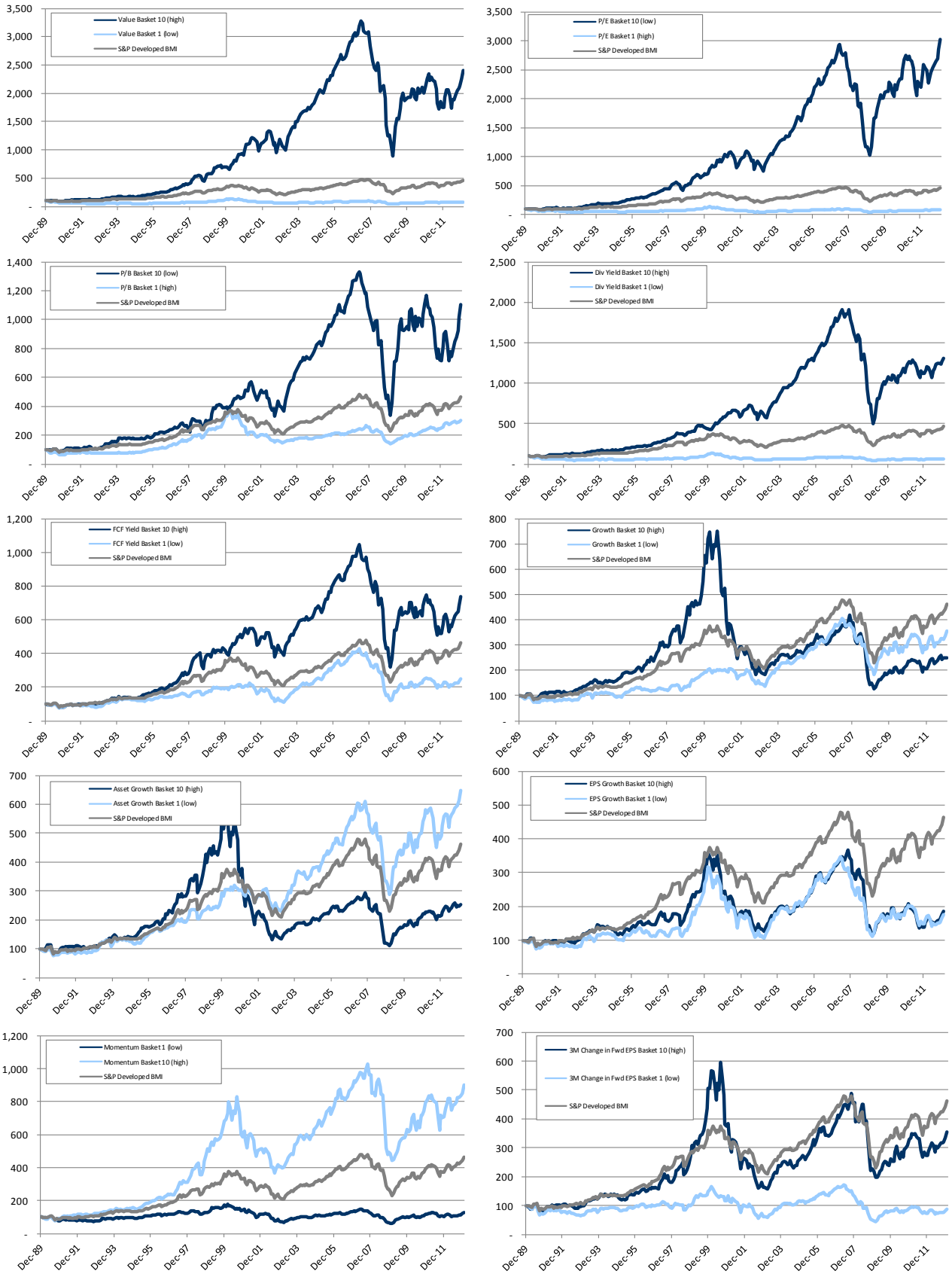


Figure 8.4.5 - Developed Performance Index Graphs (Index Year 1990 = 100) (part 2 of 2)

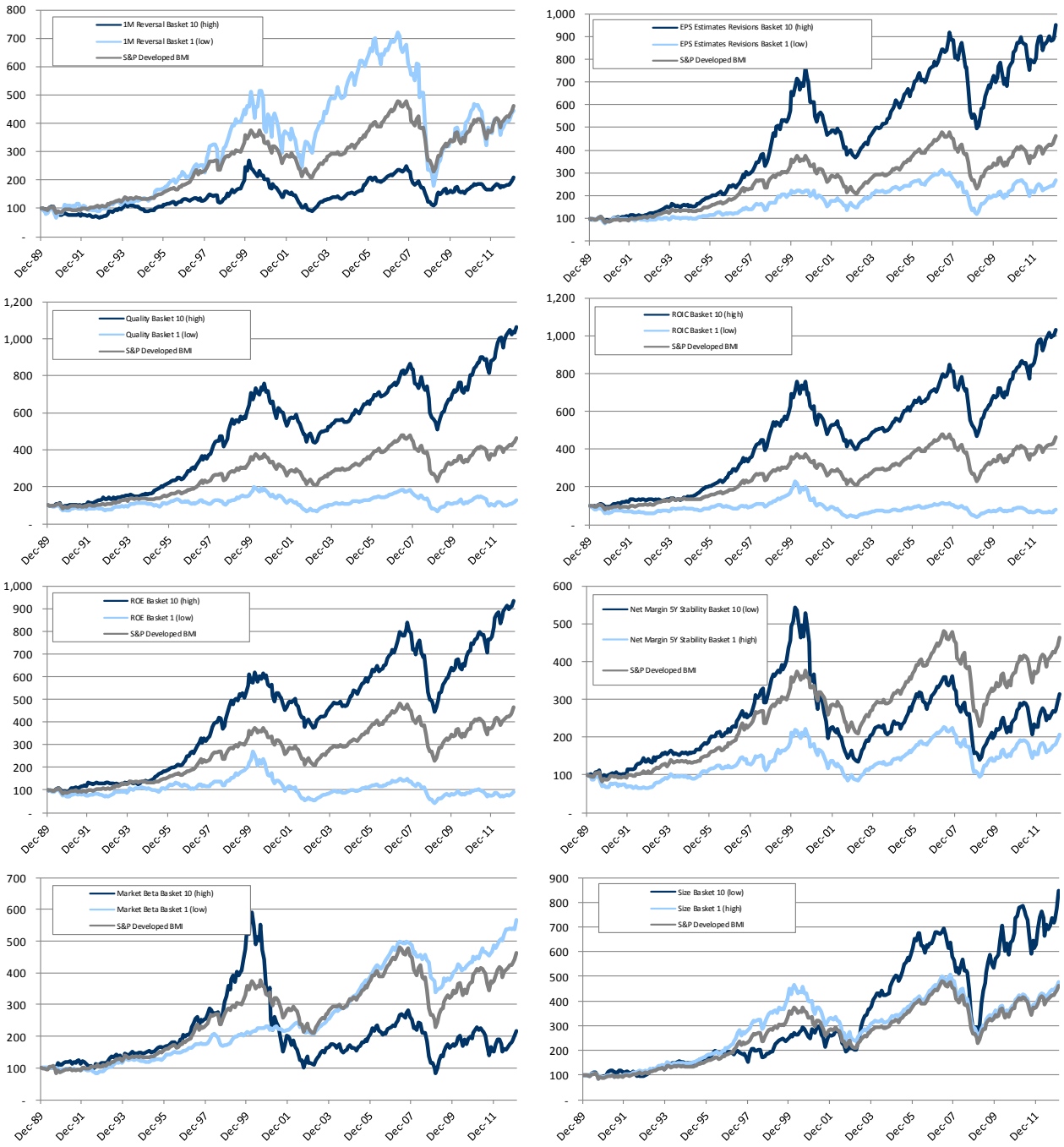
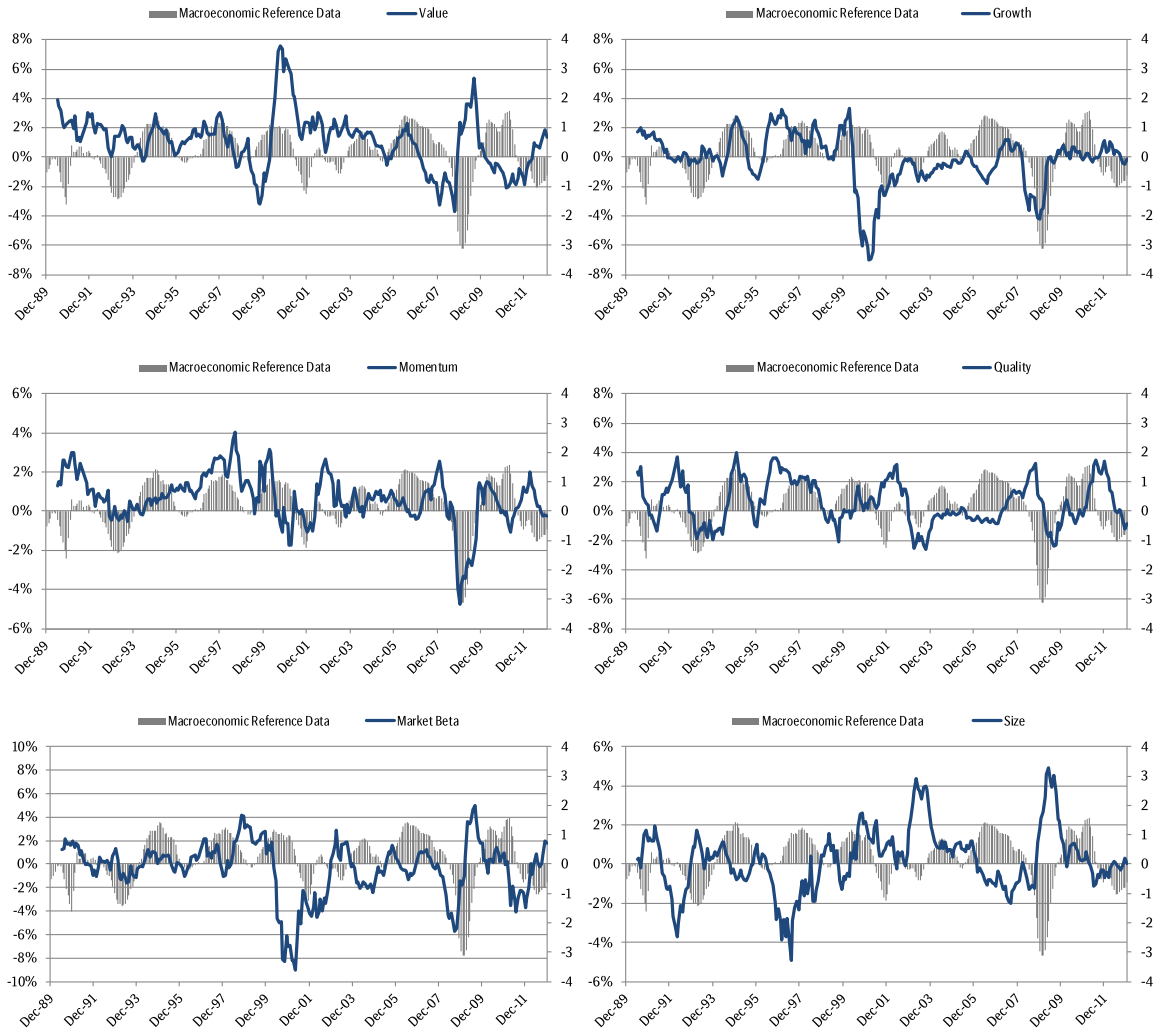


Figure 8.4.6 - Developed Historical Style Premiums



Left axis: 12MA Monthly compounded factor spreads, Right axis: Standardized macroeconomic reference index level

Table 8.4.7 - Developed Factor Premiums and P-values During the Economic Cycle

Factor Premium and P-Values	Recession		Recovery		Boom		Slowdown	
P/E	1.98%	*0.04*	2.79%	*0.01*	1.58%	*0.00*	0.34%	*0.47*
P/B	0.71%	*0.46*	2.63%	*0.13*	0.89%	*0.06*	-0.73%	*0.20*
Div Yield	1.83%	*0.04*	1.62%	*0.15*	0.71%	*0.09*	0.96%	*0.04*
FCF Yield	1.19%	*0.03*	0.55%	*0.37*	0.13%	*0.61*	0.25%	*0.34*
Asset Growth	-0.76%	*0.40*	0.38%	*0.63*	-0.23%	*0.51*	-0.47%	*0.24*
EPS Growth	-0.11%	*0.88*	-0.30%	*0.58*	0.21%	*0.37*	-0.04%	*0.89*
3M Change in Fwd EPS	-0.79%	*0.33*	-0.55%	*0.58*	0.85%	*0.02*	1.01%	*0.03*
1M Reversal	-1.64%	*0.33*	0.25%	*0.83*	-0.86%	*0.07*	0.70%	*0.25*
EPS Estimates Revisions	-0.38%	*0.61*	0.11%	*0.88*	0.32%	*0.21*	1.00%	*0.00*
Market Beta	-0.23%	*0.89*	-0.23%	*0.88*	0.70%	*0.21*	-1.64%	*0.01*
ROIC	1.92%	*0.03*	0.13%	*0.90*	0.38%	*0.36*	1.37%	*0.00*
ROE	2.42%	*0.01*	-0.72%	*0.52*	0.20%	*0.63*	1.36%	*0.00*
Net Margin 5Y Stability	0.47%	*0.51*	0.55%	*0.28*	-0.05%	*0.85*	0.07%	*0.81*
Size	-0.21%	*0.81*	-0.21%	*0.83*	0.30%	*0.43*	-0.45%	*0.30*
Value	2.33%	*0.02*	2.76%	*0.04*	1.43%	*0.00*	0.11%	*0.80*
Growth	-0.88%	*0.38*	-0.49%	*0.55*	0.29%	*0.41*	-0.12%	*0.79*
Momentum	0.78%	*0.35*	-0.23%	*0.82*	1.02%	*0.00*	0.64%	*0.12*
Quality	1.83%	*0.03*	-0.42%	*0.68*	0.09%	*0.83*	1.41%	*0.00*
Avg. Return of the S&P Developed BMI	0.00%		0.64%		1.56%		-0.26%	
# of Months	40		32		102		101	

Table 8.4.8 - Developed Transition Matrixes

Value 1 (low)	Value 2	Value 3	Value 4	Value 5	Value 6	Value 7	Value 8	Value 9	Value 10 (high)
83%	13%	2%	1%	1%	0%	0%	0%	0%	0%
12%	67%	16%	2%	1%	1%	0%	0%	0%	0%
2%	16%	59%	18%	3%	1%	1%	0%	0%	0%
1%	2%	17%	56%	18%	3%	1%	1%	0%	0%
1%	1%	3%	18%	54%	18%	3%	1%	0%	0%
0%	1%	1%	3%	18%	54%	19%	3%	1%	0%
0%	0%	0%	1%	3%	18%	55%	18%	2%	1%
0%	0%	0%	1%	1%	3%	18%	59%	16%	1%
0%	0%	0%	0%	0%	1%	2%	16%	68%	12%
0%	0%	0%	0%	0%	0%	1%	1%	11%	85%

Growth 1 (high)	Growth 2	Growth 3	Growth 4	Growth 5	Growth 6	Growth 7	Growth 8	Growth 9	Growth 10 (low)
84%	8%	2%	1%	1%	0%	0%	1%	1%	2%
8%	74%	10%	2%	1%	1%	1%	0%	0%	0%
2%	10%	69%	11%	3%	1%	1%	1%	0%	0%
1%	2%	12%	66%	12%	3%	1%	1%	1%	0%
1%	2%	3%	13%	65%	12%	4%	1%	1%	0%
1%	1%	2%	3%	13%	64%	10%	3%	1%	1%
1%	1%	1%	1%	3%	13%	67%	11%	2%	1%
1%	0%	1%	1%	1%	3%	12%	68%	10%	2%
1%	0%	0%	1%	1%	1%	2%	12%	73%	8%
1%	0%	0%	0%	0%	1%	2%	2%	9%	84%

Momentum 1 (low)	Momentum 2	Momentum 3	Momentum 4	Momentum 5	Momentum 6	Momentum 7	Momentum 8	Momentum 9	Momentum 10 (high)
26%	17%	12%	9%	8%	6%	6%	5%	5%	5%
16%	14%	12%	10%	9%	9%	8%	8%	7%	6%
11%	12%	12%	11%	11%	10%	10%	9%	8%	6%
9%	10%	11%	11%	11%	11%	10%	10%	8%	6%
7%	9%	10%	11%	12%	12%	11%	10%	9%	7%
7%	8%	10%	11%	12%	12%	12%	11%	9%	8%
6%	8%	9%	11%	11%	12%	12%	11%	11%	9%
6%	8%	9%	10%	10%	11%	11%	12%	12%	11%
6%	7%	8%	8%	9%	9%	11%	12%	14%	15%
6%	5%	6%	6%	7%	8%	9%	12%	16%	26%

Quality 1 (low)	Quality 2	Quality 3	Quality 4	Quality 5	Quality 6	Quality 7	Quality 8	Quality 9	Quality 10 (high)
91%	4%	1%	1%	1%	0%	0%	0%	0%	0%
5%	87%	5%	1%	0%	0%	0%	0%	0%	0%
1%	5%	85%	6%	1%	0%	0%	0%	0%	0%
1%	1%	6%	84%	6%	1%	0%	0%	0%	0%
1%	1%	1%	6%	84%	6%	1%	0%	0%	0%
0%	0%	0%	1%	6%	84%	6%	1%	0%	0%
0%	0%	0%	0%	1%	6%	85%	6%	1%	0%
0%	0%	0%	0%	0%	1%	5%	87%	5%	0%
0%	0%	0%	0%	0%	0%	1%	5%	90%	3%
0%	0%	0%	0%	0%	0%	0%	0%	3%	95%

Market Beta 1 (high)	Market Beta 2	Market Beta 3	Market Beta 4	Market Beta 5	Market Beta 6	Market Beta 7	Market Beta 8	Market Beta 9	Market Beta 10 (low)
84%	10%	1%	0%	0%	0%	0%	0%	0%	0%
10%	70%	14%	1%	0%	0%	0%	0%	0%	0%
1%	14%	64%	15%	2%	0%	0%	0%	0%	0%
0%	1%	16%	60%	16%	2%	0%	0%	0%	0%
0%	0%	2%	17%	59%	17%	0%	0%	0%	0%
0%	0%	0%	2%	17%	59%	2%	2%	0%	0%
0%	0%	0%	0%	2%	17%	15%	15%	1%	0%
0%	0%	0%	0%	0%	2%	66%	66%	13%	0%
0%	0%	0%	0%	0%	0%	13%	13%	73%	9%
0%	0%	0%	0%	0%	0%	0%	0%	9%	87%

Size 1 (high)	Size 2	Size 3	Size 4	Size 5	Size 6	Size 7	Size 8	Size 9	Size 10 (low)
97%	3%	0%	0%	0%	0%	0%	0%	0%	0%
3%	91%	5%	0%	0%	0%	0%	0%	0%	0%
0%	6%	87%	7%	0%	0%	0%	0%	0%	0%
0%	0%	8%	83%	9%	0%	0%	0%	0%	0%
0%	0%	0%	10%	79%	10%	0%	0%	0%	0%
0%	0%	0%	0%	11%	77%	11%	0%	0%	0%
0%	0%	0%	0%	0%	12%	75%	12%	0%	0%
0%	0%	0%	0%	0%	0%	12%	75%	12%	0%
0%	0%	0%	0%	0%	0%	0%	12%	78%	10%
0%	0%	0%	0%	0%	0%	0%	0%	9%	88%

8.5 US Data Output

Table 8.5.1 - US Return Data Output (Panels A – C)

Index	CAGR	Volatility	IR	Max DD
S&P US BMI	0.81%	4.44%	0.18	-50.8%

Panel A - Average Monthly Factor Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	0.95%	0.68%	0.72%	0.62%	0.82%	0.83%	0.77%	1.16%	1.25%	1.13%	0.18%	(low) - (high)
P/B	0.84%	0.69%	0.87%	0.78%	0.64%	0.89%	1.04%	0.83%	0.88%	0.54%	-0.31%	(low) - (high)
Div Yield	0.64%	0.75%	0.65%	0.88%	0.68%	0.87%	0.86%	0.84%	0.78%	0.92%	0.29%	(high) - (low)
FCF Yield	0.58%	0.66%	0.60%	0.73%	0.97%	0.81%	0.88%	0.99%	0.85%	0.97%	0.39%	(high) - (low)
Asset Growth	0.95%	1.07%	0.93%	0.83%	0.91%	0.77%	0.94%	0.66%	0.81%	0.40%	-0.55%	(high) - (low)
EPS Growth	0.66%	0.80%	0.70%	0.84%	0.92%	0.69%	0.96%	1.00%	0.54%	0.58%	-0.08%	(high) - (low)
3M Change in Fwd EPS	0.35%	0.75%	0.98%	0.78%	0.77%	0.73%	0.79%	0.82%	0.81%	0.77%	0.41%	(high) - (low)
1M Reversal	0.55%	0.80%	0.84%	0.97%	0.88%	0.86%	0.80%	0.74%	0.61%	0.77%	0.22%	(high) - (low)
EPS Estimates Revisions	0.56%	0.67%	0.69%	0.55%	0.31%	0.35%	0.53%	0.74%	1.06%	0.91%	0.34%	(high) - (low)
Market Beta	0.81%	0.77%	0.84%	0.76%	0.74%	0.82%	0.81%	0.72%	0.69%	0.64%	-0.16%	(high) - (low)
ROIC	0.47%	0.38%	0.58%	0.70%	0.74%	0.88%	0.85%	0.82%	0.79%	1.02%	0.55%	(high) - (low)
ROE	0.46%	0.41%	0.72%	0.78%	0.67%	0.61%	0.76%	0.79%	0.88%	0.98%	0.52%	(high) - (low)
Net Margin 5Y Stability	0.60%	0.76%	0.79%	0.85%	0.71%	0.90%	0.79%	0.84%	0.89%	0.67%	0.07%	(low) - (high)
Size	0.76%	0.89%	0.96%	0.98%	1.02%	1.05%	1.14%	1.21%	1.26%	1.69%	0.93%	(low) - (high)
Value	0.75%	0.63%	0.84%	0.77%	0.83%	0.85%	0.89%	0.82%	1.02%	1.09%	0.34%	(high) - (low)
Growth	0.84%	0.90%	1.06%	0.70%	0.95%	0.85%	0.66%	0.94%	0.79%	0.55%	-0.29%	(high) - (low)
Momentum	0.32%	0.81%	0.64%	0.67%	0.88%	0.77%	0.98%	0.93%	1.05%	0.78%	0.45%	(high) - (low)
Quality	0.71%	0.45%	0.68%	0.55%	0.84%	0.69%	0.76%	0.78%	0.97%	0.95%	0.24%	(high) - (low)

