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Added Value of Combining Value and Momentum Indicators in the Swiss Stock Market

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ABSTRACT

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The purpose of the thesis is to examine the added value of combining value and momentum indicators in the Swiss stock exchange. Value indicators employed are P/E, EV/EBITDA, P/CF, P/B ja P/S. Momentum indicators examined are 52-week high, acceleration rate, 12-month past return and 6-month past return. The thesis examines whether the composite value measures based on the above mentioned ratios can add value and whether the inclusion of momentum can further improve the risk return profile of the value portfolios.

The data is gathered from the Swiss equity market during the sample period from May 2001 to May 2011. Previous studies have shown that composite value measures can somewhat add value to the value portfolio strategy. Similarly, recent academic literature have found evidence that momentum works well as a timing indicator for time to entry to value stocks. This study indicates that the added value of composite value measures exists. It also shows that momentum combined to acceleration rate can significantly improve the risk adjusted performance of value-only portfolios.

TIIVISTELMÄ

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Tutkielman tarkoituksena on tutkia arvostus- ja momentum-indikaattoreiden yhteisvaikutusta Sveitsin osakemarkkinoilla. Arvostusmittareina käytettiin seuraavia tunnuslukuja: P/E, EV/EBITDA, P/CF, P/B ja P/S. Momentum-indikaattoreina käytettiin seuraavia tunnuslukuja: osakekurssi suhteessa 52 viikon korkeimpaan kurssiin, kiihtymisaste, 12 kk:n historiallinen tuotto, 6 kk:n historiallinen tuotto. Tämä tutkielma pyrki selvittämään yhtäältä, tarjoavatko yhdistelmätunnusluvut lisäarvoa ja toisaalta voiko momentumin avulla parantaa arvoportfolioiden tuotto-riski -suhdetta.

Data on kerätty Sveitsin osakemarkkinoilta tutkimusperiodin 2001-2011 ajalta. Aikaisemmat tutkimukset ovat osoittaneet, että yhdistelmätunnus-luvuilla voidaan lisätä jonkin verran arvoportfoliostrategian tuottoa ja arvopreemiota. Lisäksi viimeaikaiset tutkimukset ovat löytäneet näyttöä momentumin toimivuudesta arvo-osakkeiden ostohetken ajoittamisessa. Tämä tutkimus todistaa osaltaan, että yhdistelmätunnusluvuilla voidaan lisätä arvoa suhteessa yksittäisiin arvostuskertoimiin. Kaiken lisäksi 52 viikon korkein kurssi toimii ajoittamisessa kiihtymisasteen kanssa.

Forewords

I am grateful to the staff of LUT School of Business for its remarkable contribution to my highly motivated attitude for learning finance and economics more broadly. Especially, I would like to thank my examiner professor Eero Pätäri for his inspiring and dedicated approach to lecturing finance. I've been honoured to enjoy his excellent guidance from bachelor phase studies all the way to finishing my master's thesis. In addition, I would like to especially thank the staff at the department of strategy research which has been tremendeosly helpful the whole time of my studies at LUT. Special mention should also be addressed to my mother as well as to my girlfriend who have contributed to my examination process with their supportive attitude.

Espoo 29.11.2011,

Tomi Arajärvi

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1 INTRODUCTION

1.1 Background

The academic literature in the favour of existing value premium is ample. A distinctive return difference between the value and growth portfolios has been identified over various time periods and in several countries. In fact, the relative efficiency of different valuation measures appears to be at least somewhat dependent on the sample period and the equity market studied. The results of Chan et al. (1993) suggest that classifying shares by price to book (P/B) and price to cash flow (P/CF) leads to the greatest value premium in Japan during 1971-1988. In the same market, during 1983-1996, Suzuki (1998) found deviating evidence that ranking stocks by price to sales (P/S) produces the largest performance difference between value and glamour portfolios.

Fama and French (1998) examined the differences both in the magnitude of the value premium and the sorting basis (i.e. P/B, P/CF, P/E and D/P) on which the largest premium was obtained for 13 well established equity markets. In 6 of the 13 markets (i.e. the US, Japan, the UK. Switzerland, Belgium and Singapore) using P/B as a screening criterion resulted in the greatest value premium. Simultaneously, employing P/CF as a classification criterion led to the largest difference in returns to value and glamour portfolios in 4 of the 13 countries (i.e. Germany, Italy, Hong Kong and Australia) observed. Only markets where resorting to the P/E criterion generated the greatest premium were Sweden and the Netherlands.

The results of whether the composite valuation measures add to value investing are diverse. Dhatt et al. (2004) found support for added value of combining individual valuation multiples in the US during 1980-1999. They show that sorting shares on the basis of an average of P/E and P/S

provide the largest excess returns. On the contrary, Bird and Casavecchia (2007) did not find evidence of added value of combining P/B and P/S for dividing the stocks in 15 European countries during 1989-2004. More recently, Pätäri and Leivo (2009) studied extensively the relative performance of portfolios based both on the individual valuation ratios and the composite valuation measures in the Finnish equity market during 1993-2008. The authors found evidence that combining B/P, D/P and EV/EBITDA generates the largest value premium.

Value strategies have been documented, for instance by Rousseau and van Rensburg (2004), to work best over a longer holding period. To cope with the problem of early entry, momentum has gained support as a timing indicator. Value and momentum strategies both have demonstrated power to predict the cross section of stock returns. While value strategies have been found, by Bird and Whitaker (2004), to work best with a holding period extending from 24 months to 36 months, momentum investing has been evidenced to yield best with a significantly shorter investment period. Bird and Casavecchia (2007) found evidence that value winner stocks significantly outperform both the benchmark index and value loser stocks using a 6-month price momentum. They show that the value winner strategy works well in all seven countries in the sample but particularly in the UK, Germany, the Netherlands and Switzerland.

1.2 Scope and Objectives

The main objective of this study is to analyse the differences in relative performance of value and growth portfolios based on both individual and composite value measures in the Swiss stock exchange during 2001-2011. The value criteria are further enhanced by a momentum indicator to study whether the value portfolio performance can be improved consistently. One year investment periods are employed to provide a more timely approach on screening stocks. This study contributes to existing

academic literature in several ways. First, EV/EBITDA as an equity selection criterion is observed to take the net debt of a firm into account. Second, the relative performance of quintile portfolios formed on the basis of composite value measures is examined. Third, skewness and kurtosis adjusted deviation (i.e. SKAD), introduced by Pätäri (2009), is used as a basis for measuring the total risk to avoid the biasness of the traditional Sharpe Ratio stemming from its characteristic assumption of normal return distributions. Fourth, price momentum is captured in a new way taking simultaneously into account both the acceleration rate of the momentum (50 day moving average to 200 day moving average ratio) and the anchoring effect of the 52-week high (current price to 52-week high price ratio).

I've been motivated to examine the relative performance of momentum enhanced composite value measures using Swiss data because (i) the Swiss companies are of high quality (excellent management, strong growth prospects, competitive advantage, good cash flows), (ii) Swiss market is one of the few global markets that has behaved normally during economic crises (market has remained regular despite global recession, little exposure to oil, mining and retail), (iii) diversified universe of international companies and (iv) shorting opportunities are often greater in widely owned companies which improves the market efficiency.

The research questions of the study are the following:

1. What combination of individual valuation ratios as a screening criterion produces the greatest value premium and the best value portfolio?

2. Does firm size effect explain the potential value premium in the Swiss stock market?

3. Does price momentum exhibit a robust timing capability? If so, which momentum indicator works most efficiently?

4. What type of distributional implications does the inclusion of momentum have on value portfolios?

1.3 Structure

The research method in this study is a statistical analysis. The applicable theoretical background is gathered from scientific articles and books concerning the topics of value investing, momentum anomaly and their interaction. First, the theoretical background of this study is introduced. Second, the employed performance metrics and the statistical tests are introduced. Then, the performance of portfolios based on valuation multiples, momentum and their combinations is evaluated. Finally, all the relative performance of the extreme quintile portfolios is analysed in an applied Markowitzian risk return framework at the end of each section.