Panel B - Monthly Standard Deviations	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	5.63%	4.80%	4.56%	4.58%	4.46%	4.27%	4.47%	4.52%	4.95%	5.97%	4.92%	(low) - (high)
P/B	4.87%	4.44%	4.68%	4.65%	4.71%	4.83%	4.70%	5.08%	6.04%	8.12%	6.79%	(low) - (high)
Div Yield	5.53%	5.25%	4.82%	4.42%	4.60%	4.35%	4.36%	4.46%	4.75%	6.60%	6.58%	(high) - (low)
FCF Yield	6.59%	4.71%	4.91%	4.38%	4.46%	4.62%	4.90%	5.11%	5.50%	6.79%	3.67%	(high) - (low)
Asset Growth	5.04%	4.52%	4.35%	4.16%	4.44%	4.39%	4.88%	5.25%	5.85%	7.19%	5.40%	(high) - (low)
EPS Growth	7.79%	5.24%	4.41%	4.25%	4.29%	4.74%	4.99%	5.64%	6.76%	8.00%	4.41%	(high) - (low)
3M Change in Fwd EPS	7.70%	6.00%	4.90%	4.48%	4.13%	4.46%	4.68%	5.68%	6.23%	8.42%	6.43%	(high) - (low)
1M Reversal	8.05%	6.23%	5.44%	4.96%	4.35%	4.42%	4.39%	4.59%	5.24%	6.34%	6.97%	(high) - (low)
EPS Estimates Revisions	5.92%	5.36%	4.71%	5.14%	7.62%	4.69%	4.21%	3.95%	4.73%	5.43%	4.21%	(high) - (low)
Market Beta	3.06%	3.26%	3.75%	3.96%	4.51%	4.98%	5.28%	5.83%	6.97%	9.41%	8.49%	(high) - (low)
ROIC	8.30%	6.39%	5.32%	5.25%	5.13%	4.70%	4.54%	4.58%	4.57%	4.74%	6.03%	(high) - (low)
ROE	8.27%	6.54%	5.41%	5.54%	4.61%	4.73%	4.42%	4.64%	4.57%	4.53%	6.22%	(high) - (low)
Net Margin 5Y Stability	6.54%	5.60%	5.18%	5.05%	4.67%	4.65%	4.54%	4.12%	4.58%	7.37%	3.62%	(low) - (high)
Size	4.39%	4.80%	5.09%	5.28%	5.54%	5.61%	5.88%	6.02%	6.27%	6.96%	4.96%	(low) - (high)
Value	5.10%	4.93%	4.66%	4.67%	5.29%	4.52%	4.50%	5.10%	5.14%	6.87%	5.87%	(high) - (low)
Growth	5.08%	4.68%	4.05%	4.45%	4.39%	4.67%	4.79%	5.18%	5.94%	7.47%	5.49%	(high) - (low)
Momentum	5.86%	5.01%	4.56%	4.55%	4.38%	4.69%	4.47%	4.49%	5.25%	6.93%	5.62%	(high) - (low)
Quality	6.74%	6.21%	5.45%	5.66%	5.25%	4.74%	4.46%	4.73%	4.68%	4.44%	4.69%	(high) - (low)

Panel C - Risk / Reward Ratio	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	0.17	0.14	0.16	0.13	0.18	0.20	0.17	0.26	0.25	0.19	0.04	(low) - (high)
P/B	0.17	0.15	0.19	0.17	0.14	0.18	0.22	0.16	0.15	0.07	-0.05	(low) - (high)
Div Yield	0.12	0.14	0.13	0.20	0.15	0.20	0.20	0.19	0.16	0.14	0.04	(high) - (low)
FCF Yield	0.09	0.14	0.12	0.17	0.22	0.18	0.18	0.19	0.15	0.14	0.11	(high) - (low)
Asset Growth	0.19	0.24	0.21	0.20	0.20	0.17	0.19	0.12	0.14	0.06	-0.10	(high) - (low)
EPS Growth	0.09	0.15	0.16	0.20	0.21	0.15	0.19	0.18	0.08	0.07	-0.02	(high) - (low)
3M Change in Fwd EPS	0.05	0.12	0.20	0.18	0.19	0.16	0.17	0.15	0.13	0.09	0.06	(high) - (low)
1M Reversal	0.07	0.13	0.15	0.20	0.20	0.19	0.18	0.16	0.12	0.12	0.03	(high) - (low)
EPS Estimates Revisions	0.10	0.13	0.15	0.11	0.04	0.08	0.13	0.19	0.22	0.17	0.08	(high) - (low)
Market Beta	0.26	0.24	0.22	0.19	0.16	0.17	0.15	0.12	0.10	0.07	-0.02	(high) - (low)
ROIC	0.06	0.06	0.11	0.13	0.15	0.19	0.19	0.18	0.17	0.22	0.09	(high) - (low)
ROE	0.06	0.06	0.13	0.14	0.15	0.13	0.17	0.17	0.19	0.22	0.08	(high) - (low)
Net Margin 5Y Stability	0.09	0.14	0.15	0.17	0.15	0.19	0.17	0.20	0.20	0.09	0.02	(low) - (high)
Size	0.17	0.19	0.19	0.19	0.18	0.19	0.19	0.20	0.20	0.24	0.19	(low) - (high)
Value	0.15	0.13	0.18	0.16	0.16	0.19	0.20	0.16	0.20	0.16	0.06	(high) - (low)
Growth	0.17	0.19	0.26	0.16	0.22	0.18	0.14	0.18	0.13	0.07	-0.05	(high) - (low)
Momentum	0.06	0.16	0.14	0.15	0.20	0.16	0.22	0.21	0.20	0.11	0.08	(high) - (low)
Quality	0.11	0.07	0.13	0.10	0.16	0.15	0.17	0.17	0.21	0.21	0.05	(high) - (low)

Table 8.5.1 - US Return Data Output (Panels D – F)

Panel D - Max Drawdown	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-58.4%	-53.5%	-45.9%	-44.3%	-43.7%	-47.6%	-52.0%	-50.3%	-48.6%	-62.3%	-67.4%	(low) - (high)
P/B	-56.0%	-44.6%	-50.0%	-46.2%	-49.8%	-53.6%	-54.3%	-64.8%	-70.1%	-86.4%	-77.3%	(low) - (high)
Div Yield	-60.7%	-54.8%	-50.0%	-39.5%	-45.7%	-38.5%	-56.0%	-52.5%	-64.4%	-85.6%	-79.6%	(high) - (low)
FCF Yield	-73.7%	-52.5%	-60.5%	-52.5%	-44.3%	-49.8%	-49.5%	-48.8%	-66.4%	-74.0%	-46.5%	(high) - (low)
Asset Growth	-56.0%	-46.1%	-46.8%	-47.7%	-45.6%	-55.9%	-56.5%	-53.5%	-60.4%	-84.0%	-87.7%	(high) - (low)
EPS Growth	-79.3%	-60.4%	-48.9%	-50.1%	-37.8%	-48.1%	-52.3%	-51.7%	-75.0%	-78.0%	-64.5%	(high) - (low)
3M Change in Fwd EPS	-82.0%	-65.3%	-50.8%	-62.3%	-43.4%	-39.5%	-46.9%	-61.5%	-74.5%	-84.0%	-72.8%	(high) - (low)
1M Reversal	-81.0%	-65.7%	-60.0%	-47.7%	-43.1%	-46.1%	-51.1%	-53.3%	-65.7%	-63.4%	-75.4%	(high) - (low)
EPS Estimates Revisions	-64.8%	-61.1%	-49.6%	-52.9%	-42.7%	-26.9%	-36.9%	-43.5%	-41.3%	-66.5%	-60.8%	(high) - (low)
Market Beta	-33.9%	-38.9%	-41.2%	-48.9%	-53.1%	-56.1%	-56.2%	-62.0%	-74.6%	-91.8%	-93.4%	(high) - (low)
ROIC	-88.9%	-76.9%	-65.2%	-69.6%	-63.8%	-47.1%	-48.3%	-44.6%	-45.5%	-44.4%	-58.1%	(high) - (low)
ROE	-88.8%	-75.3%	-60.7%	-66.5%	-54.6%	-50.3%	-51.5%	-51.5%	-42.9%	-46.6%	-64.7%	(high) - (low)
Net Margin 5Y Stability	-73.9%	-59.3%	-58.0%	-56.4%	-52.0%	-53.9%	-47.3%	-49.4%	-44.7%	-79.9%	-40.3%	(low) - (high)
Size	-49.6%	-54.8%	-53.4%	-55.1%	-56.2%	-58.8%	-56.7%	-59.3%	-63.6%	-54.6%	-38.4%	(low) - (high)
Value	-57.2%	-53.4%	-47.4%	-47.5%	-50.3%	-49.1%	-44.5%	-58.1%	-64.3%	-80.3%	-63.9%	(high) - (low)
Growth	-63.6%	-52.3%	-43.6%	-49.2%	-46.5%	-44.7%	-56.5%	-47.0%	-59.7%	-85.4%	-87.7%	(high) - (low)
Momentum	-67.4%	-54.3%	-52.0%	-58.8%	-42.4%	-50.4%	-45.3%	-42.6%	-52.4%	-72.9%	-63.8%	(high) - (low)
Quality	-66.9%	-75.5%	-58.8%	-66.2%	-54.5%	-56.3%	-50.4%	-56.1%	-44.9%	-41.5%	-50.2%	(high) - (low)

Panel E - Monthly Turnover	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	21.2%	30.2%	40.2%	45.8%	48.0%	49.2%	50.5%	48.2%	37.5%	22.7%	43.9%	(low) - (high)
P/B	10.3%	21.6%	27.6%	35.8%	37.4%	40.9%	40.8%	38.1%	32.8%	18.6%	29.0%	(low) - (high)
Div Yield	9.3%	18.8%	23.8%	27.4%	30.3%	31.0%	30.2%	25.0%	20.0%	15.9%	25.2%	(high) - (low)
FCF Yield	11.4%	13.7%	11.8%	14.2%	21.3%	27.2%	30.9%	31.6%	24.1%	11.6%	23.0%	(high) - (low)
Asset Growth	8.2%	10.0%	11.2%	11.3%	12.4%	12.6%	11.9%	11.0%	9.6%	7.3%	15.4%	(high) - (low)
EPS Growth	21.0%	26.3%	32.7%	34.0%	35.9%	36.6%	38.2%	34.2%	29.3%	20.3%	41.2%	(high) - (low)
3M Change in Fwd EPS	39.1%	50.7%	56.3%	56.1%	53.7%	54.1%	55.4%	53.7%	47.1%	34.1%	73.2%	(high) - (low)
1M Reversal	92.9%	92.5%	91.5%	89.8%	89.4%	89.0%	89.7%	90.1%	92.5%	92.0%	184.9%	(high) - (low)
EPS Estimates Revisions	84.1%	83.8%	85.8%	87.9%	85.0%	90.3%	79.2%	78.9%	81.5%	83.0%	167.1%	(high) - (low)
Market Beta	17.2%	31.2%	36.6%	38.0%	41.0%	41.7%	37.5%	33.0%	25.7%	13.7%	30.9%	(high) - (low)
ROIC	10.4%	12.9%	14.3%	15.3%	15.6%	16.0%	15.1%	14.0%	10.5%	4.3%	14.7%	(high) - (low)
ROE	10.5%	14.0%	15.9%	17.9%	17.8%	16.9%	15.5%	13.9%	9.3%	4.7%	15.2%	(high) - (low)
Net Margin 5Y Stability	9.9%	11.7%	12.4%	12.5%	13.8%	13.2%	12.8%	11.7%	12.0%	10.1%	20.0%	(low) - (high)
Size	1.5%	9.1%	13.8%	17.8%	21.3%	23.7%	24.8%	24.9%	23.4%	16.3%	17.8%	(low) - (high)
Value	14.4%	35.9%	43.4%	48.7%	48.8%	50.2%	48.5%	44.1%	36.1%	20.6%	35.0%	(high) - (low)
Growth	20.3%	27.1%	30.1%	36.4%	34.6%	34.1%	34.0%	33.2%	26.4%	15.2%	35.5%	(high) - (low)
Momentum	79.2%	84.0%	87.7%	89.7%	89.8%	89.0%	88.0%	86.6%	84.8%	78.8%	157.9%	(high) - (low)
Quality	12.5%	17.2%	17.9%	19.8%	19.5%	19.3%	18.4%	16.0%	12.8%	4.6%	17.1%	(high) - (low)

Panel F - Monthly Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.06%	-0.09%	-0.12%	-0.14%	-0.14%	-0.15%	-0.15%	-0.14%	-0.11%	-0.07%	-0.13%	(low) - (high)
P/B	-0.03%	-0.06%	-0.08%	-0.11%	-0.11%	-0.12%	-0.12%	-0.11%	-0.10%	-0.06%	-0.09%	(low) - (high)
Div Yield	-0.03%	-0.06%	-0.07%	-0.08%	-0.09%	-0.09%	-0.09%	-0.07%	-0.06%	-0.05%	-0.08%	(high) - (low)
FCF Yield	-0.03%	-0.04%	-0.04%	-0.04%	-0.06%	-0.08%	-0.09%	-0.09%	-0.07%	-0.03%	-0.07%	(high) - (low)
Asset Growth	-0.02%	-0.03%	-0.03%	-0.03%	-0.04%	-0.04%	-0.04%	-0.03%	-0.03%	-0.02%	-0.05%	(high) - (low)
EPS Growth	-0.06%	-0.08%	-0.10%	-0.10%	-0.11%	-0.11%	-0.11%	-0.10%	-0.09%	-0.06%	-0.12%	(high) - (low)
3M Change in Fwd EPS	-0.12%	-0.15%	-0.17%	-0.17%	-0.16%	-0.16%	-0.17%	-0.16%	-0.14%	-0.10%	-0.22%	(high) - (low)
1M Reversal	-0.28%	-0.28%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.28%	-0.28%	-0.55%	(high) - (low)
EPS Estimates Revisions	-0.25%	-0.25%	-0.24%	-0.14%	-0.05%	-0.02%	-0.05%	-0.20%	-0.24%	-0.25%	-0.50%	(high) - (low)
Market Beta	-0.05%	-0.09%	-0.11%	-0.11%	-0.12%	-0.12%	-0.11%	-0.10%	-0.07%	-0.04%	-0.09%	(high) - (low)
ROIC	-0.03%	-0.04%	-0.04%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.03%	-0.01%	-0.04%	(high) - (low)
ROE	-0.03%	-0.04%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.03%	-0.01%	-0.05%	(high) - (low)
Net Margin 5Y Stability	-0.03%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.03%	-0.04%	-0.03%	-0.06%	(low) - (high)
Size	0.00%	-0.03%	-0.04%	-0.05%	-0.06%	-0.07%	-0.07%	-0.07%	-0.07%	-0.05%	-0.05%	(low) - (high)
Value	-0.04%	-0.11%	-0.13%	-0.15%	-0.15%	-0.15%	-0.15%	-0.13%	-0.11%	-0.06%	-0.10%	(high) - (low)
Growth	-0.06%	-0.08%	-0.09%	-0.11%	-0.10%	-0.10%	-0.10%	-0.10%	-0.08%	-0.05%	-0.11%	(high) - (low)
Momentum	-0.24%	-0.25%	-0.26%	-0.27%	-0.27%	-0.27%	-0.26%	-0.26%	-0.25%	-0.24%	-0.47%	(high) - (low)
Quality	-0.04%	-0.05%	-0.05%	-0.06%	-0.06%	-0.06%	-0.06%	-0.05%	-0.04%	-0.01%	-0.05%	(high) - (low)

Table 8.5.1 - US Return Data Output (Panels G – I)

Panel G - Average Monthly Returns - Net of Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	0.89%	0.59%	0.60%	0.48%	0.68%	0.69%	0.62%	1.01%	1.13%	1.06%	0.05%	(low) - (high)
P/B	0.81%	0.62%	0.79%	0.68%	0.53%	0.77%	0.92%	0.72%	0.78%	0.48%	-0.39%	(low) - (high)
Div Yield	0.61%	0.69%	0.57%	0.80%	0.59%	0.78%	0.76%	0.76%	0.72%	0.87%	0.21%	(high) - (low)
FCF Yield	0.55%	0.62%	0.57%	0.69%	0.91%	0.73%	0.79%	0.90%	0.78%	0.94%	0.32%	(high) - (low)
Asset Growth	0.93%	1.04%	0.89%	0.80%	0.87%	0.73%	0.90%	0.62%	0.78%	0.38%	-0.60%	(high) - (low)
EPS Growth	0.60%	0.72%	0.60%	0.74%	0.81%	0.58%	0.85%	0.90%	0.45%	0.52%	-0.20%	(high) - (low)
3M Change in Fwd EPS	0.24%	0.59%	0.81%	0.62%	0.61%	0.57%	0.62%	0.66%	0.67%	0.66%	0.19%	(high) - (low)
1M Reversal	0.27%	0.52%	0.57%	0.70%	0.61%	0.59%	0.53%	0.47%	0.33%	0.49%	-0.33%	(high) - (low)
EPS Estimates Revisions	0.31%	0.42%	0.45%	0.40%	0.26%	0.34%	0.48%	0.54%	0.82%	0.66%	-0.16%	(high) - (low)
Market Beta	0.76%	0.68%	0.73%	0.65%	0.62%	0.70%	0.70%	0.62%	0.62%	0.60%	-0.25%	(high) - (low)
ROIC	0.44%	0.34%	0.53%	0.65%	0.70%	0.83%	0.80%	0.78%	0.76%	1.01%	0.50%	(high) - (low)
ROE	0.43%	0.37%	0.67%	0.72%	0.62%	0.56%	0.72%	0.75%	0.86%	0.96%	0.47%	(high) - (low)
Net Margin 5Y Stability	0.57%	0.73%	0.76%	0.82%	0.67%	0.87%	0.76%	0.80%	0.86%	0.64%	0.01%	(low) - (high)
Size	0.76%	0.86%	0.92%	0.93%	0.96%	0.98%	1.07%	1.13%	1.19%	1.64%	0.87%	(low) - (high)
Value	0.71%	0.52%	0.71%	0.62%	0.68%	0.70%	0.74%	0.68%	0.91%	1.03%	0.24%	(high) - (low)
Growth	0.78%	0.82%	0.96%	0.59%	0.85%	0.75%	0.56%	0.85%	0.71%	0.50%	-0.40%	(high) - (low)
Momentum	0.09%	0.56%	0.38%	0.40%	0.61%	0.51%	0.72%	0.67%	0.79%	0.54%	-0.02%	(high) - (low)
Quality	0.67%	0.40%	0.63%	0.49%	0.78%	0.63%	0.71%	0.74%	0.93%	0.93%	0.19%	(high) - (low)

Panel H - Beta	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	1.14	0.99	0.92	0.91	0.87	0.82	0.83	0.84	0.90	1.08	-0.06	(low) - (high)
P/B	1.00	0.93	0.98	0.96	0.96	0.94	0.91	0.94	1.09	1.40	0.40	(low) - (high)
Div Yield	1.14	1.09	0.98	0.82	0.87	0.82	0.76	0.79	0.68	0.87	-0.27	(high) - (low)
FCF Yield	1.26	0.94	1.01	0.92	0.93	0.96	0.99	1.00	1.09	1.24	-0.02	(high) - (low)
Asset Growth	0.99	0.90	0.88	0.85	0.93	0.91	1.01	1.10	1.19	1.38	0.39	(high) - (low)
EPS Growth	1.46	0.99	0.83	0.81	0.88	0.97	1.03	1.11	1.34	1.53	0.07	(high) - (low)
3M Change in Fwd EPS	1.45	1.14	0.93	0.86	0.81	0.91	0.97	1.17	1.19	1.54	0.09	(high) - (low)
1M Reversal	1.53	1.23	1.10	1.03	0.90	0.91	0.89	0.94	1.04	1.11	-0.41	(high) - (low)
EPS Estimates Revisions	1.17	1.06	0.97	1.11	1.24	1.07	0.84	0.77	0.98	1.09	-0.08	(high) - (low)
Market Beta	0.43	0.52	0.65	0.72	0.84	0.95	1.03	1.18	1.40	1.84	1.36	(high) - (low)
ROIC	1.52	1.29	1.07	1.04	1.01	0.95	0.96	0.96	0.97	0.96	-0.55	(high) - (low)
ROE	1.51	1.33	1.11	1.11	0.91	0.96	0.93	0.97	0.98	0.93	-0.57	(high) - (low)
Net Margin 5Y Stability	1.32	1.15	1.08	1.06	0.98	0.98	0.95	0.85	0.91	1.41	0.09	(low) - (high)
Size	0.98	1.03	1.07	1.09	1.11	1.10	1.13	1.12	1.15	1.21	0.23	(low) - (high)
Value	1.05	1.03	0.98	0.98	1.05	0.88	0.87	0.96	0.93	1.17	0.13	(high) - (low)
Growth	0.99	0.92	0.81	0.90	0.89	0.96	1.00	1.04	1.20	1.46	0.47	(high) - (low)
Momentum	1.10	0.99	0.94	0.94	0.88	0.97	0.93	0.94	1.07	1.35	0.25	(high) - (low)
Quality	1.33	1.22	1.10	1.17	1.06	0.98	0.92	1.00	1.00	0.91	-0.42	(high) - (low)

Panel I - Beta-Adjusted Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	0.84%	0.69%	0.79%	0.68%	0.94%	1.02%	0.92%	1.39%	1.39%	1.05%	0.22%	(low) - (high)
P/B	0.85%	0.74%	0.88%	0.82%	0.67%	0.95%	1.14%	0.89%	0.81%	0.38%	-0.46%	(low) - (high)
Div Yield	0.56%	0.69%	0.66%	1.08%	0.78%	1.06%	1.12%	1.07%	1.15%	1.06%	0.50%	(high) - (low)
FCF Yield	0.46%	0.70%	0.60%	0.79%	1.05%	0.84%	0.89%	0.99%	0.78%	0.78%	0.32%	(high) - (low)
Asset Growth	0.96%	1.19%	1.05%	0.98%	0.98%	0.84%	0.93%	0.60%	0.68%	0.29%	-0.67%	(high) - (low)
EPS Growth	0.45%	0.81%	0.84%	1.04%	1.05%	0.71%	0.94%	0.90%	0.40%	0.38%	-0.07%	(high) - (low)
3M Change in Fwd EPS	0.24%	0.66%	1.05%	0.91%	0.95%	0.80%	0.81%	0.71%	0.68%	0.50%	0.25%	(high) - (low)
1M Reversal	0.36%	0.65%	0.77%	0.94%	0.98%	0.94%	0.90%	0.78%	0.59%	0.69%	0.33%	(high) - (low)
EPS Estimates Revisions	0.48%	0.64%	0.71%	0.49%	0.25%	0.33%	0.62%	0.96%	1.09%	0.83%	0.35%	(high) - (low)
Market Beta	1.90%	1.49%	1.29%	1.06%	0.89%	0.86%	0.79%	0.61%	0.49%	0.35%	-1.55%	(high) - (low)
ROIC	0.31%	0.29%	0.54%	0.67%	0.74%	0.92%	0.88%	0.85%	0.81%	1.06%	0.74%	(high) - (low)
ROE	0.30%	0.31%	0.65%	0.70%	0.73%	0.63%	0.82%	0.82%	0.90%	1.04%	0.74%	(high) - (low)
Net Margin 5Y Stability	0.46%	0.66%	0.74%	0.81%	0.73%	0.92%	0.84%	0.99%	0.98%	0.47%	0.02%	(low) - (high)
Size	0.78%	0.87%	0.90%	0.90%	0.92%	0.95%	1.01%	1.07%	1.09%	1.40%	0.62%	(low) - (high)
Value	0.72%	0.61%	0.86%	0.79%	0.79%	0.96%	1.02%	0.85%	1.10%	0.93%	0.21%	(high) - (low)
Growth	0.85%	0.98%	1.30%	0.77%	1.06%	0.89%	0.66%	0.91%	0.66%	0.38%	-0.48%	(high) - (low)
Momentum	0.30%	0.82%	0.68%	0.71%	1.00%	0.80%	1.05%	0.98%	0.97%	0.58%	0.28%	(high) - (low)
Quality	0.53%	0.37%	0.62%	0.46%	0.79%	0.71%	0.83%	0.78%	0.97%	1.04%	0.51%	(high) - (low)