2 THEORETICAL BACKGROUND

2.1 Value Premium

Value investing can be seen as investing in common stocks that are underpriced in respect to some measure of relative value. Large variety of scholars have documented the existence of value premium in almost all significant stock markets which by definition violates the efficient market hypothesis. This anomaly was first detected by Graham and Dodd (1934) and their book Security Analysis is still considered a guideline by many investors. In this section previous literature on value premium and all the valuation ratios selected for this study are introduced.

Literature on attempts to explain the existing value premium is rich. Dreman and Berry (1995) argue that mispricing correction hypothesis (MCH) explains the superior returns of strategies relying on E/P anomaly. The authors used positive and negative earnings surprises to test price reactions to new information. In contrast, Bauman and Miller (1997) postulate that investors rely too much on past returns when adjusting their expectations about the future. According to this adaptive expectations hypothesis investors tend to adapt their expectations with the most recent quarterly and yearly reports.

2.1.1 Earnings Multiples

The most commonly used earnings based valuation ratio is the price earnings ratio; *earnings yield* vice versa, the ratio of earnings per share (EPS) to the ratio of price per share (P). The stock price can be divided into two components (Bodie et al. 2005, pp. 623): the no growth value of the firm added with the present value of growth opportunities. Equation 1 suggests that the higher the growth opportunities are, the lower the E/P is. When there are no growth opportunities (i.e. PVGO = 0), equation points out that P_0 equals EPS/r which is the no growth value of the firm. E/P can also be considered the inverse of stock's payback time (i.e. the duration needed for the stock to cover its today's price through its yearly net incomes when the yearly net income remains constant).

$$\frac{EPS}{P_0} = \frac{EPS}{EPS / r + PVGO} \qquad \text{(Eq. 1)}$$

where

EPS = expected or trailing 12 months Earnings Per Share

r = expected rate of return (return that the investors require on average)

PVGO = discounted Present Value of Growth Opportunities

Another approach for earnings yield originates from the constant growth dividend discount model (DDM) popularised by Gordon and Shapiro (1956). Equation 2 indicates that the greater the expected dividend is, the lower is the E/P ratio. High expected stable growth rate of dividends also generates low E/P. Additionally, strong expected earnings per share translates into high E/P.

$$\frac{EPS_1}{P_0} = \frac{EPS_1 \times (r\text{-}g)}{D_1} \qquad \text{(Eq. 2)}$$

where

D_1 = expected dividend for the next year

r = required rate of return

g = expected stable growth rate of dividends

Basu (1977) first showed that US stocks with high E/P (i.e. value stocks) tend to have higher average returns than stocks with low E/P (i.e. growth stocks) using NYSE industrial firms in a sample period 1956-1971. Portfolios were formed yearly on the 1st of April and the stocks were divided into new quintiles based on E/P calculated from earnings of previous fiscal year. During the sample period, portfolios with high E/P generated, on average, both higher absolute and higher risk adjusted returns. The quintile of highest E/P generated systematically highest returns, while the quintile of lowest earnings generated lowest returns. Jaffe et al. (1989) re examined the value premium based on earnings yield in the US with a substantially longer sample period 1956-1986. In contrast to Basu's research, Jaffe et al. (1989) employed also companies with negative earnings leaving these into an own portfolio. They added five more quintile portfolios in a descending order of E/P. Then the stocks in each E/P quintile were ranked based on the market value on the 31st of March. Next, each E/P quintile was divided into five subquintiles according to market value. Jaffe et al. (1989) document significant value premium and size effect when estimated over the full sample period. However, the

quintile with highest E/P generated highest average annual return in all size groups.

EBITDA/EV ratio is another earnings based valuation ratio often used by international institutional investors. It is calculated by proportioning the enterprise value (EV = equity + net debt) to its operating income (EBITDA = Earnings Before Interest, Taxes, Depreciations and Amortizations). Pätäri and Leivo (2009) show that ranking on EBITDA/EV results in highest average value portfolio returns in the Finnish stock market during 1993-2008 with respect to earnings multiples. The authors report that EBITDA/EV is distinctly more efficient stock selection criterion than earnings yield both in absolute return terms and in the risk adjusted framework. Success from the use of EBITDA/EV ratio might result from its ability to avoid the problem of seemingly undervalued stocks indicated by price based valuation multiples which was argued, for instance, by Bird and Casavecchia (2007).

Cash flow to price ratio (i.e. CF/P) is a measure of the market's expectations of a firm's future financial health because operating cash flow, which is used in the nominator, indicates the core operation profitability. It is calculated by dividing the company's operating cash flow in the most recent fiscal year by the company's market capitalisation. Because this measure deals with cash flow, the effects of depreciation and other non cash factors are removed. Because accounting laws on depreciation vary across countries, CF/P can allow investors assess foreign companies from the same industry more easily. Fama and French (1998) documented that using CF/P as a stock screening criterion leads to the largest and statistically significant value premium in Germany, Italy, Hong Kong and Australia.

2.1.2 Book Value Multiples

The best known balance sheet based valuation multiple is book to market ratio (i.e. B/P). B/P measures the relationship between firm's book value and its market value. Analysts and professional investors may regard a stock with a high B/P as a safer investment seeing that the minimum value for B/P should be one (i.e. B/P > 1). Investors and analysts presumably see book value as the level below (at least not radically) which market price won't drop due to the possibility of liquidation or selling its assets for their book value. High B/P is generally viewed as providing a margin of safety. Proponents of the B/P screen would argue that if all other fundamental attributes are same for two stocks, the one with the higher B/P is safer. High B/P generally indicates that investors believe the management cannot deliver the economic value added that would cover their required return on equity (i.e. ROE). In contrast, promising economic outlook affects positively firm's market value but it doesn't have impact on its book value. Thus low B/P might justifiably project high growth expectations and it often indicates relatively strong profitability. Equation 4 illustrates that the higher the E/P ratio or the lower the ROE, the higher the B/P ratio. If high expected ROE is incorporated in the stock price, E/P should be less than ROE. Subsequently, B/P ratio should be below 1.

$$\frac{B}{P_0} = \frac{EPS/P_0}{ROE} = \frac{Earnings\ yield}{Return\ on\ equity} \qquad \text{(Eq. 4)}$$

Since the two publications of Fama and French (1992, 1993), B/P has gained support as a prominent determinant of expected returns. The authors examined stocks that enter into NYSE, AMEX and NASDAQ in the sample period 1963-1990. Fama and French (1998) extended their study to comprise also Japan, Great Britain, France, Germany, Italy, Switzerland, Sweden, Australia, Hong Kong, and Singapore during a sample period 1975-1995. Value portfolio included the 30 % cheapest stocks measured by B/P in each country. The difference between average

returns on global portfolios of value and growth portfolios is 7.68 % per year. Only Italy was an exception providing higher earnings on growth portfolio than value portfolio. This was the case also when using E/P as a proxy for relative valuation. Since the results are international they suggest that the value premium is existing globally and that it is not a country specific phenomenon alone. Consistently with the results of Fama and French (1992, 1993), Chan et al. (1995) and Davis (1994) provide evidence that B/P has significant explanatory power on expected stock returns.

Similarly, the findings of Capaul et al. (1993) support the existence of value premium. The authors analysed returns on B/P value portfolio and corresponding growth portfolio. Their research included equity markets of France, Germany, Great Britain, Japan, Switzerland and the U.S. during a sample period 1981-1992. The results indicate the existence of a significant value premium in each country. The returns on portfolios formed on the basis of B/P differ far more from month to month than would be expected if the securities had been selected randomly. B/P value portfolio outperformed B/P growth portfolio in each country during the sample period on the basis of both absolute and risk adjusted returns. Cross country correlations of monthly value growth spreads were small suggesting that forming portfolio by giving more weight to value stocks would have been more effective if it's done globally. However, it is difficult to study portfolios formed on a global basis due to changing exchange rates and differences in taxation. Capaul et al. (1993) also found that in most cases B/P value portfolio had lower beta than B/P growth portfolio violating the fundamentals of Capital Asset Pricing Model (i.e. CAPM).

Trecartin (2001) examined whether B/P systematically explains the cross section of stock returns. The author studied portfolios of stocks included in NYSE, AMEX and NASDAQ during a sample period of 1963-1997. The results indicate that high B/P ratio is positively and significantly related to return in only 43% of the monthly regressions. The author also argues that

B/P value portfolio doesn't outperform B/P growth portfolio in a short investment period. However, there was a significant positive correlation between high B/P and stock returns in an investment period of 10 years. Trecartin's (2001) results also imply that while B/P ratio doesn't consistently correlate with expected returns, high B/P might not defend its place as a risk proxy.