Figure 8.5.2 - US Return-Risk Scatterplot

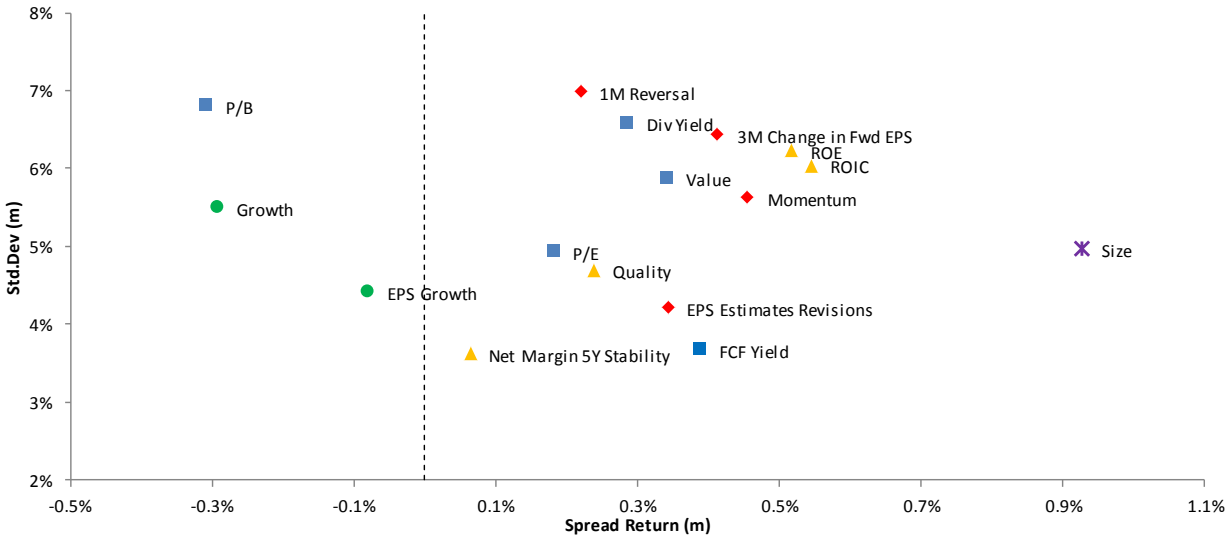


Table 8.5.3 - US Students T-test on long/short factor spreads

Students t-test	Average Monthly Return	Monthly Std.Dev	# of Obs	T-test statistic (H0: Spread = 0)	P-Value
P/E	0.2%	4.9%	277	0.69	0.49
P/B	-0.3%	6.8%	277	-0.83	0.41
Div Yield	0.3%	6.6%	277	0.78	0.44
FCF Yield	0.4%	3.7%	277	1.88	0.06
Asset Growth	-0.6%	5.4%	277	-1.90	0.06
EPS Growth	-0.1%	4.4%	277	-0.33	0.74
3M Change in Fwd EPS	0.4%	6.4%	277	1.12	0.27
1M Reversal	0.2%	7.0%	277	0.56	0.57
EPS Estimates Revisions	0.4%	4.2%	277	1.45	0.15
Market Beta	-0.2%	8.5%	277	-0.35	0.72
ROIC	0.6%	6.0%	277	1.59	0.11
ROE	0.5%	6.2%	277	1.46	0.15
Net Margin 5Y Stability	0.1%	3.6%	277	0.32	0.75
Size	1.0%	5.0%	277	3.37	0.00
Value	0.4%	5.9%	277	1.05	0.29
Growth	-0.3%	5.5%	277	-0.98	0.33
Momentum	0.5%	5.6%	277	1.40	0.16
Quality	0.3%	4.7%	277	0.92	0.36

Table 8.5.4 - US Factor Spread Correlations

Correlation Matrix	P/E	P/B	Div Yield	FCF Yield	Asset Growth	EPS Growth	3M Change in Fwd EPS	1M Reversal	EPS Estimates Revisions	Market Beta	ROIC	ROE	Net Margin 5Y Stability	Size	Value	Growth	Momentum	Quality
S&P US BMI	-0.05	0.26	-0.18	-0.02	0.32	0.07	0.06	-0.26	-0.08	0.72	-0.41	-0.41	0.11	0.21	0.10	0.38	0.20	-0.40
P/E	1.00	0.62	0.47	0.27	-0.30	-0.19	-0.49	-0.32	-0.53	-0.24	0.05	0.08	-0.29	0.35	0.76	-0.50	-0.36	-0.15
P/B		1.00	0.57	0.18	-0.23	-0.19	-0.53	-0.31	-0.57	0.16	-0.31	-0.29	-0.28	0.59	0.84	-0.33	-0.41	-0.51
Div Yield			1.00	0.16	-0.38	-0.28	-0.46	-0.10	-0.36	-0.27	-0.04	-0.02	-0.14	0.30	0.71	-0.54	-0.45	-0.13
FCF Yield				1.00	-0.21	0.02	-0.27	-0.12	-0.15	-0.04	0.31	0.34	-0.11	-0.07	0.36	-0.23	-0.20	0.24
Asset Growth					1.00	0.08	0.25	-0.14	0.20	0.49	-0.25	-0.28	0.24	-0.09	-0.32	0.82	0.31	-0.03
EPS Growth						1.00	0.45	0.04	0.27	-0.01	0.07	0.03	-0.06	-0.12	-0.28	0.35	0.33	0.04
3M Change in Fwd EPS							1.00	0.22	0.65	0.14	-0.13	-0.17	0.34	-0.26	-0.58	0.43	0.64	0.01
1M Reversal								1.00	0.31	-0.19	0.10	0.09	0.10	-0.30	-0.30	-0.04	-0.31	0.15
EPS Estimates Revisions									1.00	0.00	0.14	0.09	0.24	-0.36	-0.57	0.32	0.58	0.26
Market Beta										1.00	-0.49	-0.51	0.24	0.20	-0.02	0.54	0.24	-0.40
ROIC											1.00	0.96	-0.23	-0.46	-0.19	-0.18	-0.04	0.84
ROE												1.00	-0.20	-0.45	-0.15	-0.22	-0.06	0.84
Net Margin 5Y Stability													1.00	-0.10	-0.30	0.20	0.22	0.02
Size														1.00	0.49	-0.12	-0.18	-0.56
Value															1.00	-0.50	-0.45	-0.34
Growth																1.00	0.45	0.02
Momentum																	1.00	0.08
Quality																		1.00

Figure 8.5.5 - US Performance Index Graphs (Index Year 1990 = 100) (part 1 of 2)

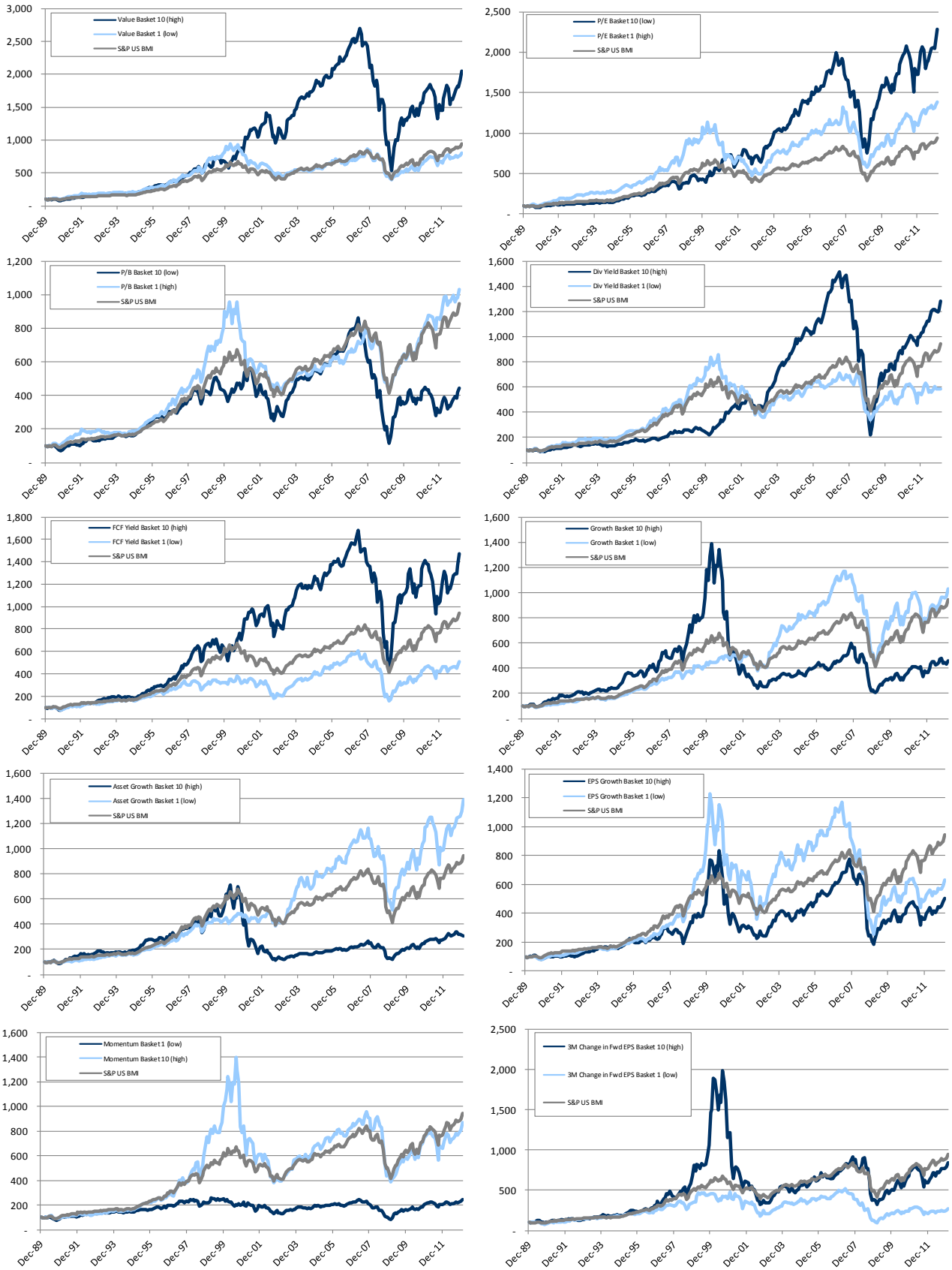


Figure 8.5.5 - US Performance Index (Index Year 1990 = 100) (part 2 of 2)

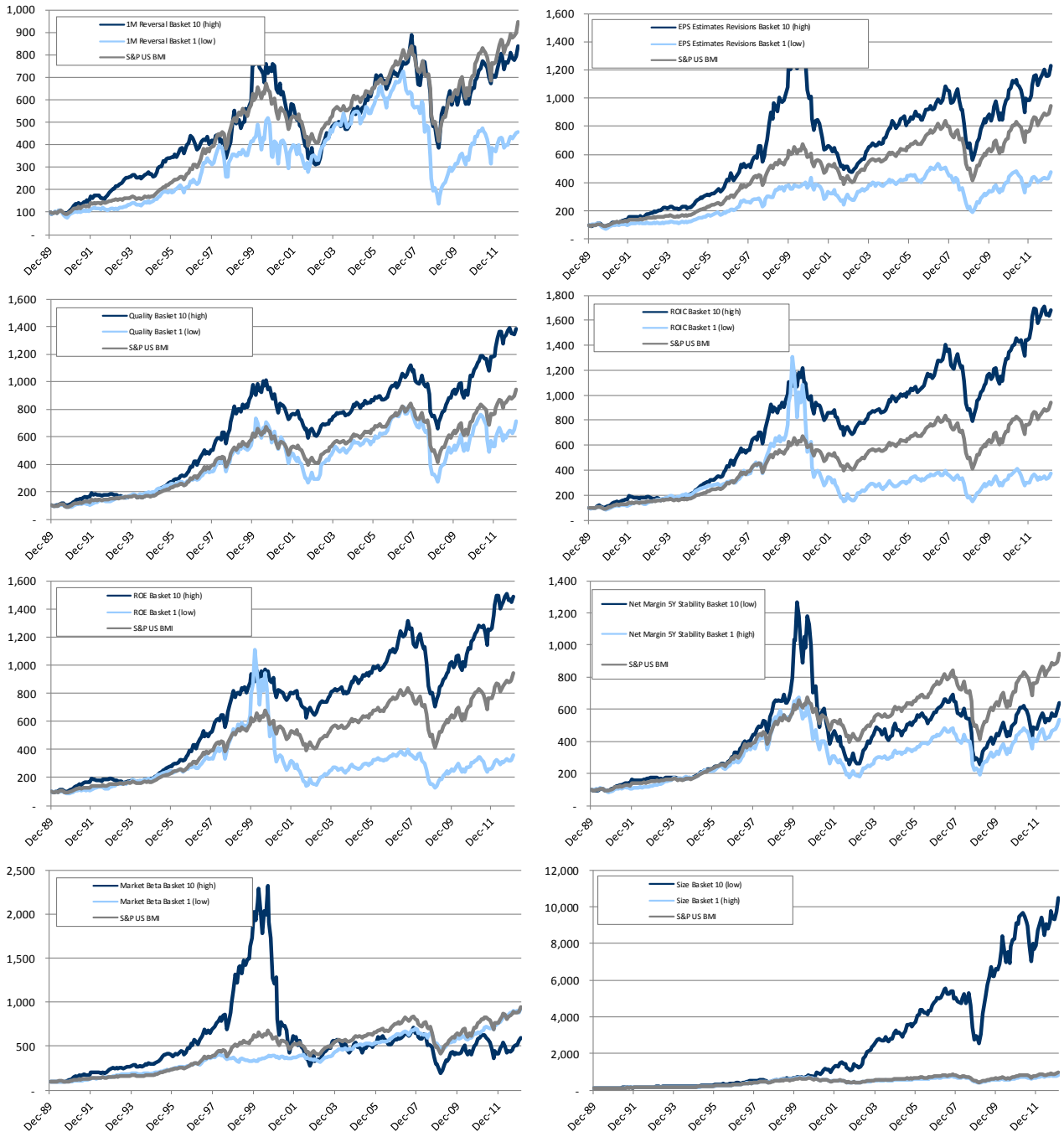
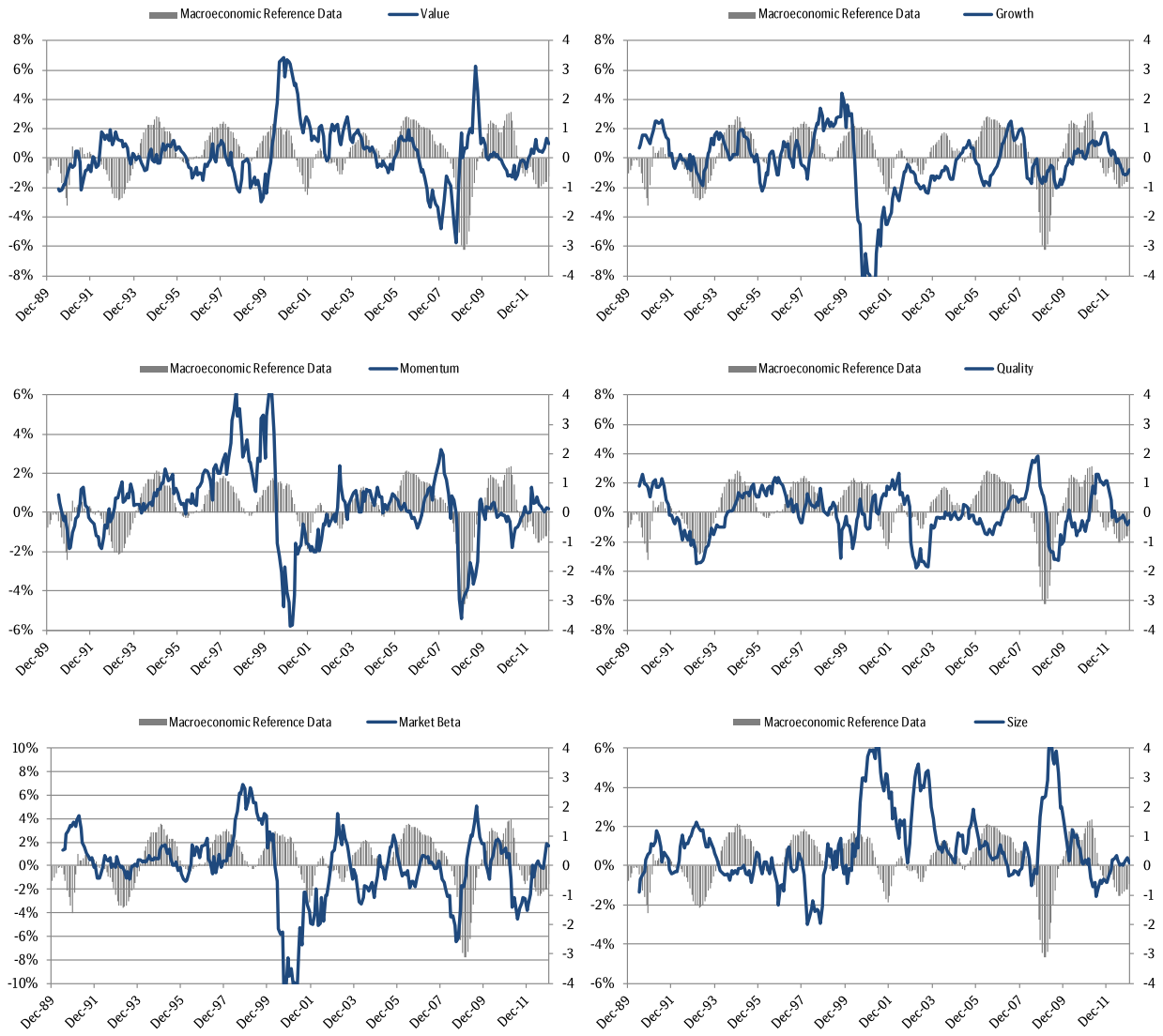


Figure 8.5.6 - US Historical Style Premiums



Left axis: 12MA Monthly compounded factor spreads, Right axis: Standardized macroeconomic reference index level

Table 8.5.7 - US Factor Premiums and P-values During the Economic Cycle

Factor Premium and P-Values	Recession		Recovery		Boom		Slowdown	
P/E	0.08%	*0.93*	0.30%	*0.75*	0.18%	*0.67*	0.13%	*0.78*
P/B	-1.53%	*0.18*	0.98%	*0.59*	0.10%	*0.85*	-0.67%	*0.26*
Div Yield	-0.65%	*0.59*	0.65%	*0.71*	-0.24%	*0.64*	1.12%	*0.03*
FCF Yield	1.66%	*0.01*	-0.01%	*0.98*	0.36%	*0.29*	-0.17%	*0.63*
Asset Growth	-0.89%	*0.45*	-1.06%	*0.26*	-0.59%	*0.13*	0.07%	*0.89*
EPS Growth	-1.73%	*0.07*	0.13%	*0.89*	0.18%	*0.57*	0.51%	*0.18*
3M Change in Fwd EPS	-0.55%	*0.64*	0.13%	*0.93*	0.40%	*0.39*	1.04%	*0.12*
1M Reversal	1.31%	*0.37*	1.12%	*0.42*	-0.51%	*0.26*	0.17%	*0.81*
EPS Estimates Revisions	0.32%	*0.71*	-0.57%	*0.50*	0.27%	*0.43*	0.79%	*0.03*
Market Beta	-1.46%	*0.42*	-1.46%	*0.38*	1.05%	*0.11*	-1.38%	*0.07*
ROIC	2.89%	*0.00*	-1.33%	*0.25*	-0.02%	*0.97*	0.65%	*0.34*
ROE	3.39%	*0.00*	-1.14%	*0.36*	-0.05%	*0.91*	0.19%	*0.79*
Net Margin 5Y Stability	0.52%	*0.39*	-0.03%	*0.95*	0.07%	*0.81*	-0.04%	*0.93*
Size	-0.02%	*0.98*	-0.02%	*0.99*	0.94%	*0.03*	0.01%	*0.97*
Value	-0.69%	*0.53*	1.89%	*0.23*	0.23%	*0.56*	0.26%	*0.60*
Growth	-1.23%	*0.29*	-0.64%	*0.55*	0.20%	*0.65*	0.00%	*0.99*
Momentum	-0.46%	*0.66*	-0.46%	*0.72*	0.45%	*0.26*	1.21%	*0.03*
Quality	2.09%	*0.00*	-0.94%	*0.35*	-0.23%	*0.55*	0.27%	*0.60*
Avg. Return of the S&P US BMI	-0.38%		1.07%		1.65%		0.34%	
# of Months	48		37		100		88	

Table 8.5.8 - US Transition Matrixes

Asset Growth 1 (high)	Asset Growth 2	Asset Growth 3	Asset Growth 4	Asset Growth 5	Asset Growth 6	Asset Growth 7	Asset Growth 8	Asset Growth 9	Asset Growth 10 (low)
94%	2%	1%	0%	0%	0%	0%	0%	0%	0%
2%	92%	3%	1%	1%	0%	0%	0%	0%	0%
1%	3%	91%	3%	1%	1%	0%	0%	0%	0%
0%	1%	3%	90%	3%	1%	0%	0%	0%	0%
0%	1%	1%	3%	90%	3%	1%	1%	0%	0%
0%	0%	1%	1%	3%	90%	1%	1%	0%	0%
0%	0%	0%	1%	1%	3%	3%	3%	1%	0%
0%	0%	0%	0%	1%	1%	90%	90%	3%	1%
0%	0%	0%	0%	0%	0%	3%	3%	92%	2%
0%	0%	0%	0%	0%	0%	1%	1%	3%	94%

1M Reversal 1 (low)	1M Reversal 2	1M Reversal 3	1M Reversal 4	1M Reversal 5	1M Reversal 6	1M Reversal 7	1M Reversal 8	1M Reversal 9	1M Reversal 10 (high)
16%	10%	8%	8%	7%	7%	8%	9%	10%	16%
11%	10%	10%	9%	10%	9%	10%	10%	11%	11%
9%	9%	10%	10%	10%	10%	11%	11%	10%	10%
8%	9%	10%	11%	11%	11%	11%	10%	10%	9%
8%	9%	10%	11%	11%	11%	11%	10%	10%	8%
7%	9%	10%	11%	11%	11%	11%	11%	10%	7%
8%	10%	10%	11%	11%	11%	11%	10%	10%	8%
9%	10%	11%	11%	11%	11%	10%	10%	9%	8%
10%	11%	10%	10%	10%	10%	10%	10%	10%	9%
15%	11%	9%	8%	8%	8%	8%	9%	10%	13%