2.1.3 Sales Multiples

Sales to price (i.e. S/P) ratio measures sales in relation to market value of the firm. S/P is regarded as good value measure in valuating start up firms that usually have no earnings (often negative) at their outset. Additionally, S/P values are more stable than those of E/P. Similarly to E/P, S/P is most feasible within industry comparisons. S/P is calculated by dividing the revenue per share for the trailing 12 months or the expected sales per share by stock's current price. However, in studies concerning value investing, realised sales are employed:

$$\frac{SPS}{P_0} = \frac{Sales\ per\ share}{Stock\ price} \qquad \text{(Eq. 5)}$$

Suzuki (1998) reports that S/P value portfolio outperforms the corresponding growth portfolio in the Tokyo Stock Exchange (TSE). The author shows that S/P value portfolio outperforms the comparable value portfolios based on E/P and B/P in six years during the sample period 1982-1996. Equation 6 illustrates that equation 5 can be broken into two components: the asset turnover (sales/total assets) and operating leverage (total assets/market value). S/P will go up as a result of a rise in asset turnover or leverage. Asset turnover is somewhat sensitive to market conditions while leverage is substantially influenced by management's risk aversion. A firm that is relatively heavier on debt, has a better chance to increase its sales compared to a firm that is more averse to leverage.

$$\frac{S}{P_0} = \frac{Sales}{Total\ assets} \times \frac{Total\ assets}{Market\ value} \qquad \text{(Eq. 6)}$$

According to the results of Suzuki (1998), S/P criterion seems to be especially successful during the phases of national economic recovery. By using S/P criterion investors have a wider set of stocks and industries to choose from compared to B/P and E/P criteria. This implies that managing the idiosyncratic portfolio risk is easier with S/P criterion than with using the other two. Senchack and Martin (1987) show that investing in S/P and E/P value portfolios generates returns that are well above the market portfolio. Their sample consists of NYSE and AMEX stocks in the sample period 1976-1984. However, E/P value portfolio dominates the comparable S/P value portfolio on both absolute and risk adjusted basis. Relative performance of E/P value portfolio is more consistent during the sample period than that of S/P value portfolio. Senchack and Martin find that firm size effect is stronger in S/P value portfolio than in E/P value portfolio.

2.2 Beta, CAPM and Revisited Returns

Whether beta predicts future returns has been examined in the academic literature since at least 1970's most visibly studied by Fama and French (1992, 1998). Researchers around the world have to date disagreed on whether the market beta unrelated to size and the value growth characteristics is rewarded by the market. Market beta is calculated by dividing the covariance between stock return and market portfolio return by the variance of market portfolio return:

$$\beta = \frac{\mathrm{cov}\ (r_i, r_m)}{\sigma_m^2} \qquad \text{(Eq. 8)}$$

where

$cov(r_i, r_m)$ = the covariance between the return of stock i and market portfolio return

σ^2_m = the market variance

Beta is a measure of the sensitivity or systematic (undiversifiable) risk of a security or a portfolio in comparison to the market portfolio as a whole. There should be a positive correlation between undiversifiable market risk and expected returns because investors require higher return as a compensation for taking higher risk. According to Capital Asset Pricing Model the relation between market risk and expected return can be written as follows:

$$R_i = R_f + \beta_i \times (R_m - R_f) \qquad \text{(Eq. 9)}$$

where

R_i = the return of portfolio *i*

R_f = the risk free rate of return

R_m = the stock market return

β_i = the beta coefficient of portfolio *i*

A wide array of recent empirical studies has been incapable of identifying the relation between the market beta and returns predicted by the CAPM. The conventional tests of the CAPM in the spirit of Fama and McBeth (1973) carry a joint hypothesis that there is a relationship between beta and returns revisited and that the market risk premium is positive. Fama and French (1992) reported that there is no interdependence between market beta and return when firm size and B/P are the other explanatory variables. The test was replicated in the German stock market by Schlag and Wohlshieß (1997) with a same kind of result. One possible explanation for the results is that realised market risk premiums are often negative even if the expected risk premium is positive. However, the conditional test popularised by Pettengil et al. (1995) allows to