ROE 1 (low)	ROE 2	ROE 3	ROE 4	ROE 5	ROE 6	ROE 7	ROE 8	ROE 9	ROE 10 (high)
93%	3%	1%	0%	0%	0%	0%	0%	0%	0%
3%	89%	5%	1%	0%	0%	0%	0%	0%	0%
1%	4%	87%	6%	1%	1%	0%	0%	0%	0%
0%	1%	5%	86%	6%	1%	0%	0%	0%	0%
0%	1%	1%	5%	86%	6%	1%	0%	0%	0%
0%	0%	1%	1%	5%	86%	5%	1%	0%	0%
0%	0%	0%	1%	1%	5%	87%	5%	1%	0%
0%	0%	0%	0%	1%	1%	5%	88%	4%	0%
0%	0%	0%	0%	0%	0%	1%	5%	90%	3%
0%	0%	0%	0%	0%	0%	0%	0%	3%	95%

Growth 1 (high)	Growth 2	Growth 3	Growth 4	Growth 5	Growth 6	Growth 7	Growth 8	Growth 9	Growth 10 (low)
85%	8%	2%	1%	0%	0%	0%	0%	1%	2%
9%	74%	11%	2%	1%	1%	0%	0%	0%	0%
2%	12%	68%	13%	3%	1%	0%	0%	0%	0%
1%	3%	13%	64%	13%	3%	1%	1%	0%	0%
1%	1%	3%	14%	63%	13%	1%	1%	1%	0%
1%	1%	1%	3%	14%	63%	2%	2%	1%	1%
0%	1%	1%	1%	3%	14%	12%	12%	2%	1%
0%	0%	1%	1%	1%	2%	68%	68%	11%	2%
0%	0%	0%	0%	1%	1%	12%	12%	73%	8%
1%	0%	0%	0%	0%	1%	2%	2%	10%	85%

Momentum 1 (low)	Momentum 2	Momentum 3	Momentum 4	Momentum 5	Momentum 6	Momentum 7	Momentum 8	Momentum 9	Momentum 10 (high)
26%	18%	13%	10%	8%	6%	5%	5%	4%	4%
17%	16%	13%	11%	9%	8%	7%	7%	6%	5%
12%	13%	12%	11%	11%	10%	9%	8%	7%	6%
9%	11%	12%	12%	12%	11%	11%	9%	8%	6%
8%	9%	10%	12%	12%	12%	11%	10%	9%	7%
7%	8%	10%	11%	12%	12%	12%	11%	10%	8%
6%	7%	9%	11%	11%	12%	11%	12%	11%	10%
5%	7%	8%	9%	10%	11%	12%	13%	13%	13%
5%	6%	7%	7%	9%	10%	11%	13%	15%	16%
5%	4%	5%	6%	6%	8%	10%	13%	17%	25%

Quality 1 (low)	Quality 2	Quality 3	Quality 4	Quality 5	Quality 6	Quality 7	Quality 8	Quality 9	Quality 10
91%	5%	1%	1%	1%	0%	0%	0%	0%	0%
5%	86%	6%	1%	0%	0%	0%	0%	0%	0%
1%	5%	85%	6%	1%	0%	0%	0%	0%	0%
1%	1%	6%	83%	7%	1%	0%	0%	0%	0%
0%	1%	1%	6%	83%	7%	1%	0%	0%	0%
0%	0%	0%	1%	6%	83%	7%	1%	0%	0%
0%	0%	0%	0%	1%	6%	84%	6%	1%	0%
0%	0%	0%	0%	0%	1%	5%	86%	6%	0%
0%	0%	0%	0%	0%	0%	1%	5%	89%	4%
0%	0%	0%	0%	0%	0%	0%	0%	3%	95%

8.6 Europe Data Output

Table 8.6.1 - Europe Return Data Output (Panels A – C)

Index	CAGR	Volatility	IR	Max DD
S&P Europe BMI	0.68%	4.49%	0.15	-54.1%

Panel A - Average Monthly Factor Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	0.28%	0.50%	0.66%	0.63%	0.77%	0.88%	0.81%	0.74%	1.24%	1.03%	0.75%	(low) - (high)
P/B	0.48%	0.64%	0.49%	0.50%	0.58%	0.65%	0.73%	0.78%	0.67%	0.85%	0.37%	(low) - (high)
Div Yield	0.39%	0.35%	0.34%	0.72%	0.67%	0.81%	0.72%	0.94%	1.07%	0.98%	0.59%	(high) - (low)
FCF Yield	0.35%	0.47%	0.34%	0.54%	0.75%	0.66%	0.91%	0.69%	1.01%	0.62%	0.27%	(high) - (low)
Asset Growth	0.91%	0.70%	0.66%	0.75%	0.47%	0.49%	0.42%	0.74%	0.44%	0.25%	-0.66%	(high) - (low)
EPS Growth	0.27%	0.58%	0.49%	0.53%	0.68%	0.67%	0.74%	0.55%	0.27%	0.33%	0.06%	(high) - (low)
3M Change in Fwd EPS	-0.08%	0.24%	0.69%	0.40%	0.67%	0.78%	0.61%	0.67%	0.72%	0.76%	0.84%	(high) - (low)
1M Reversal	0.52%	0.67%	0.75%	0.83%	0.66%	0.58%	0.61%	0.76%	0.53%	0.30%	-0.22%	(high) - (low)
EPS Estimates Revisions	0.21%	0.37%	0.48%	0.46%	0.27%	0.26%	0.48%	0.58%	0.74%	1.04%	0.83%	(high) - (low)
Market Beta	0.63%	0.89%	0.74%	0.82%	0.81%	0.74%	0.66%	0.67%	0.28%	0.38%	-0.25%	(high) - (low)
ROIC	0.08%	0.28%	0.56%	0.50%	0.74%	0.55%	0.73%	0.72%	0.73%	0.80%	0.72%	(high) - (low)
ROE	0.04%	0.37%	0.47%	0.76%	0.70%	0.41%	0.88%	0.57%	0.62%	0.82%	0.78%	(high) - (low)
Net Margin 5Y Stability	0.51%	0.69%	0.60%	0.58%	0.71%	0.64%	0.82%	0.45%	0.65%	0.58%	0.07%	(low) - (high)
Size	0.66%	0.70%	0.69%	0.64%	0.68%	0.61%	0.61%	0.54%	0.42%	0.14%	-0.52%	(low) - (high)
Value	0.33%	0.31%	0.65%	0.48%	0.51%	0.95%	0.83%	0.91%	1.02%	1.12%	0.78%	(high) - (low)
Growth	0.76%	0.74%	0.70%	0.82%	0.64%	0.42%	0.44%	0.74%	0.45%	0.32%	-0.43%	(high) - (low)
Momentum	0.18%	0.30%	0.50%	0.80%	0.60%	0.79%	0.67%	0.85%	0.86%	0.85%	0.68%	(high) - (low)
Quality	0.48%	0.18%	0.61%	0.55%	0.66%	0.56%	0.52%	0.64%	0.64%	0.97%	0.49%	(high) - (low)

Panel B - Monthly Standard Deviations	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	5.16%	4.70%	4.14%	4.50%	4.57%	4.52%	4.90%	5.33%	5.86%	6.33%	4.37%	(low) - (high)
P/B	4.86%	4.39%	4.35%	4.51%	4.87%	5.02%	5.15%	5.47%	6.38%	7.31%	6.30%	(low) - (high)
Div Yield	5.09%	5.09%	5.11%	4.84%	4.80%	4.66%	4.55%	4.69%	4.59%	5.68%	4.76%	(high) - (low)
FCF Yield	6.75%	5.25%	5.00%	4.95%	4.59%	4.28%	4.27%	4.79%	4.88%	6.43%	3.49%	(high) - (low)
Asset Growth	5.24%	4.52%	4.39%	4.53%	4.97%	4.99%	4.84%	5.00%	5.51%	5.83%	3.78%	(high) - (low)
EPS Growth	6.99%	4.88%	4.44%	4.25%	4.41%	4.40%	4.69%	5.29%	5.99%	6.94%	3.56%	(high) - (low)
3M Change in Fwd EPS	7.48%	6.03%	5.01%	4.76%	4.55%	4.28%	4.18%	4.41%	5.33%	6.22%	4.60%	(high) - (low)
1M Reversal	7.44%	6.18%	5.26%	4.89%	4.75%	4.39%	4.69%	4.66%	4.94%	5.63%	5.94%	(high) - (low)
EPS Estimates Revisions	5.47%	5.06%	4.87%	5.14%	5.77%	4.50%	3.68%	4.43%	4.61%	4.62%	3.26%	(high) - (low)
Market Beta	3.77%	3.01%	3.59%	3.53%	3.75%	3.83%	4.36%	4.64%	5.59%	7.48%	7.71%	(high) - (low)
ROIC	6.83%	6.22%	5.93%	5.31%	4.89%	4.86%	4.46%	4.38%	4.28%	4.71%	4.75%	(high) - (low)
ROE	6.97%	5.79%	5.81%	5.36%	4.91%	4.89%	4.57%	4.44%	4.53%	4.29%	4.90%	(high) - (low)
Net Margin 5Y Stability	5.79%	5.75%	5.05%	5.43%	4.92%	4.59%	4.95%	5.06%	4.06%	5.14%	3.34%	(low) - (high)
Size	4.53%	4.73%	4.83%	4.89%	5.03%	4.99%	5.10%	5.30%	5.43%	6.35%	4.66%	(low) - (high)
Value	4.56%	4.99%	4.72%	4.49%	5.00%	4.70%	5.24%	5.02%	5.25%	6.37%	5.21%	(high) - (low)
Growth	5.35%	4.52%	4.46%	4.38%	4.66%	4.79%	4.90%	5.29%	5.57%	6.28%	4.05%	(high) - (low)
Momentum	5.76%	5.05%	4.72%	4.97%	4.39%	4.74%	4.95%	4.79%	5.03%	5.58%	4.52%	(high) - (low)
Quality	6.45%	6.26%	5.60%	5.06%	5.29%	4.74%	4.86%	4.57%	4.12%	4.67%	4.76%	(high) - (low)

Panel C - Risk / Reward Ratio	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	0.05	0.11	0.16	0.14	0.17	0.19	0.17	0.14	0.21	0.16	0.17	(low) - (high)
P/B	0.10	0.14	0.11	0.11	0.12	0.13	0.14	0.14	0.10	0.12	0.06	(low) - (high)
Div Yield	0.08	0.07	0.07	0.15	0.14	0.17	0.16	0.20	0.23	0.17	0.12	(high) - (low)
FCF Yield	0.05	0.09	0.07	0.11	0.16	0.15	0.21	0.14	0.21	0.10	0.08	(high) - (low)
Asset Growth	0.17	0.16	0.15	0.17	0.10	0.10	0.09	0.15	0.08	0.04	-0.18	(high) - (low)
EPS Growth	0.04	0.12	0.11	0.12	0.15	0.15	0.16	0.10	0.04	0.05	0.02	(high) - (low)
3M Change in Fwd EPS	-0.01	0.04	0.14	0.08	0.15	0.18	0.15	0.15	0.14	0.12	0.18	(high) - (low)
1M Reversal	0.07	0.11	0.14	0.17	0.14	0.13	0.13	0.16	0.11	0.05	-0.04	(high) - (low)
EPS Estimates Revisions	0.04	0.07	0.10	0.09	0.05	0.06	0.13	0.13	0.16	0.23	0.25	(high) - (low)
Market Beta	0.17	0.30	0.21	0.23	0.21	0.19	0.15	0.14	0.05	0.05	-0.03	(high) - (low)
ROIC	0.01	0.04	0.09	0.09	0.15	0.11	0.16	0.16	0.17	0.17	0.15	(high) - (low)
ROE	0.01	0.06	0.08	0.14	0.14	0.08	0.19	0.13	0.14	0.19	0.16	(high) - (low)
Net Margin 5Y Stability	0.09	0.12	0.12	0.11	0.14	0.14	0.17	0.09	0.16	0.11	0.02	(low) - (high)
Size	0.15	0.15	0.14	0.13	0.13	0.12	0.12	0.10	0.08	0.02	-0.11	(low) - (high)
Value	0.07	0.06	0.14	0.11	0.10	0.20	0.16	0.18	0.19	0.18	0.15	(high) - (low)
Growth	0.14	0.16	0.16	0.19	0.14	0.09	0.09	0.14	0.08	0.05	-0.11	(high) - (low)
Momentum	0.03	0.06	0.11	0.16	0.14	0.17	0.13	0.18	0.17	0.15	0.15	(high) - (low)
Quality	0.07	0.03	0.11	0.11	0.12	0.12	0.11	0.14	0.15	0.21	0.10	(high) - (low)

Table 8.6.1 - Europe Return Data Output (Panels D – F)

Panel D - Max Drawdown	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-72.2%	-61.0%	-47.5%	-48.1%	-50.6%	-50.8%	-62.1%	-53.6%	-65.3%	-73.4%	-41.5%	(low) - (high)
P/B	-72.6%	-58.8%	-54.2%	-48.6%	-54.0%	-54.6%	-61.3%	-66.0%	-70.1%	-74.3%	-62.8%	(low) - (high)
Div Yield	-73.3%	-64.7%	-57.2%	-51.0%	-56.1%	-50.7%	-51.4%	-50.7%	-52.2%	-72.1%	-52.3%	(high) - (low)
FCF Yield	-73.1%	-62.1%	-62.7%	-62.5%	-61.4%	-51.1%	-41.6%	-59.3%	-54.8%	-69.3%	-33.8%	(high) - (low)
Asset Growth	-53.7%	-47.3%	-46.2%	-50.8%	-56.9%	-58.9%	-58.7%	-56.5%	-67.9%	-76.3%	-88.9%	(high) - (low)
EPS Growth	-79.0%	-61.0%	-55.6%	-53.3%	-50.3%	-51.0%	-49.9%	-67.4%	-74.6%	-71.9%	-55.5%	(high) - (low)
3M Change in Fwd EPS	-84.1%	-69.8%	-58.2%	-58.1%	-56.7%	-43.8%	-44.7%	-50.3%	-64.0%	-70.7%	-52.7%	(high) - (low)
1M Reversal	-74.5%	-61.7%	-58.1%	-53.6%	-53.6%	-54.4%	-54.7%	-51.5%	-54.2%	-66.8%	-88.9%	(high) - (low)
EPS Estimates Revisions	-64.1%	-59.2%	-52.5%	-56.1%	-66.2%	-20.3%	-20.1%	-48.4%	-49.7%	-55.8%	-31.4%	(high) - (low)
Market Beta	-48.7%	-30.6%	-38.2%	-46.0%	-45.4%	-45.5%	-54.2%	-58.1%	-69.2%	-85.8%	-91.6%	(high) - (low)
ROIC	-83.3%	-72.5%	-70.2%	-61.2%	-49.8%	-50.7%	-48.1%	-52.4%	-45.1%	-60.3%	-50.6%	(high) - (low)
ROE	-82.6%	-65.0%	-63.4%	-57.3%	-54.8%	-57.6%	-58.6%	-52.8%	-45.2%	-51.7%	-43.7%	(high) - (low)
Net Margin 5Y Stability	-63.1%	-59.8%	-55.0%	-59.4%	-55.5%	-53.7%	-58.6%	-55.7%	-48.7%	-66.5%	-55.7%	(low) - (high)
Size	-52.4%	-56.4%	-60.9%	-61.4%	-64.2%	-62.0%	-60.2%	-64.3%	-67.5%	-71.6%	-81.6%	(low) - (high)
Value	-69.3%	-72.0%	-52.9%	-49.9%	-60.0%	-55.8%	-54.9%	-54.6%	-60.8%	-73.6%	-52.7%	(high) - (low)
Growth	-52.0%	-47.8%	-52.5%	-50.1%	-52.5%	-58.6%	-56.9%	-60.5%	-67.8%	-78.9%	-85.3%	(high) - (low)
Momentum	-70.6%	-60.0%	-56.7%	-53.5%	-53.3%	-49.2%	-60.4%	-49.2%	-54.1%	-64.5%	-58.3%	(high) - (low)
Quality	-71.0%	-76.2%	-61.1%	-61.2%	-55.1%	-64.7%	-54.5%	-53.4%	-43.5%	-52.7%	-51.0%	(high) - (low)

Panel E - Monthly Turnover	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	19.0%	28.7%	38.5%	44.5%	48.4%	47.8%	46.7%	46.3%	37.4%	22.8%	41.7%	(low) - (high)
P/B	11.2%	20.4%	28.8%	32.0%	36.3%	36.1%	36.0%	33.0%	28.9%	17.5%	28.7%	(low) - (high)
Div Yield	12.7%	24.8%	33.4%	39.8%	42.7%	40.4%	40.6%	37.3%	30.1%	20.2%	32.9%	(high) - (low)
FCF Yield	10.8%	14.5%	13.9%	13.6%	14.3%	20.2%	23.8%	23.7%	20.9%	9.2%	20.0%	(high) - (low)
Asset Growth	8.7%	10.9%	11.8%	12.1%	13.2%	11.7%	13.2%	12.4%	11.1%	8.3%	17.0%	(high) - (low)
EPS Growth	23.2%	32.1%	41.4%	45.5%	48.0%	46.3%	43.4%	39.6%	32.2%	23.6%	46.8%	(high) - (low)
3M Change in Fwd EPS	44.5%	59.1%	64.7%	68.1%	69.7%	69.3%	68.1%	64.5%	57.7%	40.9%	85.4%	(high) - (low)
1M Reversal	92.7%	93.3%	91.2%	91.2%	90.5%	89.8%	88.6%	91.2%	92.0%	92.6%	185.3%	(high) - (low)
EPS Estimates Revisions	81.2%	85.7%	84.3%	87.6%	89.5%	88.6%	77.3%	79.8%	81.7%	81.1%	162.3%	(high) - (low)
Market Beta	20.8%	33.2%	40.9%	42.0%	41.9%	41.7%	38.6%	32.0%	26.1%	9.2%	30.0%	(high) - (low)
ROIC	11.5%	12.8%	14.4%	16.0%	16.0%	15.7%	15.3%	13.9%	12.3%	6.5%	17.9%	(high) - (low)
ROE	11.7%	13.7%	15.4%	16.0%	17.1%	16.1%	14.8%	14.0%	12.2%	6.8%	18.5%	(high) - (low)
Net Margin 5Y Stability	9.4%	12.8%	13.8%	15.9%	16.5%	16.0%	15.5%	14.1%	11.8%	10.2%	19.6%	(low) - (high)
Size	2.3%	9.1%	13.1%	16.8%	20.0%	22.1%	23.7%	24.2%	21.9%	16.0%	18.2%	(low) - (high)
Value	14.9%	33.3%	41.1%	46.2%	48.4%	50.1%	46.7%	41.5%	34.9%	19.7%	34.6%	(high) - (low)
Growth	20.2%	28.8%	32.0%	32.5%	36.7%	35.6%	35.7%	31.7%	27.0%	19.2%	39.4%	(high) - (low)
Momentum	79.3%	87.0%	89.1%	87.7%	90.2%	89.3%	88.9%	89.9%	86.8%	77.1%	156.4%	(high) - (low)
Quality	12.4%	15.9%	17.7%	18.5%	18.2%	18.3%	16.8%	16.3%	12.2%	7.1%	19.5%	(high) - (low)

Panel F - Monthly Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.06%	-0.09%	-0.12%	-0.13%	-0.15%	-0.14%	-0.14%	-0.14%	-0.11%	-0.07%	-0.13%	(low) - (high)
P/B	-0.03%	-0.06%	-0.09%	-0.10%	-0.11%	-0.11%	-0.11%	-0.10%	-0.09%	-0.05%	-0.09%	(low) - (high)
Div Yield	-0.04%	-0.07%	-0.10%	-0.12%	-0.13%	-0.12%	-0.12%	-0.11%	-0.09%	-0.06%	-0.10%	(high) - (low)
FCF Yield	-0.03%	-0.04%	-0.04%	-0.04%	-0.04%	-0.06%	-0.07%	-0.07%	-0.06%	-0.03%	-0.06%	(high) - (low)
Asset Growth	-0.03%	-0.03%	-0.04%	-0.04%	-0.04%	-0.03%	-0.04%	-0.04%	-0.03%	-0.02%	-0.05%	(high) - (low)
EPS Growth	-0.07%	-0.10%	-0.12%	-0.14%	-0.14%	-0.14%	-0.13%	-0.12%	-0.10%	-0.07%	-0.14%	(high) - (low)
3M Change in Fwd EPS	-0.13%	-0.18%	-0.19%	-0.20%	-0.21%	-0.21%	-0.20%	-0.19%	-0.17%	-0.12%	-0.26%	(high) - (low)
1M Reversal	-0.28%	-0.28%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.28%	-0.28%	-0.55%	(high) - (low)
EPS Estimates Revisions	-0.24%	-0.26%	-0.25%	-0.23%	-0.12%	-0.03%	-0.10%	-0.20%	-0.24%	-0.24%	-0.49%	(high) - (low)
Market Beta	-0.06%	-0.10%	-0.12%	-0.13%	-0.13%	-0.13%	-0.12%	-0.10%	-0.08%	-0.03%	-0.09%	(high) - (low)
ROIC	-0.03%	-0.04%	-0.04%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.04%	-0.02%	-0.05%	(high) - (low)
ROE	-0.04%	-0.04%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.04%	-0.04%	-0.02%	-0.06%	(high) - (low)
Net Margin 5Y Stability	-0.03%	-0.04%	-0.04%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.04%	-0.03%	-0.06%	(low) - (high)
Size	-0.01%	-0.03%	-0.04%	-0.05%	-0.06%	-0.07%	-0.07%	-0.07%	-0.07%	-0.05%	-0.05%	(low) - (high)
Value	-0.04%	-0.10%	-0.12%	-0.14%	-0.15%	-0.15%	-0.14%	-0.12%	-0.10%	-0.06%	-0.10%	(high) - (low)
Growth	-0.06%	-0.09%	-0.10%	-0.10%	-0.11%	-0.11%	-0.11%	-0.09%	-0.08%	-0.06%	-0.12%	(high) - (low)
Momentum	-0.24%	-0.26%	-0.27%	-0.26%	-0.27%	-0.27%	-0.27%	-0.27%	-0.26%	-0.23%	-0.47%	(high) - (low)
Quality	-0.04%	-0.05%	-0.05%	-0.06%	-0.06%	-0.06%	-0.05%	-0.05%	-0.04%	-0.02%	-0.06%	(high) - (low)

Table 8.6.1 - Europe Return Data Output (Panels G – I)

Panel G - Average Monthly Returns - Net of Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	0.22%	0.41%	0.55%	0.50%	0.63%	0.74%	0.67%	0.60%	1.13%	0.96%	0.62%	(low) - (high)
P/B	0.45%	0.58%	0.41%	0.41%	0.47%	0.54%	0.63%	0.68%	0.58%	0.80%	0.28%	(low) - (high)
Div Yield	0.35%	0.27%	0.24%	0.60%	0.54%	0.69%	0.60%	0.83%	0.98%	0.92%	0.49%	(high) - (low)
FCF Yield	0.31%	0.43%	0.30%	0.50%	0.71%	0.60%	0.84%	0.62%	0.95%	0.59%	0.22%	(high) - (low)
Asset Growth	0.88%	0.67%	0.62%	0.72%	0.44%	0.46%	0.39%	0.71%	0.41%	0.22%	-0.71%	(high) - (low)
EPS Growth	0.20%	0.48%	0.37%	0.40%	0.54%	0.53%	0.61%	0.43%	0.17%	0.26%	-0.08%	(high) - (low)
3M Change in Fwd EPS	-0.21%	0.07%	0.49%	0.20%	0.46%	0.57%	0.41%	0.48%	0.55%	0.63%	0.58%	(high) - (low)
1M Reversal	0.24%	0.39%	0.47%	0.56%	0.38%	0.31%	0.34%	0.49%	0.25%	0.02%	-0.77%	(high) - (low)
EPS Estimates Revisions	-0.03%	0.11%	0.22%	0.23%	0.15%	0.22%	0.38%	0.38%	0.49%	0.80%	0.34%	(high) - (low)
Market Beta	0.57%	0.80%	0.62%	0.69%	0.68%	0.62%	0.55%	0.57%	0.20%	0.35%	-0.34%	(high) - (low)
ROIC	0.04%	0.24%	0.52%	0.45%	0.69%	0.50%	0.68%	0.68%	0.69%	0.78%	0.67%	(high) - (low)
ROE	0.00%	0.33%	0.42%	0.71%	0.65%	0.36%	0.83%	0.53%	0.58%	0.80%	0.73%	(high) - (low)
Net Margin 5Y Stability	0.48%	0.65%	0.56%	0.53%	0.66%	0.59%	0.77%	0.40%	0.61%	0.55%	0.01%	(low) - (high)
Size	0.65%	0.67%	0.65%	0.59%	0.62%	0.54%	0.54%	0.46%	0.35%	0.09%	-0.57%	(low) - (high)
Value	0.29%	0.21%	0.53%	0.34%	0.36%	0.80%	0.69%	0.79%	0.91%	1.06%	0.68%	(high) - (low)
Growth	0.70%	0.65%	0.60%	0.72%	0.53%	0.32%	0.34%	0.64%	0.37%	0.27%	-0.55%	(high) - (low)
Momentum	-0.06%	0.04%	0.23%	0.54%	0.33%	0.53%	0.40%	0.58%	0.60%	0.62%	0.21%	(high) - (low)
Quality	0.45%	0.13%	0.56%	0.50%	0.60%	0.51%	0.47%	0.59%	0.60%	0.95%	0.43%	(high) - (low)

Panel H - Beta	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	1.00	0.89	0.79	0.85	0.89	0.85	0.91	1.00	1.04	1.13	0.13	(low) - (high)
P/B	0.87	0.83	0.85	0.87	0.95	0.98	0.99	1.04	1.18	1.21	0.34	(low) - (high)
Div Yield	0.96	1.00	1.01	0.94	0.92	0.86	0.86	0.86	0.84	0.97	0.01	(high) - (low)
FCF Yield	1.20	0.99	0.96	0.96	0.93	0.86	0.84	0.93	0.93	1.15	-0.05	(high) - (low)
Asset Growth	0.96	0.87	0.82	0.91	0.98	0.98	0.96	1.00	1.04	1.14	0.17	(high) - (low)
EPS Growth	1.25	0.90	0.84	0.81	0.87	0.88	0.92	1.05	1.19	1.34	0.09	(high) - (low)
3M Change in Fwd EPS	1.35	1.13	0.96	0.92	0.89	0.84	0.81	0.85	1.04	1.17	-0.18	(high) - (low)
1M Reversal	1.32	1.12	1.01	0.94	0.92	0.86	0.95	0.90	0.94	0.97	-0.34	(high) - (low)
EPS Estimates Revisions	1.04	0.98	0.96	1.05	1.23	0.79	0.56	0.84	0.90	0.87	-0.17	(high) - (low)
Market Beta	0.26	0.35	0.52	0.57	0.63	0.69	0.81	0.88	1.08	1.49	1.19	(high) - (low)
ROIC	1.24	1.21	1.15	1.04	0.98	0.92	0.86	0.87	0.78	0.89	-0.35	(high) - (low)
ROE	1.27	1.08	1.14	1.05	0.96	0.96	0.93	0.88	0.89	0.82	-0.45	(high) - (low)
Net Margin 5Y Stability	1.12	1.02	0.95	1.04	0.98	0.90	0.96	0.97	0.81	1.02	-0.10	(low) - (high)
Size	1.00	0.96	0.95	0.93	0.94	0.92	0.91	0.92	0.95	1.06	0.06	(low) - (high)
Value	0.85	0.98	0.94	0.90	1.00	0.88	1.01	0.95	0.96	1.14	0.29	(high) - (low)
Growth	0.98	0.86	0.87	0.86	0.91	0.97	0.97	1.04	1.09	1.21	0.23	(high) - (low)
Momentum	1.03	0.96	0.94	0.99	0.87	0.94	0.97	0.91	0.96	1.05	0.01	(high) - (low)
Quality	1.19	1.21	1.10	0.98	1.06	0.95	0.92	0.87	0.82	0.88	-0.30	(high) - (low)

Panel I - Beta-Adjusted Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	0.28%	0.56%	0.84%	0.74%	0.87%	1.04%	0.89%	0.74%	1.19%	0.91%	0.63%	(low) - (high)
P/B	0.55%	0.76%	0.58%	0.58%	0.61%	0.67%	0.74%	0.75%	0.56%	0.70%	0.15%	(low) - (high)
Div Yield	0.41%	0.35%	0.33%	0.76%	0.73%	0.94%	0.84%	1.10%	1.26%	1.01%	0.60%	(high) - (low)
FCF Yield	0.29%	0.47%	0.35%	0.56%	0.81%	0.77%	1.09%	0.74%	1.08%	0.54%	0.25%	(high) - (low)
Asset Growth	0.94%	0.81%	0.80%	0.83%	0.48%	0.50%	0.44%	0.74%	0.43%	0.22%	-0.73%	(high) - (low)
EPS Growth	0.21%	0.64%	0.59%	0.65%	0.78%	0.77%	0.80%	0.52%	0.23%	0.25%	0.03%	(high) - (low)
3M Change in Fwd EPS	-0.06%	0.22%	0.72%	0.43%	0.74%	0.93%	0.75%	0.79%	0.70%	0.65%	0.71%	(high) - (low)
1M Reversal	0.39%	0.60%	0.74%	0.88%	0.71%	0.67%	0.64%	0.84%	0.56%	0.31%	-0.09%	(high) - (low)
EPS Estimates Revisions	0.21%	0.37%	0.50%	0.44%	0.22%	0.33%	0.86%	0.69%	0.81%	1.20%	0.99%	(high) - (low)
Market Beta	2.44%	2.52%	1.44%	1.43%	1.27%	1.08%	0.82%	0.76%	0.26%	0.26%	-2.19%	(high) - (low)
ROIC	0.06%	0.23%	0.49%	0.48%	0.76%	0.59%	0.85%	0.82%	0.93%	0.90%	0.83%	(high) - (low)
ROE	0.03%	0.34%	0.41%	0.72%	0.73%	0.43%	0.95%	0.65%	0.70%	1.00%	0.97%	(high) - (low)
Net Margin 5Y Stability	0.46%	0.67%	0.63%	0.55%	0.73%	0.71%	0.86%	0.46%	0.80%	0.57%	0.11%	(low) - (high)
Size	0.66%	0.73%	0.72%	0.69%	0.72%	0.66%	0.67%	0.58%	0.44%	0.13%	-0.53%	(low) - (high)
Value	0.39%	0.31%	0.69%	0.54%	0.51%	1.08%	0.82%	0.96%	1.05%	0.98%	0.59%	(high) - (low)
Growth	0.77%	0.86%	0.80%	0.95%	0.70%	0.44%	0.46%	0.71%	0.41%	0.27%	-0.50%	(high) - (low)
Momentum	0.17%	0.32%	0.53%	0.81%	0.69%	0.85%	0.68%	0.93%	0.90%	0.81%	0.64%	(high) - (low)
Quality	0.41%	0.15%	0.56%	0.56%	0.62%	0.59%	0.56%	0.73%	0.78%	1.10%	0.69%	(high) - (low)

Figure 8.6.2 - Europe Return-Risk Scatterplot

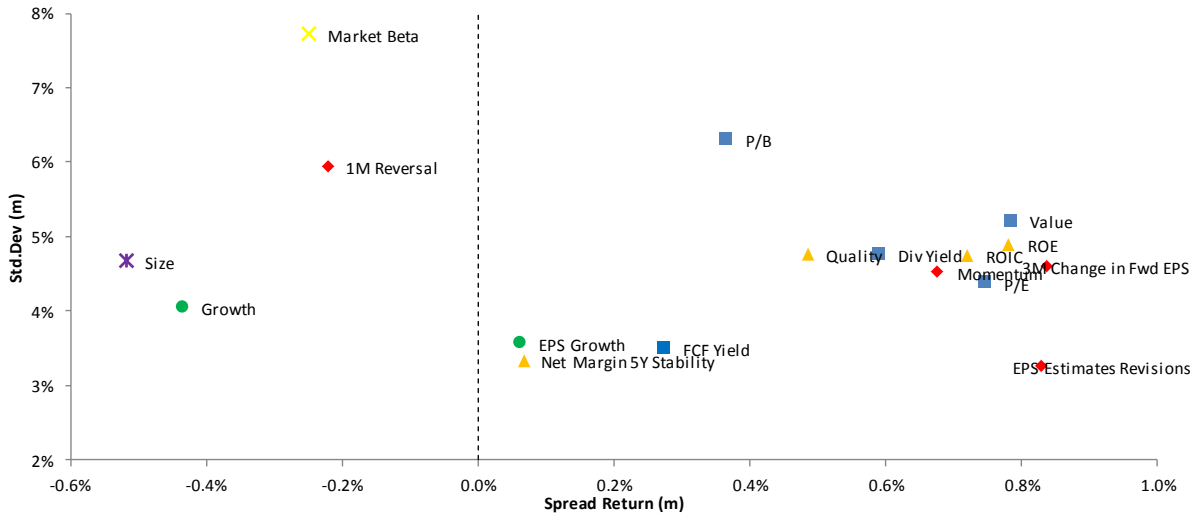


Table 8.6.3 - Europe Students T-test on long/short factor spreads

Students t-test	Average Monthly Return	Monthly Std.Dev	# of Obs	T-test statistic (H0: Spread = 0)	P-Value
P/E	0.8%	4.4%	277	2.94	0.00
P/B	0.4%	6.3%	277	1.02	0.31
Div Yield	0.6%	4.8%	277	2.16	0.03
FCF Yield	0.3%	3.5%	277	1.36	0.17
Asset Growth	-0.7%	3.8%	277	-3.24	0.00
EPS Growth	0.1%	3.6%	277	0.30	0.77
3M Change in Fwd EPS	0.8%	4.6%	277	3.02	0.00
1M Reversal	-0.2%	5.9%	277	-0.65	0.51
EPS Estimates Revisions	0.9%	3.3%	277	4.35	0.00
Market Beta	-0.3%	7.7%	277	-0.58	0.56
ROIC	0.7%	4.7%	277	2.55	0.01
ROE	0.8%	4.9%	277	2.68	0.01
Net Margin 5Y Stability	0.1%	3.3%	277	0.36	0.72
Size	-0.6%	4.7%	277	-1.99	0.05
Value	0.8%	5.2%	277	2.60	0.01
Growth	-0.5%	4.1%	277	-1.95	0.05
Momentum	0.7%	4.5%	277	2.54	0.01
Quality	0.5%	4.8%	277	1.80	0.07

Table 8.6.4 - Europe Factor Spread Correlations

Correlation Matrix	P/E	P/B	Div Yield	FCF Yield	Asset Growth	EPS Growth	3M Change in Fwd EPS	1M Reversal	EPS Estimates Revisions	Market Beta	ROIC	ROE	Net Margin 5Y Stability	Size	Value	Growth	Momentum	Quality
S&P Europe BMI	0.13	0.24	0.01	-0.07	0.20	0.11	-0.17	-0.26	-0.23	0.70	-0.33	-0.42	-0.13	0.06	0.25	0.26	0.01	-0.29
P/E	1.00	0.61	0.60	0.09	-0.03	-0.15	-0.44	-0.43	-0.32	0.10	-0.21	-0.20	-0.32	0.43	0.77	-0.24	0.01	-0.32
P/B		1.00	0.62	-0.05	-0.09	-0.24	-0.49	-0.40	-0.39	0.27	-0.52	-0.54	-0.43	0.51	0.78	-0.34	-0.07	-0.63
Div Yield			1.00	0.00	-0.16	-0.15	-0.44	-0.40	-0.29	0.04	-0.25	-0.22	-0.21	0.34	0.76	-0.35	0.11	-0.33
FCF Yield				1.00	-0.08	0.20	0.04	0.13	0.06	-0.05	0.25	0.29	-0.08	-0.29	0.19	0.00	0.00	0.19
Asset Growth					1.00	0.00	0.05	-0.13	-0.03	0.32	-0.01	-0.04	0.17	0.00	-0.08	0.69	0.10	0.15
EPS Growth						1.00	0.25	0.10	0.10	-0.01	0.29	0.30	0.16	-0.18	-0.06	0.41	0.21	0.27
3M Change in Fwd EPS							1.00	0.19	0.61	-0.24	0.28	0.32	0.24	-0.34	-0.45	0.25	0.48	0.33
1M Reversal								1.00	0.21	-0.21	0.22	0.22	0.20	-0.28	-0.44	0.01	-0.47	0.24
EPS Estimates Revisions									1.00	-0.35	0.22	0.28	0.18	-0.25	-0.41	0.09	0.42	0.28
Market Beta										1.00	-0.34	-0.43	-0.09	-0.02	0.21	0.22	-0.04	-0.24
ROIC											1.00	0.93	0.33	-0.34	-0.34	0.17	0.12	0.83
ROE												1.00	0.36	-0.38	-0.33	0.15	0.16	0.84
Net Margin 5Y Stability													1.00	-0.33	-0.40	0.24	0.08	0.57
Size														1.00	0.41	-0.14	-0.06	-0.44
Value															1.00	-0.25	0.03	-0.45
Growth																1.00	0.17	0.29
Momentum																	1.00	0.12
Quality																		1.00

Figure 8.6.5 - Europe Performance Index Graphs (Index Year 1990 = 100) (part 1 of 2)

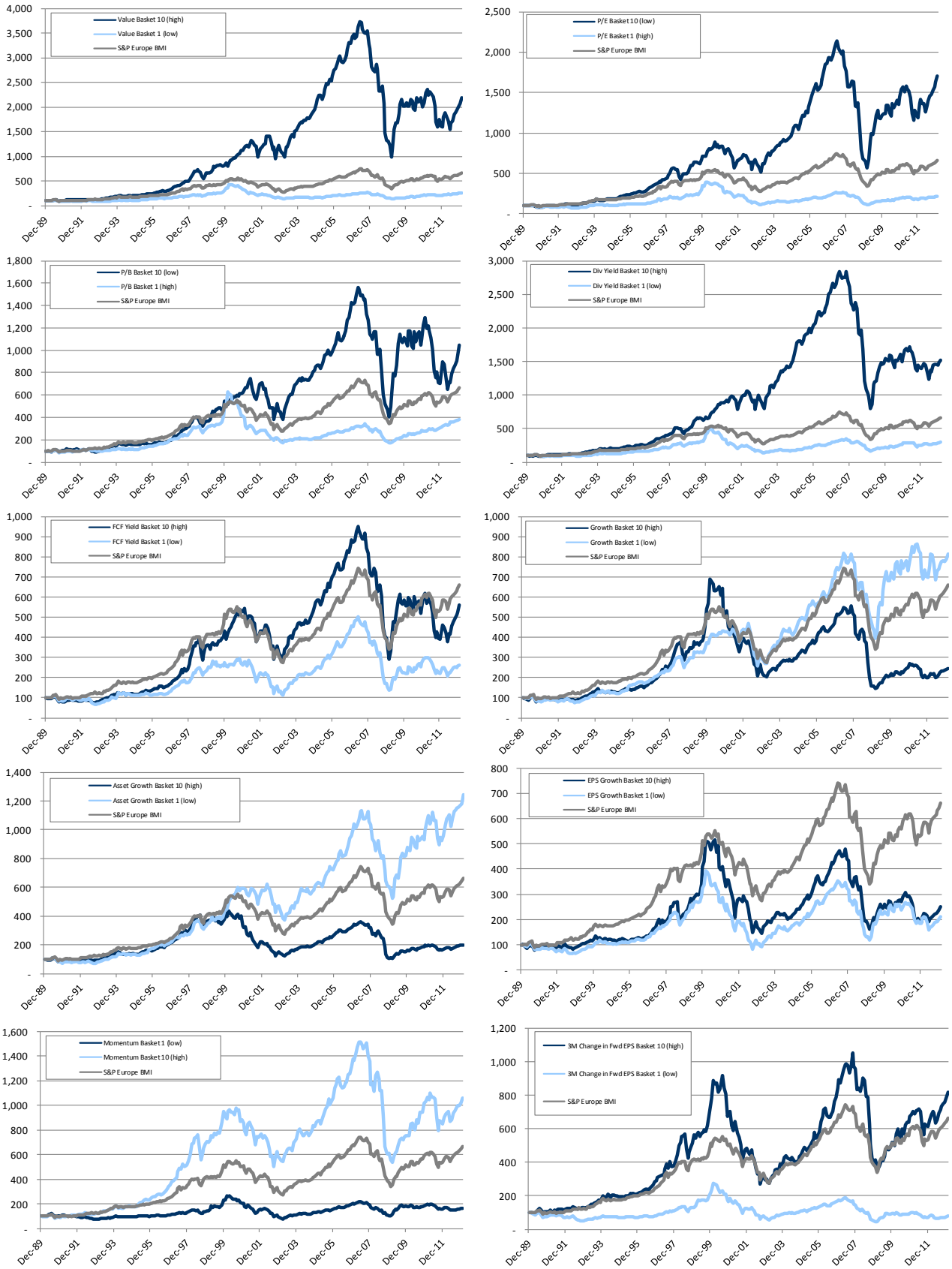


Figure 8.6.5 - Europe Performance Index Graphs Index Year 1990 = 100) (part 2 of 2)

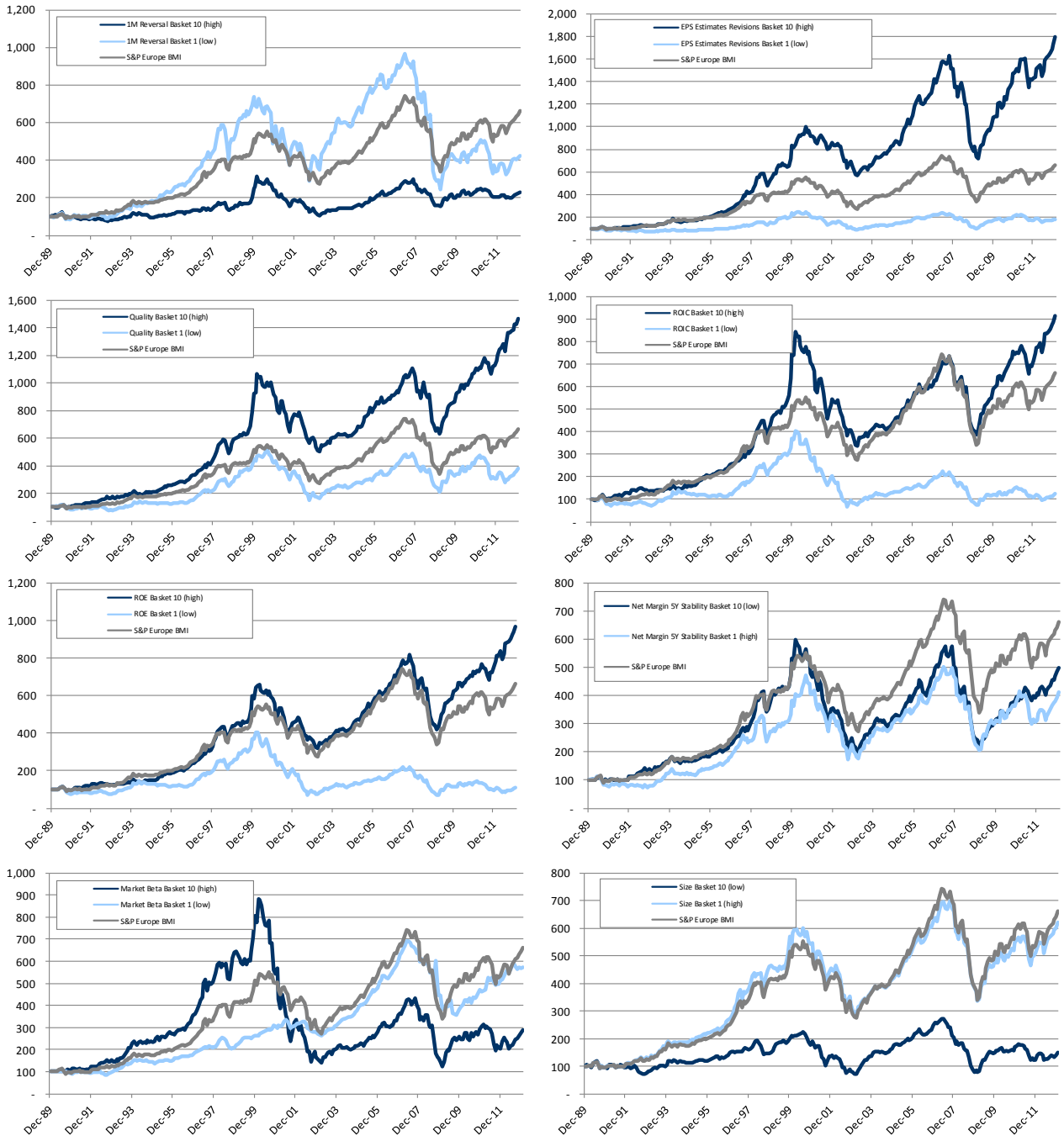
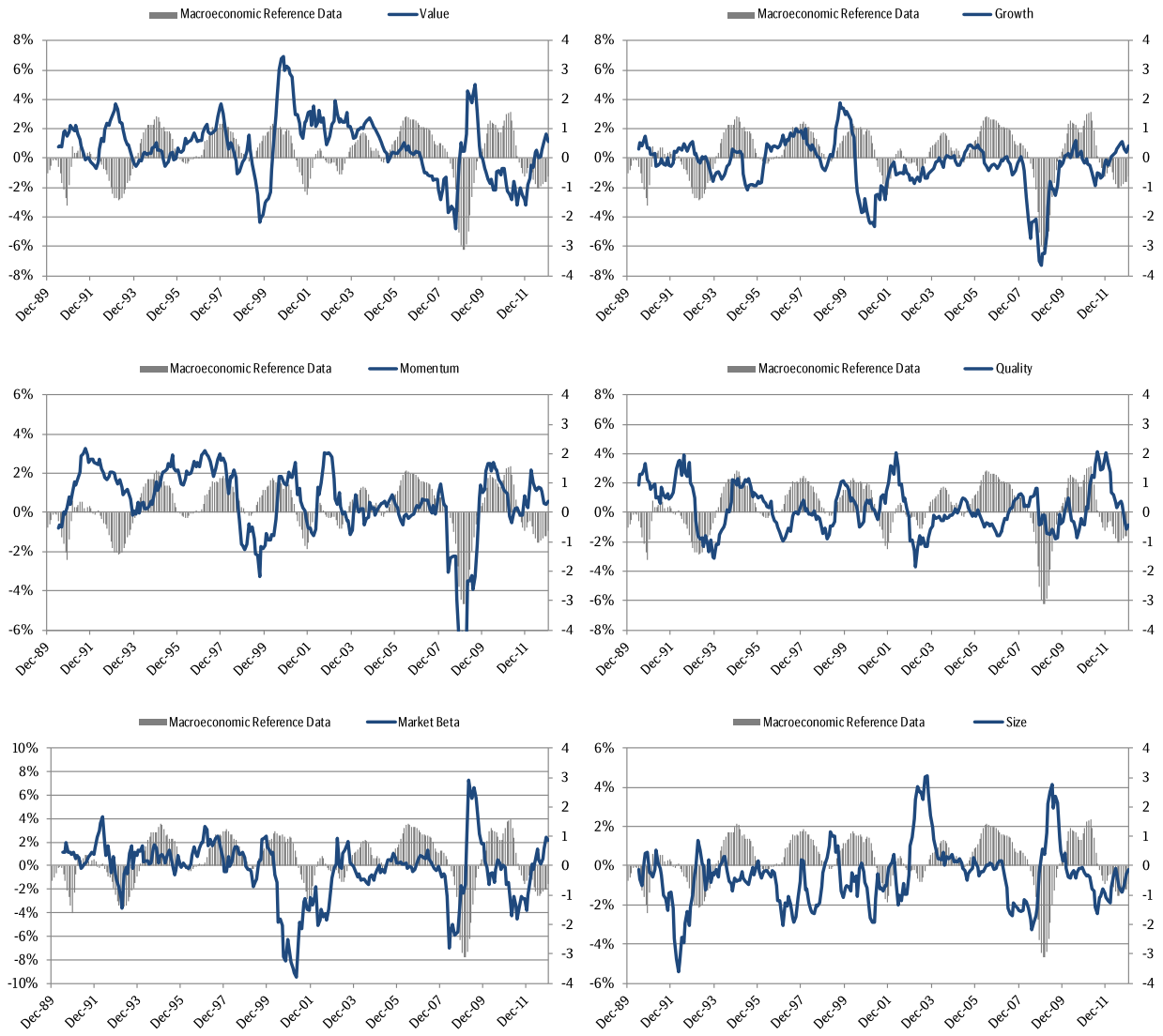