independently test if there is a relation between beta and realised returns. Their empirical results provide support for a positive and statistically significant relationship between beta and realised returns. Similarly, Elsas et al. (2003) show that there is an evident relation between beta and realised returns. The authors examined monthly stock returns on the German equity market in a sample period 1965-1995. The authors argue that earlier studies have failed to discover connection because the traditional tests neglect the conditional nature of the relation between beta and returns and the fact that the average market risk premium in the test period has been so close to zero.

2.3 Momentum Anomaly

Momentum is the empirically observed tendency for rising stock prices to rise further and falling prices to keep falling. It was first shown, by Jegadeesh and Titman (1993, 1999) that stocks with strong past performance continue to outperform stocks with poor past performance in the next period with an average excess return of about 1 % per month. The behavioural explanation is that investors are irrational because they underreact to new information by failing to adjust for news in their transaction prices (Barberis et al., 1998). The news is not immediately reflected in the price and so continues to have an impact in subsequent periods. However, recent research has argued that momentum can be observed even with perfectly rational traders (Crombez, 2001). The author considers an environment where investors are rational, markets are efficient and there are information imperfections. Based on a simulation experiment, the author finds that returns on momentum strategies can exist because of the noise in expert information. Accordingly, the costly public information of expert knowledge reflected in the forecasts is slowly diffused in the markets. This means that stock prices do not fully reflect all public information on a timely manner even though the investors are rational. The empirical evidence of Crombez (2001) shows that even in a

sample of large and liquid stocks this noise is still observable and momentum can be found for these samples.

2.3.1 Industry Dependence

Moskowitz and Grinblatt (1999) document a strong and persistent intermediate term industry momentum effect in the US that is not explained by microstructure effects, individual stock momentum or the cross sectional dispersion in mean returns. Furthermore, Scowcroft and Sefton (2005) show that large cap momentum among MSCI World stocks is driven mainly by industry momentum, not individual stock momentum. Among small cap stocks, firm specific effects have more significance. The authors report that fund managers can add alpha to their portfolios by building in sector tilts based on past return performance. This increase in performance will come at the cost of somewhat increased risk, both from the sector tilts and from the exposure to momentum.

Boni and Womack (2006) document that analysts create value in their recommendations mainly through their ability to rank stocks within industries. Analysts provide added value through recommendation upgrades and downgrades at the industry level which is significantly greater than resulting from a non specialised firm coverage. Moreover, a strategy based on buying upgrades and selling downgrades also appears to be more efficient than price momentum strategies based on past returns. The authors conclude that recommendation information is quite valuable in identifying short term industry specific mispricing but this same information is not as valuable in projecting future relative returns across industries.

2.3.2 Reversal Effect

A fundamental question in momentum investing is how a stock's past return history affects future stock returns. The intermediate term momentum effect was first documented by Jegadeesh and Titman (1993). More recently, Figelman (2007) documents existing short term reversal, intermediate term momentum and long term reversal among S&P 500 stocks. His evidence suggests that short term reversal is a stock specific phenomenon. Intermediate term momentum appears to be dependent both on the industry and the company. Consistently with the previous literature, the author argues that intermediate term momentum is caused by slow dissemination or interpretation of news in the market and long term reversal effect is weakest of the three. Like intermediate momentum, it is driven by both industry and firm specific factors, although the stock specific evidence is much weaker. According to the author there might be a relation between the long term reversal effect and the outperformance of value stocks over growth stocks.

Park (2010) shows that neither the pure 52-week high nor the moving average ratio strategy contributes to long term reversals even when long term reversals measured by past returns are observed. This suggests that intermediate term return continuation and long term return reversals are separate phenomena and that separate theories for long term reversals should be developed. Moreover, McLean (2010) documents that reversal represents a larger mispricing than momentum after testing whether idiosyncratic risk can explain the persistence of the momentum and reversal effects. He reported that reversals are stronger in high idiosyncratic risk firms. The results suggest that idiosyncratic risk plays an important role in preventing arbitrage in relatively large reversal mispricing. Momentum generates a smaller return than reversal suggesting that the transaction costs are sufficient to prevent arbitrageurs from eliminating momentum mispricing.