Figure 8.6.6 - Europe Historical Style Premiums



Left axis: 12MA Monthly compounded factor spreads, Right axis: Standardized macroeconomic reference index level

Figure 8.6.7 - Europe Factor Premiums and P-values During the Economic Cycle

Factor Premium and P-Values	Recession		Recovery		Boom		Slowdown	
P/E	-0.23%	*0.70*	2.43%	*0.00*	0.73%	*0.12*	0.37%	*0.38*
P/B	-1.16%	*0.23*	3.79%	*0.00*	-0.16%	*0.77*	0.27%	*0.66*
Div Yield	0.41%	*0.61*	1.41%	*0.05*	0.10%	*0.82*	0.84%	*0.08*
FCF Yield	0.43%	*0.41*	0.25%	*0.66*	0.22%	*0.53*	0.32%	*0.38*
Asset Growth	-1.25%	*0.09*	-0.54%	*0.27*	-0.75%	*0.04*	-0.40%	*0.26*
EPS Growth	0.37%	*0.55*	-0.94%	*0.07*	0.44%	*0.21*	-0.15%	*0.65*
3M Change in Fwd EPS	1.66%	*0.02*	-1.45%	*0.12*	1.34%	*0.00*	1.05%	*0.02*
1M Reversal	0.62%	*0.56*	-1.55%	*0.03*	0.31%	*0.61*	-0.65%	*0.25*
EPS Estimates Revisions	1.48%	*0.01*	-0.19%	*0.74*	0.92%	*0.00*	0.98%	*0.00*
Market Beta	-1.95%	*0.20*	-1.95%	*0.12*	-0.25%	*0.67*	-0.46%	*0.54*
ROIC	1.22%	*0.10*	-1.01%	*0.20*	0.59%	*0.21*	1.35%	*0.00*
ROE	1.31%	*0.10*	-1.28%	*0.15*	0.76%	*0.10*	1.46%	*0.00*
Net Margin 5Y Stability	0.53%	*0.29*	-0.91%	*0.14*	0.01%	*0.96*	0.39%	*0.29*
Size	-1.25%	*0.13*	-1.25%	*0.12*	-0.59%	*0.15*	-0.90%	*0.03*
Value	-0.27%	*0.75*	3.31%	*0.00*	0.31%	*0.48*	0.74%	*0.17*
Growth	-1.20%	*0.09*	-1.38%	*0.01*	0.51%	*0.24*	-0.59%	*0.11*
Momentum	0.46%	*0.57*	-0.91%	*0.24*	0.92%	*0.02*	1.47%	*0.00*
Quality	1.80%	*0.03*	-1.50%	*0.08*	0.24%	*0.56*	0.87%	*0.04*
Avg. Return of the S&P Europe BMI	-0.83%		2.04%		1.36%		0.32%	
# of Months	56		46		88		79	

Figure 8.6.8 - Europe Transition Matrixes

Asset Growth 1 (high)	Asset Growth 2	Asset Growth 3	Asset Growth 4	Asset Growth 5	Asset Growth 6	Asset Growth 7	Asset Growth 8	Asset Growth 9	Asset Growth 10 (low)
93%	2%	1%	0%	0%	0%	0%	0%	0%	0%
3%	91%	3%	1%	1%	0%	0%	0%	0%	0%
1%	3%	89%	3%	1%	1%	0%	0%	0%	0%
1%	1%	3%	89%	3%	1%	0%	0%	0%	0%
0%	1%	1%	3%	89%	3%	1%	1%	0%	0%
0%	0%	1%	1%	3%	89%	1%	1%	0%	0%
0%	0%	0%	1%	1%	4%	3%	3%	1%	0%
0%	0%	0%	0%	1%	1%	89%	89%	3%	1%
0%	0%	0%	0%	0%	1%	3%	3%	90%	2%
0%	0%	0%	0%	0%	0%	1%	1%	3%	93%

1M Reversal 1 (high)	1M Reversal 2	1M Reversal 3	1M Reversal 4	1M Reversal 5	1M Reversal 6	1M Reversal 7	1M Reversal 8	1M Reversal 9	1M Reversal 10 (low)
17%	10%	9%	8%	7%	7%	8%	8%	10%	15%
11%	10%	10%	9%	9%	9%	10%	10%	10%	11%
9%	10%	10%	10%	10%	10%	10%	10%	10%	10%
8%	10%	10%	11%	10%	10%	10%	10%	10%	9%
8%	9%	10%	10%	11%	11%	10%	10%	10%	8%
8%	10%	10%	10%	11%	11%	10%	10%	10%	8%
8%	9%	10%	11%	11%	11%	10%	10%	10%	8%
8%	10%	10%	10%	11%	11%	10%	10%	10%	8%
9%	10%	10%	10%	10%	10%	10%	10%	10%	9%
13%	11%	10%	9%	9%	9%	9%	9%	9%	12%

ROE 1 (low)	ROE 2	ROE 3	ROE 4	ROE 5	ROE 6	ROE 7	ROE 8	ROE 9	ROE 10 (high)
92%	3%	1%	0%	0%	0%	0%	0%	0%	0%
3%	89%	4%	1%	0%	0%	0%	0%	0%	0%
1%	4%	87%	5%	1%	0%	0%	0%	0%	0%
0%	1%	5%	86%	5%	1%	0%	0%	0%	0%
0%	1%	1%	5%	86%	5%	1%	0%	0%	0%
0%	0%	1%	1%	5%	86%	5%	1%	0%	0%
0%	0%	0%	1%	1%	5%	87%	4%	1%	0%
0%	0%	0%	0%	1%	1%	5%	88%	4%	0%
0%	0%	0%	0%	0%	0%	1%	4%	90%	3%
0%	0%	0%	0%	0%	0%	0%	1%	3%	94%

Growth 1 (high)	Growth 2	Growth 3	Growth 4	Growth 5	Growth 6	Growth 7	Growth 8	Growth 9	Growth 10 (low)
83%	8%	2%	1%	1%	0%	1%	1%	1%	2%
9%	73%	11%	2%	1%	1%	0%	0%	0%	0%
2%	11%	67%	13%	3%	1%	1%	1%	0%	0%
1%	3%	12%	64%	13%	3%	1%	1%	1%	0%
1%	2%	3%	13%	63%	13%	1%	1%	1%	0%
1%	1%	2%	3%	14%	62%	3%	3%	1%	1%
1%	1%	1%	1%	3%	14%	12%	12%	2%	1%
1%	1%	1%	1%	2%	3%	66%	66%	11%	2%
1%	0%	0%	1%	1%	1%	13%	13%	71%	9%
1%	0%	0%	0%	0%	1%	2%	2%	10%	83%

Momentum 1 (low)	Momentum 2	Momentum 3	Momentum 4	Momentum 5	Momentum 6	Momentum 7	Momentum 8	Momentum 9	Momentum 10 (high)
25%	17%	12%	10%	8%	7%	6%	5%	5%	5%
16%	14%	12%	11%	9%	9%	8%	8%	7%	5%
12%	12%	12%	11%	11%	10%	10%	9%	8%	6%
9%	10%	11%	12%	11%	11%	10%	9%	8%	6%
8%	9%	10%	11%	12%	12%	11%	10%	9%	7%
7%	9%	10%	11%	12%	12%	11%	10%	9%	8%
6%	8%	9%	10%	11%	12%	12%	11%	11%	9%
6%	8%	9%	10%	10%	10%	11%	12%	12%	12%
6%	7%	8%	8%	9%	9%	11%	12%	14%	16%
5%	5%	5%	6%	6%	7%	9%	12%	16%	26%

Quality 1 (low)	Quality 2	Quality 3	Quality 4	Quality 5	Quality 6	Quality 7	Quality 8	Quality 9	Quality 10 (high)
91%	4%	1%	1%	1%	0%	0%	0%	0%	0%
5%	87%	5%	1%	0%	0%	0%	0%	0%	0%
1%	5%	85%	6%	1%	1%	0%	0%	0%	0%
1%	1%	6%	84%	6%	1%	1%	0%	0%	0%
0%	1%	1%	6%	84%	6%	1%	0%	0%	0%
0%	0%	1%	1%	6%	84%	6%	1%	0%	0%
0%	0%	0%	1%	1%	6%	85%	6%	1%	0%
0%	0%	0%	0%	0%	1%	5%	86%	5%	0%
0%	0%	0%	0%	0%	0%	1%	4%	89%	3%
0%	0%	0%	0%	0%	0%	0%	1%	3%	94%

8.7 Japan Data Output

Table 8.7.1 - Japan Return Data Output (Panels A – C)

Index	CAGR	Volatility	IR	Max DD
S&P Japan BMI	-0.26%	5.70%	-0.05	-66.3%

Panel A - Average Monthly Factor Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.38%	-0.45%	-0.32%	-0.35%	-0.06%	-0.12%	0.02%	0.10%	0.23%	0.25%	0.63%	(low) - (high)
P/B	-0.78%	-0.59%	-0.49%	-0.32%	0.01%	0.13%	0.03%	0.29%	0.41%	0.61%	1.39%	(low) - (high)
Div Yield	-0.78%	-0.52%	-0.44%	-0.09%	-0.29%	-0.04%	-0.07%	0.02%	0.23%	0.34%	1.12%	(high) - (low)
FCF Yield	-0.09%	-0.14%	-0.33%	-0.41%	-0.34%	-0.20%	-0.03%	-0.06%	-0.06%	-0.08%	0.01%	(high) - (low)
Asset Growth	-0.43%	-0.23%	-0.21%	-0.28%	-0.45%	-0.28%	-0.28%	-0.21%	-0.24%	-0.54%	-0.12%	(high) - (low)
EPS Growth	-0.37%	0.07%	-0.03%	-0.25%	-0.01%	-0.48%	-0.28%	-0.16%	-0.46%	-0.37%	0.00%	(high) - (low)
3M Change in Fwd EPS	-0.47%	-0.19%	-0.24%	-0.25%	-0.29%	-0.07%	-0.22%	-0.34%	-0.41%	-0.12%	0.35%	(high) - (low)
1M Reversal	0.54%	-0.07%	-0.07%	-0.14%	-0.02%	-0.23%	-0.47%	-0.41%	-0.52%	-0.89%	-1.43%	(high) - (low)
EPS Estimates Revisions	-0.37%	0.04%	-0.27%	-0.09%	-0.12%	-0.08%	0.13%	-0.13%	-0.11%	-0.11%	0.26%	(high) - (low)
Market Beta	-0.22%	0.03%	0.11%	0.08%	0.07%	0.05%	-0.04%	0.10%	-0.25%	-0.36%	-0.14%	(high) - (low)
ROIC	-0.30%	-0.36%	-0.36%	-0.20%	-0.45%	-0.18%	-0.17%	-0.24%	-0.25%	-0.27%	0.03%	(high) - (low)
ROE	-0.28%	-0.42%	-0.41%	-0.29%	-0.14%	-0.29%	-0.12%	-0.23%	-0.42%	-0.28%	0.00%	(high) - (low)
Net Margin 5Y Stability	-0.57%	-0.36%	-0.47%	-0.26%	-0.30%	-0.09%	-0.15%	-0.25%	-0.14%	-0.27%	0.30%	(low) - (high)
Size	-0.27%	-0.29%	-0.21%	-0.22%	-0.35%	-0.31%	-0.30%	-0.08%	-0.13%	0.04%	0.32%	(low) - (high)
Value	-0.63%	-0.68%	-0.52%	-0.39%	-0.11%	-0.13%	0.04%	0.28%	0.30%	0.56%	1.19%	(high) - (low)
Growth	-0.23%	0.03%	-0.38%	-0.24%	-0.26%	-0.23%	-0.26%	-0.34%	-0.40%	-0.43%	-0.21%	(high) - (low)
Momentum	-0.70%	-0.44%	-0.48%	-0.26%	-0.18%	-0.22%	-0.28%	-0.08%	-0.08%	0.07%	0.77%	(high) - (low)
Quality	-0.39%	-0.44%	-0.30%	-0.36%	-0.18%	-0.17%	-0.29%	-0.09%	-0.25%	-0.23%	0.16%	(high) - (low)

Panel B - Monthly Standard Deviations	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	6.58%	5.86%	5.36%	5.66%	5.73%	5.64%	5.50%	5.88%	6.53%	6.83%	5.20%	(low) - (high)
P/B	6.48%	6.14%	5.77%	5.94%	5.95%	5.98%	6.23%	6.71%	7.07%	8.27%	7.36%	(low) - (high)
Div Yield	6.85%	5.80%	5.75%	5.93%	6.03%	5.82%	6.10%	6.13%	6.14%	6.49%	6.60%	(high) - (low)
FCF Yield	7.04%	6.81%	6.29%	5.99%	5.93%	6.19%	5.81%	5.70%	5.71%	7.09%	4.57%	(high) - (low)
Asset Growth	7.36%	6.66%	5.99%	5.76%	5.70%	5.50%	5.66%	5.63%	6.24%	7.10%	5.25%	(high) - (low)
EPS Growth	7.81%	6.84%	6.15%	5.34%	5.76%	5.75%	5.64%	6.23%	6.44%	7.35%	4.31%	(high) - (low)
3M Change in Fwd EPS	7.68%	6.98%	6.18%	5.88%	5.76%	5.89%	5.94%	6.12%	6.75%	7.36%	5.24%	(high) - (low)
1M Reversal	8.24%	7.21%	6.71%	6.20%	6.16%	5.92%	5.75%	6.14%	5.86%	7.04%	7.28%	(high) - (low)
EPS Estimates Revisions	6.89%	6.34%	6.68%	6.83%	6.28%	5.27%	5.66%	5.76%	5.80%	6.19%	4.19%	(high) - (low)
Market Beta	3.51%	4.02%	4.30%	4.77%	5.35%	5.56%	5.95%	6.53%	7.31%	9.20%	8.35%	(high) - (low)
ROIC	8.39%	6.90%	6.33%	5.93%	5.88%	5.57%	5.39%	5.63%	5.67%	6.27%	6.00%	(high) - (low)
ROE	8.36%	6.92%	6.12%	6.00%	5.70%	5.63%	5.21%	5.52%	5.46%	6.68%	5.79%	(high) - (low)
Net Margin 5Y Stability	7.68%	7.18%	6.86%	6.79%	5.93%	5.58%	5.08%	5.11%	5.41%	6.70%	3.62%	(low) - (high)
Size	5.82%	5.73%	5.97%	6.03%	6.22%	6.35%	6.76%	7.46%	7.40%	8.58%	6.29%	(low) - (high)
Value	6.55%	6.15%	6.06%	5.99%	5.98%	6.25%	6.10%	6.39%	6.59%	7.20%	6.67%	(high) - (low)
Growth	7.55%	6.62%	5.98%	5.37%	5.54%	5.63%	5.79%	5.72%	6.07%	7.06%	4.99%	(high) - (low)
Momentum	6.54%	6.28%	5.66%	5.97%	5.77%	6.01%	5.70%	6.34%	6.62%	6.86%	5.15%	(high) - (low)
Quality	7.74%	6.97%	6.84%	6.43%	5.90%	5.45%	5.25%	5.59%	5.46%	5.96%	5.19%	(high) - (low)

Panel C - Risk / Reward Ratio	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.06	-0.08	-0.06	-0.06	-0.01	-0.02	0.00	0.02	0.03	0.04	0.12	(low) - (high)
P/B	-0.12	-0.10	-0.09	-0.05	0.00	0.02	0.01	0.04	0.06	0.07	0.19	(low) - (high)
Div Yield	-0.11	-0.09	-0.08	-0.02	-0.05	-0.01	-0.01	0.00	0.04	0.05	0.17	(high) - (low)
FCF Yield	-0.01	-0.02	-0.05	-0.07	-0.06	-0.03	-0.01	-0.01	-0.01	-0.01	0.00	(high) - (low)
Asset Growth	-0.06	-0.03	-0.03	-0.05	-0.08	-0.05	-0.05	-0.04	-0.04	-0.08	-0.02	(high) - (low)
EPS Growth	-0.05	0.01	-0.01	-0.05	0.00	-0.08	-0.05	-0.03	-0.07	-0.05	0.00	(high) - (low)
3M Change in Fwd EPS	-0.06	-0.03	-0.04	-0.04	-0.05	-0.01	-0.04	-0.06	-0.06	-0.02	0.07	(high) - (low)
1M Reversal	0.07	-0.01	-0.01	-0.02	0.00	-0.04	-0.08	-0.07	-0.09	-0.13	-0.20	(high) - (low)
EPS Estimates Revisions	-0.05	0.01	-0.04	-0.01	-0.02	-0.01	0.02	-0.02	-0.02	-0.02	0.06	(high) - (low)
Market Beta	-0.06	0.01	0.03	0.02	0.01	0.01	-0.01	0.02	-0.03	-0.04	-0.02	(high) - (low)
ROIC	-0.04	-0.05	-0.06	-0.03	-0.08	-0.03	-0.03	-0.04	-0.04	-0.04	0.00	(high) - (low)
ROE	-0.03	-0.06	-0.07	-0.05	-0.02	-0.05	-0.02	-0.04	-0.08	-0.04	0.00	(high) - (low)
Net Margin 5Y Stability	-0.07	-0.05	-0.07	-0.04	-0.05	-0.02	-0.03	-0.05	-0.03	-0.04	0.08	(low) - (high)
Size	-0.05	-0.05	-0.03	-0.04	-0.06	-0.05	-0.04	-0.01	-0.02	0.01	0.05	(low) - (high)
Value	-0.10	-0.11	-0.09	-0.07	-0.02	-0.02	0.01	0.04	0.05	0.08	0.18	(high) - (low)
Growth	-0.03	0.00	-0.06	-0.05	-0.05	-0.04	-0.05	-0.06	-0.07	-0.06	-0.04	(high) - (low)
Momentum	-0.11	-0.07	-0.08	-0.04	-0.03	-0.04	-0.05	-0.01	-0.01	0.01	0.15	(high) - (low)
Quality	-0.05	-0.06	-0.04	-0.06	-0.03	-0.03	-0.06	-0.02	-0.05	-0.04	0.03	(high) - (low)

Table 8.7.1 - Japan Return Data Output (Panels D – F)

Panel D - Max Drawdown	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-76.5%	-77.7%	-70.3%	-72.9%	-57.9%	-58.3%	-52.7%	-61.7%	-62.9%	-63.6%	-68.1%	(low) - (high)
P/B	-91.1%	-86.0%	-80.1%	-72.1%	-57.3%	-56.3%	-52.0%	-55.3%	-52.3%	-64.7%	-74.1%	(low) - (high)
Div Yield	-91.3%	-82.3%	-79.6%	-60.9%	-63.7%	-59.0%	-64.0%	-55.8%	-54.0%	-62.3%	-73.6%	(high) - (low)
FCF Yield	-73.1%	-66.7%	-71.1%	-76.5%	-69.3%	-70.1%	-56.6%	-54.4%	-61.9%	-67.7%	-65.8%	(high) - (low)
Asset Growth	-79.9%	-77.1%	-71.9%	-75.3%	-78.9%	-67.9%	-66.7%	-61.4%	-65.9%	-84.9%	-79.0%	(high) - (low)
EPS Growth	-77.7%	-59.6%	-58.3%	-74.4%	-56.3%	-79.6%	-67.3%	-66.9%	-79.9%	-77.8%	-58.9%	(high) - (low)
3M Change in Fwd EPS	-85.8%	-67.0%	-71.0%	-69.1%	-73.9%	-60.5%	-60.4%	-69.7%	-78.9%	-65.0%	-55.6%	(high) - (low)
1M Reversal	-60.3%	-62.0%	-61.6%	-58.2%	-63.1%	-66.7%	-81.1%	-77.6%	-83.9%	-94.1%	-99.5%	(high) - (low)
EPS Estimates Revisions	-73.5%	-57.0%	-66.9%	-63.2%	-43.1%	-29.8%	-24.5%	-53.7%	-60.4%	-60.1%	-38.9%	(high) - (low)
Market Beta	-64.6%	-52.6%	-40.8%	-47.5%	-61.8%	-56.5%	-67.3%	-63.3%	-76.4%	-82.9%	-86.5%	(high) - (low)
ROIC	-81.1%	-80.8%	-74.8%	-67.4%	-81.6%	-58.4%	-66.2%	-61.9%	-65.8%	-75.4%	-84.7%	(high) - (low)
ROE	-78.5%	-83.5%	-77.2%	-71.8%	-62.6%	-72.8%	-54.7%	-64.7%	-78.1%	-73.7%	-79.0%	(high) - (low)
Net Margin 5Y Stability	-84.7%	-74.6%	-80.0%	-69.8%	-67.6%	-53.5%	-57.3%	-66.5%	-64.0%	-79.4%	-39.4%	(low) - (high)
Size	-65.2%	-69.6%	-65.3%	-70.7%	-76.8%	-74.4%	-77.7%	-71.8%	-68.2%	-72.8%	-65.5%	(low) - (high)
Value	-87.2%	-88.6%	-82.8%	-74.8%	-60.1%	-69.6%	-54.7%	-51.0%	-50.2%	-57.7%	-63.5%	(high) - (low)
Growth	-79.1%	-63.4%	-75.1%	-66.2%	-71.5%	-65.0%	-65.9%	-72.7%	-76.5%	-80.7%	-83.6%	(high) - (low)
Momentum	-89.3%	-79.2%	-83.6%	-64.0%	-69.0%	-61.7%	-64.7%	-58.9%	-56.9%	-55.1%	-36.5%	(high) - (low)
Quality	-78.2%	-80.0%	-76.3%	-77.9%	-65.2%	-60.3%	-72.6%	-61.0%	-64.3%	-72.9%	-73.3%	(high) - (low)

Panel E - Monthly Turnover	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	27.9%	37.4%	43.4%	47.5%	50.7%	50.5%	48.0%	43.0%	37.4%	22.0%	49.9%	(low) - (high)
P/B	12.0%	23.3%	33.9%	40.5%	45.6%	47.6%	47.4%	43.9%	36.6%	19.6%	31.6%	(low) - (high)
Div Yield	12.7%	28.0%	39.8%	44.6%	47.9%	50.0%	48.7%	45.8%	37.9%	16.1%	28.8%	(high) - (low)
FCF Yield	11.7%	18.0%	17.7%	19.5%	19.3%	21.4%	24.6%	26.5%	23.4%	12.3%	24.0%	(high) - (low)
Asset Growth	8.0%	9.8%	10.9%	11.6%	12.2%	12.6%	11.7%	10.8%	10.6%	7.0%	15.0%	(high) - (low)
EPS Growth	28.5%	37.6%	44.6%	50.7%	52.0%	53.0%	52.1%	49.2%	42.9%	29.3%	57.8%	(high) - (low)
3M Change in Fwd EPS	49.0%	63.4%	68.6%	72.2%	74.6%	73.8%	72.0%	67.5%	62.3%	44.3%	93.3%	(high) - (low)
1M Reversal	92.7%	91.9%	92.7%	91.6%	91.4%	90.8%	90.8%	90.6%	91.3%	90.7%	183.5%	(high) - (low)
EPS Estimates Revisions	86.9%	86.5%	85.2%	86.9%	89.9%	85.0%	80.7%	76.5%	74.6%	84.0%	170.8%	(high) - (low)
Market Beta	15.1%	26.5%	35.9%	41.3%	42.9%	42.4%	41.2%	36.5%	28.6%	14.8%	29.9%	(high) - (low)
ROIC	10.3%	13.1%	15.5%	15.5%	16.7%	17.2%	16.0%	14.0%	11.4%	6.3%	16.7%	(high) - (low)
ROE	10.6%	13.9%	16.1%	16.8%	17.7%	17.1%	16.1%	14.2%	11.7%	7.1%	17.8%	(high) - (low)
Net Margin 5Y Stability	9.3%	11.7%	13.3%	13.5%	15.3%	15.7%	14.9%	13.1%	9.8%	9.1%	18.4%	(low) - (high)
Size	1.5%	9.1%	14.4%	18.1%	21.2%	24.6%	26.6%	26.9%	24.0%	15.8%	17.3%	(low) - (high)
Value	15.8%	37.8%	47.3%	54.0%	55.3%	57.0%	54.9%	52.9%	44.8%	23.6%	39.4%	(high) - (low)
Growth	23.4%	31.0%	38.8%	42.8%	43.4%	43.3%	44.4%	40.2%	34.3%	20.5%	43.9%	(high) - (low)
Momentum	77.4%	88.4%	90.4%	91.5%	91.5%	91.0%	92.2%	91.2%	88.2%	76.6%	154.0%	(high) - (low)
Quality	10.5%	15.5%	18.4%	19.6%	19.8%	19.1%	18.9%	16.1%	11.9%	7.3%	17.8%	(high) - (low)

Panel F - Monthly Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.08%	-0.11%	-0.13%	-0.14%	-0.15%	-0.15%	-0.14%	-0.13%	-0.11%	-0.07%	-0.15%	(low) - (high)
P/B	-0.04%	-0.07%	-0.10%	-0.12%	-0.14%	-0.14%	-0.14%	-0.13%	-0.11%	-0.06%	-0.09%	(low) - (high)
Div Yield	-0.04%	-0.08%	-0.12%	-0.13%	-0.14%	-0.15%	-0.15%	-0.14%	-0.11%	-0.05%	-0.09%	(high) - (low)
FCF Yield	-0.03%	-0.05%	-0.05%	-0.06%	-0.06%	-0.06%	-0.07%	-0.08%	-0.07%	-0.04%	-0.07%	(high) - (low)
Asset Growth	-0.02%	-0.03%	-0.03%	-0.03%	-0.04%	-0.04%	-0.03%	-0.03%	-0.03%	-0.02%	-0.04%	(high) - (low)
EPS Growth	-0.09%	-0.11%	-0.13%	-0.15%	-0.16%	-0.16%	-0.16%	-0.15%	-0.13%	-0.09%	-0.17%	(high) - (low)
3M Change in Fwd EPS	-0.15%	-0.19%	-0.21%	-0.22%	-0.22%	-0.22%	-0.22%	-0.20%	-0.19%	-0.13%	-0.28%	(high) - (low)
1M Reversal	-0.28%	-0.28%	-0.28%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.55%	(high) - (low)
EPS Estimates Revisions	-0.26%	-0.24%	-0.15%	-0.08%	-0.03%	-0.01%	-0.01%	-0.06%	-0.19%	-0.25%	-0.51%	(high) - (low)
Market Beta	-0.04%	-0.08%	-0.10%	-0.12%	-0.12%	-0.12%	-0.12%	-0.11%	-0.08%	-0.04%	-0.09%	(high) - (low)
ROIC	-0.03%	-0.04%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.03%	-0.02%	-0.05%	(high) - (low)
ROE	-0.03%	-0.04%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.04%	-0.04%	-0.02%	-0.05%	(high) - (low)
Net Margin 5Y Stability	-0.03%	-0.03%	-0.04%	-0.04%	-0.05%	-0.05%	-0.04%	-0.04%	-0.03%	-0.03%	-0.05%	(low) - (high)
Size	0.00%	-0.03%	-0.04%	-0.05%	-0.06%	-0.07%	-0.08%	-0.08%	-0.07%	-0.05%	-0.05%	(low) - (high)
Value	-0.05%	-0.11%	-0.14%	-0.16%	-0.17%	-0.17%	-0.16%	-0.16%	-0.13%	-0.07%	-0.12%	(high) - (low)
Growth	-0.07%	-0.09%	-0.12%	-0.13%	-0.13%	-0.13%	-0.13%	-0.12%	-0.10%	-0.06%	-0.13%	(high) - (low)
Momentum	-0.23%	-0.26%	-0.27%	-0.27%	-0.27%	-0.27%	-0.28%	-0.27%	-0.26%	-0.23%	-0.46%	(high) - (low)
Quality	-0.03%	-0.05%	-0.05%	-0.06%	-0.06%	-0.06%	-0.06%	-0.05%	-0.04%	-0.02%	-0.05%	(high) - (low)

Table 8.7.1 - Japan Return Data Output (Panels G – I)

Panel G - Average Monthly Returns - Net of Transaction Costs	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.46%	-0.56%	-0.45%	-0.49%	-0.21%	-0.28%	-0.12%	-0.03%	0.11%	0.19%	0.49%	(low) - (high)
P/B	-0.81%	-0.66%	-0.59%	-0.44%	-0.13%	-0.01%	-0.11%	0.16%	0.30%	0.55%	1.29%	(low) - (high)
Div Yield	-0.82%	-0.60%	-0.56%	-0.23%	-0.43%	-0.19%	-0.22%	-0.12%	0.11%	0.29%	1.03%	(high) - (low)
FCF Yield	-0.12%	-0.20%	-0.38%	-0.47%	-0.39%	-0.27%	-0.10%	-0.14%	-0.13%	-0.11%	-0.06%	(high) - (low)
Asset Growth	-0.45%	-0.26%	-0.24%	-0.32%	-0.49%	-0.32%	-0.31%	-0.24%	-0.27%	-0.57%	-0.16%	(high) - (low)
EPS Growth	-0.45%	-0.04%	-0.17%	-0.40%	-0.16%	-0.63%	-0.43%	-0.31%	-0.59%	-0.45%	-0.17%	(high) - (low)
3M Change in Fwd EPS	-0.62%	-0.38%	-0.45%	-0.46%	-0.52%	-0.29%	-0.44%	-0.54%	-0.60%	-0.25%	0.07%	(high) - (low)
1M Reversal	0.26%	-0.35%	-0.34%	-0.41%	-0.30%	-0.50%	-0.75%	-0.68%	-0.80%	-1.17%	-1.98%	(high) - (low)
EPS Estimates Revisions	-0.63%	-0.20%	-0.42%	-0.17%	-0.14%	-0.09%	0.13%	-0.19%	-0.30%	-0.36%	-0.25%	(high) - (low)
Market Beta	-0.27%	-0.05%	0.01%	-0.04%	-0.05%	-0.08%	-0.16%	0.00%	-0.33%	-0.40%	-0.22%	(high) - (low)
ROIC	-0.33%	-0.40%	-0.40%	-0.25%	-0.50%	-0.23%	-0.22%	-0.28%	-0.28%	-0.29%	-0.02%	(high) - (low)
ROE	-0.31%	-0.46%	-0.46%	-0.34%	-0.19%	-0.35%	-0.17%	-0.27%	-0.45%	-0.30%	-0.05%	(high) - (low)
Net Margin 5Y Stability	-0.60%	-0.40%	-0.51%	-0.30%	-0.34%	-0.14%	-0.20%	-0.29%	-0.17%	-0.30%	0.24%	(low) - (high)
Size	-0.28%	-0.32%	-0.25%	-0.28%	-0.42%	-0.39%	-0.38%	-0.16%	-0.20%	0.00%	0.26%	(low) - (high)
Value	-0.67%	-0.79%	-0.66%	-0.55%	-0.28%	-0.30%	-0.12%	0.12%	0.17%	0.49%	1.07%	(high) - (low)
Growth	-0.30%	-0.07%	-0.49%	-0.37%	-0.39%	-0.36%	-0.39%	-0.46%	-0.50%	-0.50%	-0.34%	(high) - (low)
Momentum	-0.93%	-0.70%	-0.75%	-0.53%	-0.45%	-0.49%	-0.56%	-0.35%	-0.34%	-0.16%	0.31%	(high) - (low)
Quality	-0.42%	-0.48%	-0.36%	-0.42%	-0.24%	-0.23%	-0.35%	-0.14%	-0.28%	-0.25%	0.11%	(high) - (low)

Panel H - Beta	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	1.04	0.96	0.86	0.93	0.94	0.89	0.85	0.90	0.98	0.99	-0.05	(low) - (high)
P/B	1.01	1.03	0.96	0.98	0.96	0.96	0.96	0.99	1.04	1.07	0.06	(low) - (high)
Div Yield	1.07	0.97	0.94	0.95	0.97	0.93	0.94	0.94	0.91	0.86	-0.20	(high) - (low)
FCF Yield	1.05	1.09	1.04	0.94	0.97	1.00	0.92	0.91	0.89	1.03	-0.02	(high) - (low)
Asset Growth	1.16	1.07	0.94	0.95	0.91	0.90	0.93	0.92	1.00	1.10	-0.06	(high) - (low)
EPS Growth	1.22	1.07	1.00	0.85	0.92	0.92	0.91	1.01	1.05	1.19	-0.03	(high) - (low)
3M Change in Fwd EPS	1.14	1.09	0.97	0.93	0.92	0.95	0.95	0.96	1.07	1.16	0.02	(high) - (low)
1M Reversal	1.18	1.09	1.04	1.01	1.00	0.96	0.94	0.99	0.92	1.06	-0.12	(high) - (low)
EPS Estimates Revisions	1.10	1.01	1.17	1.24	0.95	0.79	0.92	0.91	0.95	1.00	-0.10	(high) - (low)
Market Beta	0.34	0.51	0.61	0.68	0.81	0.85	0.94	1.04	1.18	1.40	1.03	(high) - (low)
ROIC	1.29	1.10	1.04	0.97	0.96	0.91	0.86	0.90	0.93	0.99	-0.30	(high) - (low)
ROE	1.28	1.10	0.98	0.98	0.93	0.92	0.85	0.91	0.91	1.07	-0.20	(high) - (low)
Net Margin 5Y Stability	1.25	1.20	1.15	1.12	0.97	0.91	0.84	0.83	0.86	1.01	-0.24	(low) - (high)
Size	1.00	0.97	0.99	0.96	0.97	0.97	1.01	1.05	1.06	1.18	0.18	(low) - (high)
Value	1.04	1.02	1.00	0.98	0.97	0.99	0.95	0.97	0.96	0.95	-0.08	(high) - (low)
Growth	1.18	1.06	0.95	0.87	0.91	0.93	0.95	0.95	1.01	1.13	-0.05	(high) - (low)
Momentum	1.01	1.02	0.92	0.98	0.94	0.98	0.94	1.02	1.06	1.09	0.08	(high) - (low)
Quality	1.22	1.12	1.13	1.06	0.97	0.89	0.86	0.93	0.89	0.95	-0.27	(high) - (low)

Panel I - Beta-Adjusted Returns	Basket 1	Basket 2	Basket 3	Basket 4	Basket 5	Basket 6	Basket 7	Basket 8	Basket 9	Basket 10	Basket 10 - Basket 1	Direction
P/E	-0.37%	-0.47%	-0.37%	-0.37%	-0.06%	-0.14%	0.02%	0.11%	0.23%	0.26%	0.62%	(low) - (high)
P/B	-0.77%	-0.58%	-0.51%	-0.33%	0.01%	0.14%	0.04%	0.29%	0.40%	0.57%	1.34%	(low) - (high)
Div Yield	-0.73%	-0.53%	-0.46%	-0.10%	-0.29%	-0.04%	-0.08%	0.02%	0.25%	0.39%	1.13%	(high) - (low)
FCF Yield	-0.08%	-0.13%	-0.31%	-0.43%	-0.35%	-0.20%	-0.03%	-0.07%	-0.06%	-0.07%	0.01%	(high) - (low)
Asset Growth	-0.37%	-0.22%	-0.22%	-0.30%	-0.50%	-0.31%	-0.30%	-0.23%	-0.24%	-0.49%	-0.13%	(high) - (low)
EPS Growth	-0.30%	0.06%	-0.03%	-0.29%	-0.01%	-0.52%	-0.31%	-0.16%	-0.44%	-0.31%	-0.01%	(high) - (low)
3M Change in Fwd EPS	-0.41%	-0.18%	-0.25%	-0.27%	-0.32%	-0.07%	-0.23%	-0.35%	-0.38%	-0.11%	0.31%	(high) - (low)
1M Reversal	0.46%	-0.07%	-0.06%	-0.14%	-0.02%	-0.24%	-0.51%	-0.41%	-0.57%	-0.84%	-1.30%	(high) - (low)
EPS Estimates Revisions	-0.34%	0.04%	-0.23%	-0.07%	-0.12%	-0.10%	0.14%	-0.14%	-0.11%	-0.11%	0.23%	(high) - (low)
Market Beta	-0.66%	0.05%	0.19%	0.12%	0.09%	0.05%	-0.04%	0.10%	-0.21%	-0.25%	0.40%	(high) - (low)
ROIC	-0.23%	-0.33%	-0.35%	-0.21%	-0.47%	-0.20%	-0.20%	-0.27%	-0.27%	-0.27%	-0.04%	(high) - (low)
ROE	-0.22%	-0.38%	-0.42%	-0.29%	-0.15%	-0.32%	-0.15%	-0.25%	-0.46%	-0.26%	-0.04%	(high) - (low)
Net Margin 5Y Stability	-0.46%	-0.30%	-0.41%	-0.23%	-0.31%	-0.10%	-0.18%	-0.30%	-0.17%	-0.27%	0.18%	(low) - (high)
Size	-0.27%	-0.30%	-0.21%	-0.23%	-0.37%	-0.32%	-0.29%	-0.07%	-0.12%	0.04%	0.31%	(low) - (high)
Value	-0.60%	-0.67%	-0.52%	-0.40%	-0.11%	-0.14%	0.05%	0.28%	0.32%	0.59%	1.19%	(high) - (low)
Growth	-0.19%	0.03%	-0.40%	-0.28%	-0.28%	-0.25%	-0.28%	-0.36%	-0.39%	-0.38%	-0.19%	(high) - (low)
Momentum	-0.69%	-0.43%	-0.52%	-0.26%	-0.19%	-0.22%	-0.30%	-0.08%	-0.07%	0.07%	0.75%	(high) - (low)
Quality	-0.32%	-0.39%	-0.27%	-0.34%	-0.19%	-0.19%	-0.34%	-0.09%	-0.28%	-0.24%	0.08%	(high) - (low)

Figure 8.7.2 - Japan Return-Risk Scatterplot

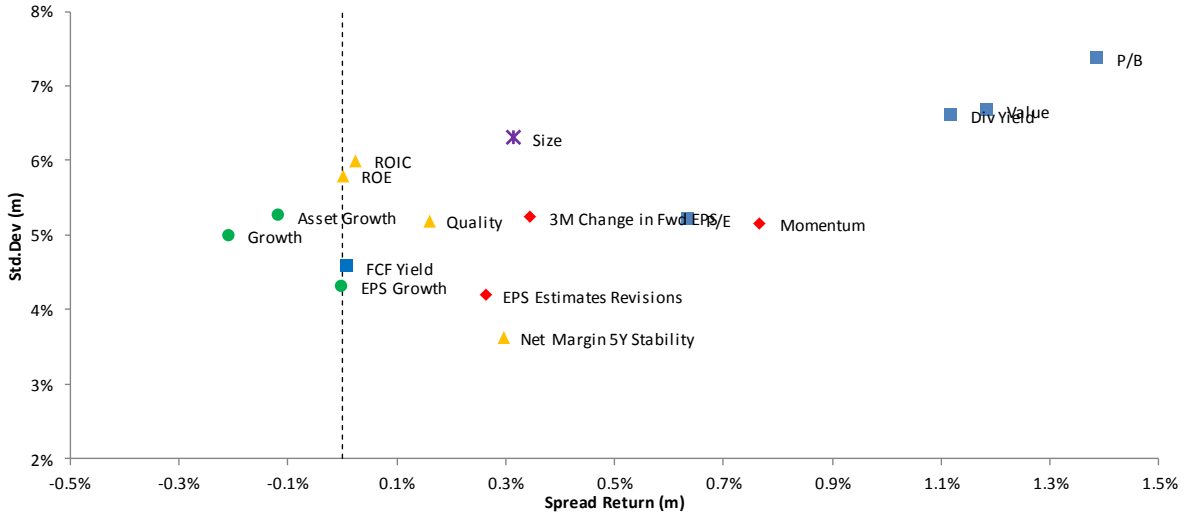


Table 8.7.3 - Japan Students T-test on long/short factor spreads

Students t-test	Average Monthly Return	Monthly Std.Dev	# of Obs	T-test statistic (H0: Spread = 0)	P-Value
P/E	0.6%	5.2%	277	1.96	0.05
P/B	1.3%	7.4%	277	2.90	0.00
Div Yield	1.0%	6.6%	277	2.62	0.01
FCF Yield	0.0%	4.6%	277	0.04	0.97
Asset Growth	-0.1%	5.2%	277	-0.35	0.73
EPS Growth	0.0%	4.3%	277	0.00	1.00
3M Change in Fwd EPS	0.3%	5.2%	277	1.05	0.29
1M Reversal	-1.5%	7.3%	277	-3.51	0.00
EPS Estimates Revisions	0.3%	4.2%	277	1.01	0.31
Market Beta	-0.1%	8.3%	277	-0.26	0.79
ROIC	0.0%	6.0%	277	0.07	0.94
ROE	0.0%	5.8%	277	0.01	0.99
Net Margin 5Y Stability	0.3%	3.6%	277	1.28	0.20
Size	0.3%	6.3%	277	0.81	0.42
Value	1.1%	6.7%	277	2.78	0.01
Growth	-0.2%	5.0%	277	-0.67	0.50
Momentum	0.7%	5.2%	277	2.31	0.02
Quality	0.2%	5.2%	277	0.50	0.62

Table 8.7.4 - Japan Factor Spread Correlations

Correlation Matrix	P/E	P/B	Div Yield	FCF Yield	Asset Growth	EPS Growth	3M Change in Fwd EPS	1M Reversal	EPS Estimates Revisions	Market Beta	ROIC	ROE	Net Margin 5Y Stability	Size	Value	Growth	Momentum	Quality
S&P Japan BMI	-0.06	0.04	-0.18	-0.02	-0.07	-0.04	0.03	-0.09	-0.14	0.71	-0.29	-0.20	-0.39	0.17	-0.07	-0.06	0.08	-0.30
P/E	1.00	0.55	0.56	0.05	-0.22	-0.28	-0.22	-0.31	-0.26	-0.06	-0.14	-0.13	-0.03	0.38	0.66	-0.24	0.01	-0.16
P/B		1.00	0.78	0.12	-0.63	-0.37	-0.35	-0.29	-0.31	0.11	-0.54	-0.56	-0.11	0.62	0.86	-0.58	-0.15	-0.61
Div Yield			1.00	0.07	-0.54	-0.23	-0.36	-0.37	-0.25	-0.15	-0.34	-0.39	-0.03	0.46	0.88	-0.48	-0.07	-0.42
FCF Yield				1.00	-0.03	-0.04	-0.06	-0.15	-0.07	0.05	0.02	-0.05	-0.08	0.02	0.27	-0.12	-0.01	-0.06
Asset Growth					1.00	0.34	0.25	0.12	0.10	-0.06	0.62	0.59	0.06	-0.37	-0.52	0.84	0.09	0.64
EPS Growth						1.00	0.09	0.14	0.04	-0.08	0.43	0.45	-0.13	-0.25	-0.34	0.52	-0.04	0.32
3M Change in Fwd EPS							1.00	0.02	0.38	-0.03	0.20	0.14	0.05	-0.18	-0.36	0.25	0.47	0.19
1M Reversal								1.00	0.12	-0.15	0.12	0.18	0.05	-0.37	-0.36	0.14	-0.62	0.18
EPS Estimates Revisions									1.00	-0.26	0.12	0.09	0.12	-0.24	-0.33	0.12	0.47	0.15
Market Beta										1.00	-0.26	-0.21	-0.41	0.12	-0.04	-0.08	0.00	-0.34
ROIC											1.00	0.89	0.12	-0.39	-0.38	0.66	0.04	0.85
ROE												1.00	0.08	-0.43	-0.44	0.66	0.01	0.86
Net Margin 5Y Stability													1.00	0.03	-0.06	-0.01	-0.02	0.38
Size														1.00	0.53	-0.35	0.05	-0.43
Value															1.00	-0.51	-0.13	-0.46
Growth																1.00	0.08	0.64
Momentum																	1.00	0.05
Quality																		1.00

Figure 8.7.5 - Japan Performance Index Graphs (Index Year 1990 = 100) (part 1 of 2)

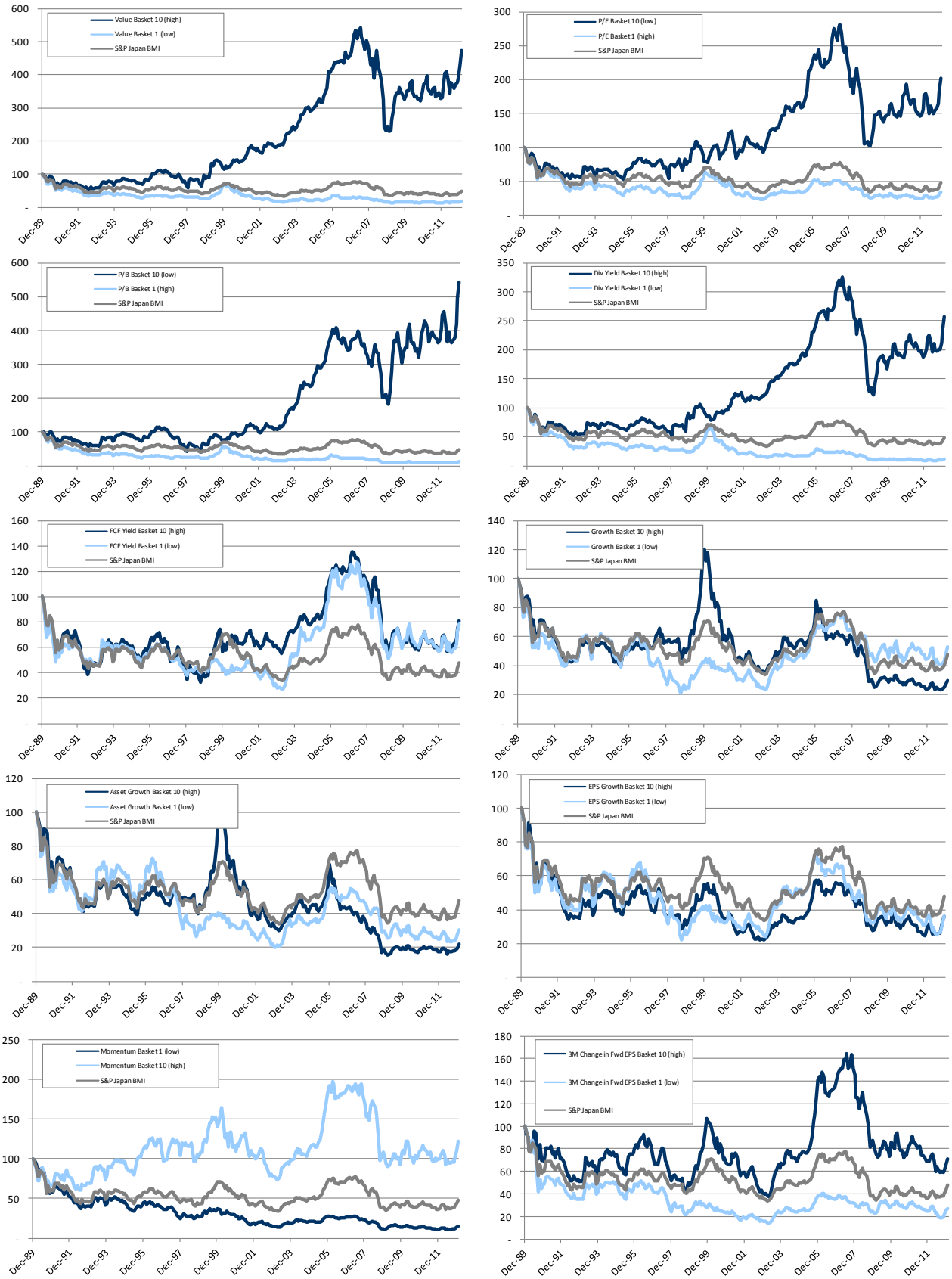


Figure 8.7.5 - Japan Performance Index Graphs (Index Year 1990 = 100) (part 2 of 2)

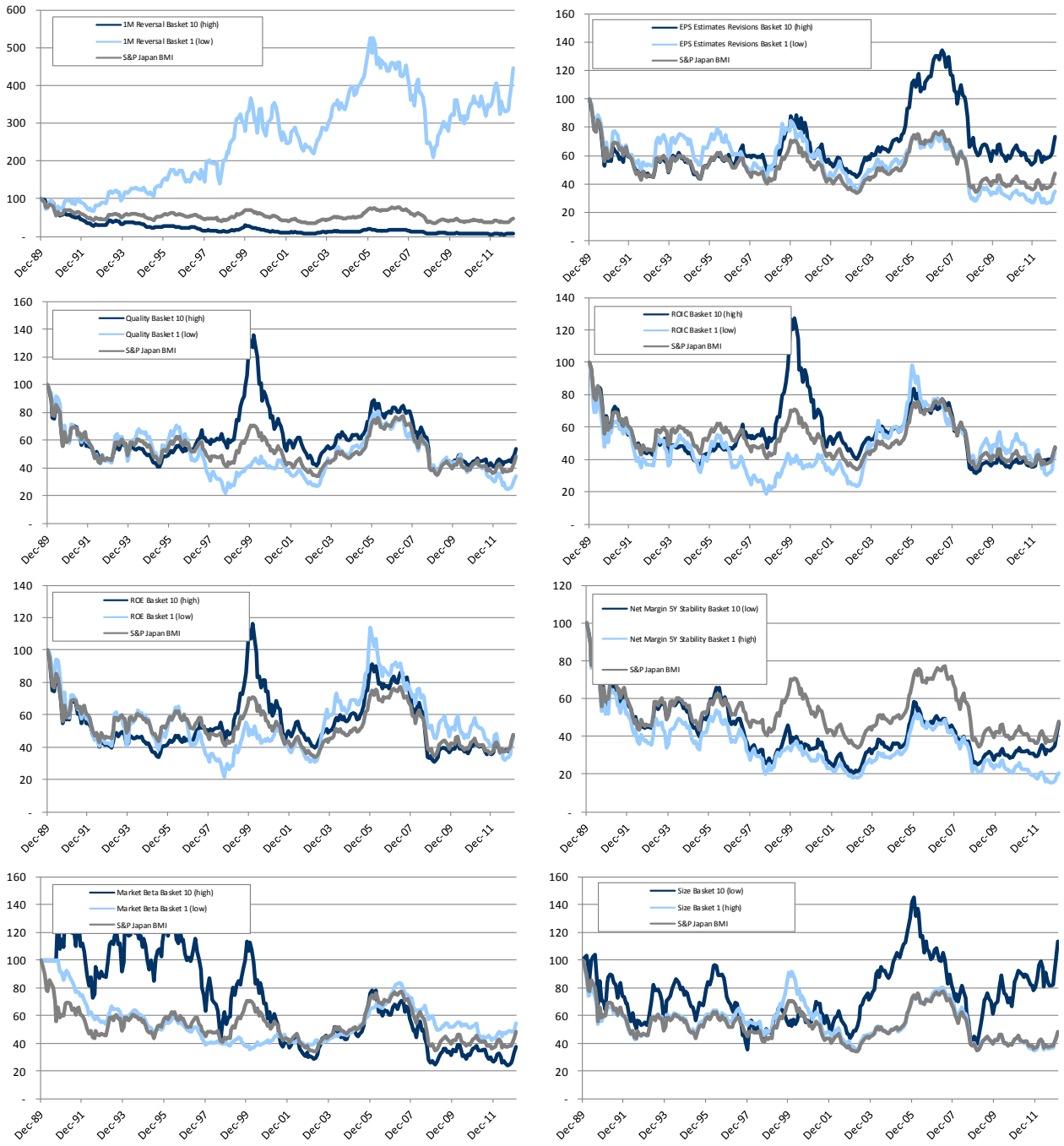
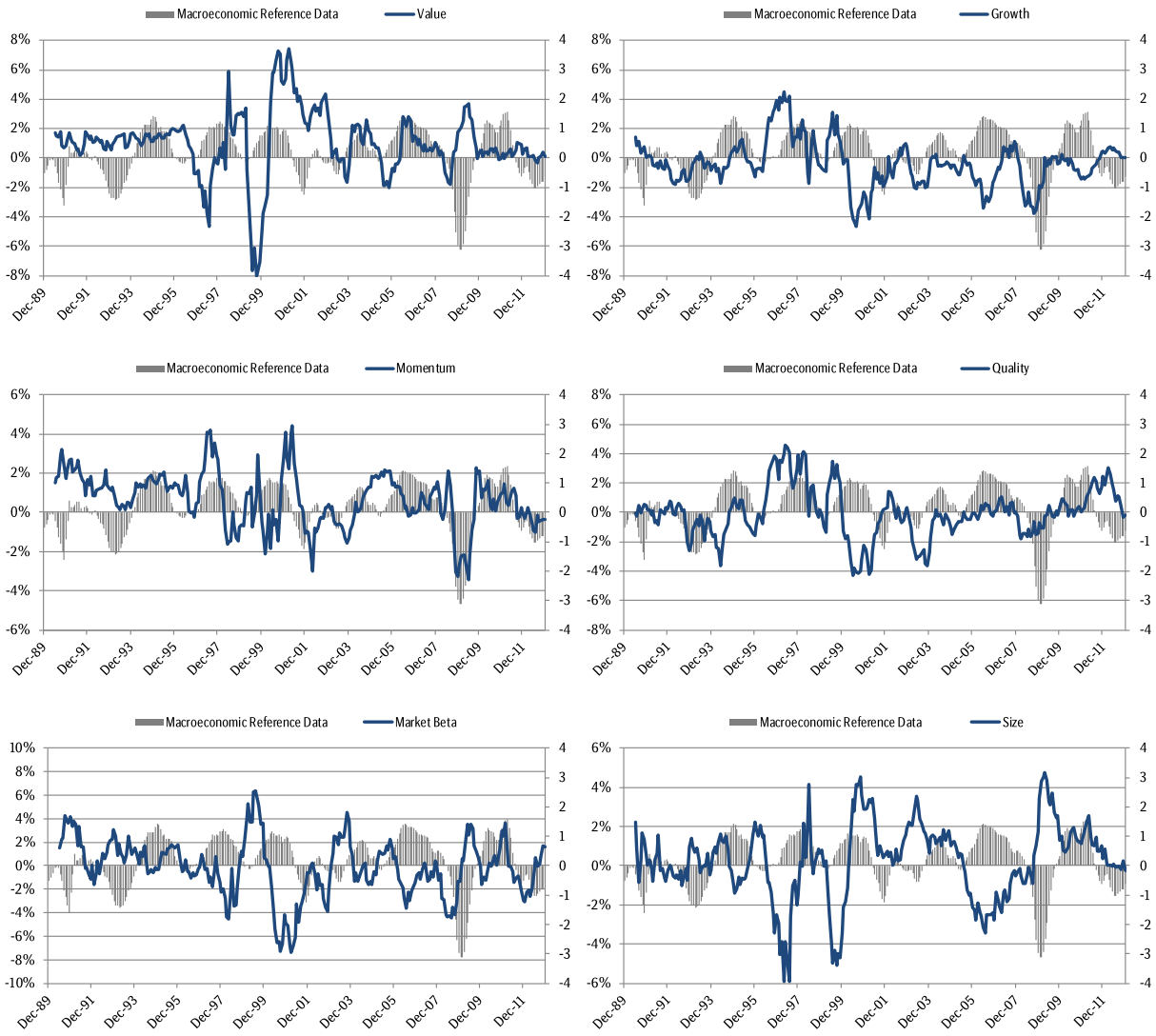


Figure 8.7.6 - Japan Historical Style Premiums



Left axis: 12MA Monthly compounded factor spreads, Right axis: Standardized macroeconomic reference index level

Table 8.7.7 - Japan Factor Premiums and P-values During the Economic Cycle

Factor Premium and P-Values	Recession		Recovery		Boom		Slowdown	
P/E	1.42%	*0.02*	0.10%	*0.85*	0.69%	*0.34*	0.33%	*0.57*
P/B	1.81%	*0.10*	1.11%	*0.06*	0.07%	*0.95*	1.69%	*0.00*
Div Yield	1.85%	*0.03*	0.60%	*0.33*	0.05%	*0.96*	1.35%	*0.06*
FCF Yield	0.02%	*0.97*	0.11%	*0.82*	-0.35%	*0.60*	-0.19%	*0.74*
Asset Growth	-0.09%	*0.90*	0.26%	*0.56*	-1.53%	*0.18*	-0.01%	*0.98*
EPS Growth	0.02%	*0.97*	-0.13%	*0.76*	0.26%	*0.67*	0.51%	*0.43*
3M Change in Fwd EPS	-0.52%	*0.37*	0.48%	*0.30*	1.71%	*0.03*	1.05%	*0.32*
1M Reversal	-2.11%	*0.02*	-1.20%	*0.07*	0.97%	*0.42*	-2.34%	*0.05*
EPS Estimates Revisions	-0.02%	*0.97*	0.39%	*0.30*	1.48%	*0.01*	0.07%	*0.89*
Market Beta	-0.42%	*0.70*	-0.42%	*0.55*	-0.54%	*0.64*	0.66%	*0.63*
ROIC	0.18%	*0.81*	0.00%	*1.00*	0.19%	*0.80*	0.09%	*0.89*
ROE	0.14%	*0.85*	0.01%	*0.99*	0.67%	*0.28*	-0.36%	*0.54*
Net Margin 5Y Stability	0.28%	*0.57*	0.49%	*0.10*	0.04%	*0.93*	0.38%	*0.42*
Size	0.35%	*0.68*	0.35%	*0.50*	-1.44%	*0.10*	0.36%	*0.73*
Value	1.73%	*0.06*	0.78%	*0.18*	0.43%	*0.72*	1.23%	*0.04*
Growth	-0.42%	*0.53*	0.18%	*0.68*	-1.25%	*0.18*	0.24%	*0.64*
Momentum	0.89%	*0.15*	0.57%	*0.26*	0.80%	*0.19*	1.33%	*0.07*
Quality	0.49%	*0.49*	0.13%	*0.77*	0.46%	*0.41*	-0.22%	*0.69*
Avg. Return of the S&P Japan BMI	-0.76%		0.13%		0.87%		-1.83%	
# of Months	87		117		25		39	

Table 8.7.8 - Japan Transition Matrixes

Asset Growth 1 (low)	Asset Growth 2	Asset Growth 3	Asset Growth 4	Asset Growth 5	Asset Growth 6	Asset Growth 7	Asset Growth 8	Asset Growth 9	Asset Growth 10 (high)
94%	3%	1%	0%	0%	0%	0%	0%	0%	0%
3%	90%	3%	1%	1%	0%	0%	0%	0%	0%
1%	3%	90%	3%	1%	1%	0%	0%	0%	0%
1%	1%	3%	89%	3%	1%	1%	1%	0%	0%
0%	1%	1%	3%	89%	3%	1%	1%	0%	0%
0%	0%	1%	1%	3%	89%	1%	1%	1%	0%
0%	0%	1%	1%	1%	3%	3%	3%	1%	0%
0%	0%	0%	0%	1%	1%	89%	89%	3%	1%
0%	0%	0%	0%	0%	1%	3%	3%	91%	3%
0%	0%	0%	0%	0%	0%	1%	1%	3%	94%

1M Reversal 1 (low)	1M Reversal 2	1M Reversal 3	1M Reversal 4	1M Reversal 5	1M Reversal 6	1M Reversal 7	1M Reversal 8	1M Reversal 9	1M Reversal 10 (high)
13%	9%	8%	8%	8%	8%	10%	10%	11%	15%
9%	10%	10%	10%	10%	10%	10%	10%	11%	11%
8%	9%	10%	10%	10%	11%	11%	11%	11%	10%
8%	10%	10%	11%	11%	11%	10%	10%	10%	9%
8%	9%	10%	11%	11%	11%	10%	10%	10%	9%
8%	10%	10%	11%	11%	11%	11%	11%	10%	8%
9%	10%	11%	11%	11%	11%	10%	10%	9%	8%
9%	10%	10%	10%	10%	10%	10%	10%	10%	9%
11%	11%	11%	10%	10%	10%	9%	9%	9%	9%
16%	12%	10%	9%	8%	8%	8%	8%	9%	12%

ROE 1 (low)	ROE 2	ROE 3	ROE 4	ROE 5	ROE 6	ROE 7	ROE 8	ROE 9	ROE 10 (high)
92%	3%	1%	0%	0%	0%	0%	0%	0%	1%
4%	88%	5%	1%	1%	0%	0%	0%	0%	0%
1%	5%	86%	5%	1%	1%	0%	0%	0%	0%
1%	1%	5%	85%	5%	1%	1%	0%	0%	0%
0%	1%	1%	6%	84%	5%	1%	1%	0%	0%
0%	0%	1%	2%	6%	85%	5%	1%	0%	0%
0%	0%	0%	1%	1%	6%	85%	5%	1%	0%
0%	0%	0%	0%	1%	1%	5%	87%	4%	0%
0%	0%	0%	0%	0%	0%	1%	5%	89%	3%
0%	0%	0%	0%	0%	0%	0%	1%	4%	94%

Growth 1 (low)	Growth 2	Growth 3	Growth 4	Growth 5	Growth 6	Growth 7	Growth 8	Growth 9	Growth 10 (high)
83%	7%	2%	1%	1%	0%	1%	1%	1%	2%
9%	75%	8%	3%	1%	1%	0%	0%	0%	1%
2%	10%	71%	9%	3%	2%	1%	1%	1%	0%
1%	3%	11%	69%	9%	3%	1%	1%	1%	0%
1%	2%	3%	11%	68%	10%	1%	1%	1%	0%
1%	1%	2%	3%	12%	66%	3%	3%	1%	1%
1%	1%	1%	2%	3%	13%	11%	11%	2%	1%
1%	1%	1%	1%	1%	3%	68%	68%	10%	2%
1%	0%	1%	1%	1%	1%	12%	12%	72%	8%
1%	0%	0%	0%	1%	1%	2%	2%	10%	83%

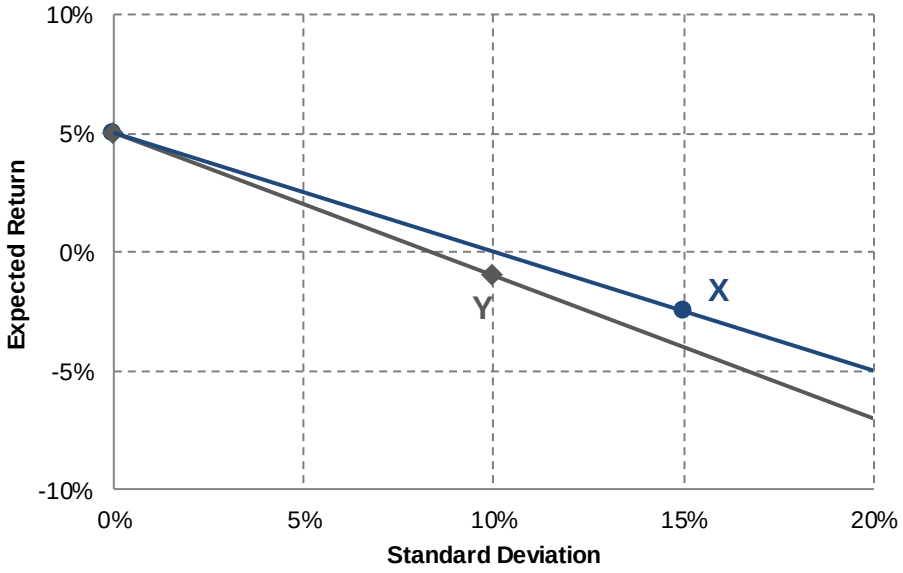
Momentum 1 (low)	Momentum 2	Momentum 3	Momentum 4	Momentum 5	Momentum 6	Momentum 7	Momentum 8	Momentum 9	Momentum 10 (high)
22%	14%	10%	8%	8%	7%	7%	7%	8%	8%
14%	12%	11%	10%	9%	9%	9%	9%	9%	8%
11%	11%	11%	10%	10%	10%	10%	10%	9%	8%
9%	9%	11%	11%	11%	11%	11%	10%	9%	7%
8%	9%	11%	11%	12%	11%	11%	10%	9%	7%
7%	9%	10%	12%	11%	12%	11%	10%	9%	8%
7%	9%	10%	11%	11%	12%	11%	10%	10%	8%
7%	9%	10%	10%	10%	10%	11%	11%	11%	10%
8%	9%	9%	9%	9%	10%	10%	10%	12%	13%
8%	8%	7%	7%	7%	8%	9%	11%	14%	22%

Quality 1 (low)	Quality 2	Quality 3	Quality 4	Quality 5	Quality 6	Quality 7	Quality 8	Quality 9	Quality 10 (high)
91%	4%	1%	1%	1%	0%	0%	0%	0%	0%
5%	86%	5%	1%	1%	0%	0%	0%	0%	0%
1%	6%	84%	6%	1%	1%	0%	0%	0%	0%
1%	1%	6%	83%	6%	1%	1%	0%	0%	0%
1%	1%	1%	7%	83%	6%	1%	0%	0%	0%
0%	0%	1%	1%	6%	83%	6%	1%	0%	0%
0%	0%	0%	1%	1%	6%	84%	6%	1%	0%
0%	0%	0%	0%	1%	1%	6%	86%	5%	0%
0%	0%	0%	0%	0%	0%	1%	5%	88%	4%
0%	0%	0%	0%	0%	0%	0%	1%	4%	94%

8.8 Interpretation of Negative Sharpe Ratios

The concept of negative Sharpe ratio is often considered a paradox, as portfolios with greater standard deviation and worse average performance may nonetheless have a higher (or less negative) excess return Sharpe ratio, and thus it is considered a better investment. Consider the case shown below.

Negative Sharpe Ratio Example



In the example above, X is clearly inferior to Y and both are inferior to the risk free asset. However, an investor planning for a standard deviation of 10% would be able to achieve a better return by combining 2/3 X and 1/3 risk free asset. Thus, a mixed portfolio containing both X and the risk free asset with the higher (or less negative) Sharpe ratio would have been a better. Naturally, one would never invest in X and Y if their prospects involved negative expected returns. In any case, the Sharpe Ratio comparison remains valid, even in the case of negative expected returns.[113]

[113] http://www.stanford.edu/~wfsharpe/art/stars/stars6.htm

8.9 Attached CD

The attached CD contains 2 files:

- Data – Style Factors (Excel): The raw output of the algorithm
- CJG Thesis (PDF): PDF file containing the dissartation