2.3.3 52-Week High

George and Hwang (2004) report that when coupled with a stock's current price, the 52-week high price explains a large portion of the profits from momentum investing. According to the authors, nearness to the 52-week high dominates and improves compared to the forecasting power of past returns for future stock returns. Unlike traditional momentum strategies when using 52-week high future returns do not reverse in the long run. This suggests that short term momentum and long term reversals are largely separate phenomena. Consistently with the results of Jegadeesh and Titman (1993), these findings present a challenge to the current theory that markets are semi strong efficient. Furthermore, the nearness of a stock's price to its 52-week high is public information which makes it relatively easy to use. It is also much better predictor of future returns than past returns to individual stocks. Results of George and Hwang (2004) indicate that the 52-week measure has predictive power whether or not individual stocks have had extreme past returns. This suggests that the price level itself is important.

Similarly, Marshall and Cahan (2005) find that the 52-week high momentum strategy is highly profitable on Australian stocks that have been approved for short selling during a sample period of 1991-2003. They document an average return of 2.14 % per month which is substantially greater than the corresponding return for this strategy in the US and the return to other momentum strategies in Australia. The profitability of the 52-week high strategy is consistent in different size and liquidity groups and remains in the risk adjusted framework. Consistently with the results of George and Hwang (2004) and Marshall and Cahan (2005), Burghof and Prothmann (2009) document that the 52-week high strategy largely dominates the traditional momentum strategy and that the distance of a stock's price to its 52-week high price is a better predictor of future returns than traditional momentum criteria using German stock data in a sample period 1980-2008. In addition, the authors show that the

average monthly return of industry momentum is much smaller than the individual stock momentum profits.

2.3.4 Acceleration Effect

Moving average is an indicator that is frequently used in technical analysis showing the average value of a stock's price over specific time period. Moving averages are generally used to measure momentum. One of the technical trading rules introduced in Reilly and Norton (2003) suggests that investors buy stocks when the short term moving average line crosses the long term moving average line from below and sell stocks when the short term moving average line crosses the long term moving average line from above (acceleration rate, henceforth AR).

Park (2010) shows that an investment strategy that ranks stocks based on the ratio of the 50 day moving average to the 200 day moving average (AR), buys the highest ratio stocks and sells the lowest ratio stocks, returns over the subsequent 6-month period substantially more than momentum strategies based on past returns or the 52-week high strategy. The author shows that, overall, ratios of a short term moving average to a long term moving average have significant predictive power for future returns distinct from either past returns or nearness to the 52-week high. Each of the moving average ratio combinations generated statistically significant profits, even when controlling for traditional momentum and the 52-week high. For all short and long term moving average combinations tested, the moving average ratio has more predictive power than the past 12-month return. The ratio of a short term moving average to a long term moving average along with the ratio of the current price to the 52-week high seem to explain most of the intermediate term momentum. This suggests that some investors regard moving average prices and some the 52-week high as their reference prices. However, the proportion of these investor groups that overlap is unclear.

2.4 Interaction of Value and Momentum

Researchers have convincingly demonstrated that value strategies and momentum strategies violate the efficient market hypothesis, but often done so separately. Even though both value and momentum strategies are effective, Bird and Whitaker (2004) report that the added value of value and momentum strategies are negatively correlated. Asness (1997) documents that in the US stock market value strategies work overall but are strongest among low momentum (loser) stocks and weakest among high momentum (winner) stocks. The author argues that the interdependence of value and momentum to future returns is not only stronger holding the other variable constant but the relation is conditional on each other.

Bird and Casavecchia (2007) argue that the traditional valuation multiples, used to identify value stocks, don't provide enough assistance when these stocks should be bought. The authors argue that one way is to delay entry into these stocks until there is a clear change in their momentum. They illustrate that the hit rate, the proportion of stocks outperforming the market portfolio, from investing in value stocks measured with P/S over a one year period in the 15 European countries during a period 1969-2004 increased from 42 percent to 53 percent on average by using a price momentum indicator to time entry into value stocks. Given the difficulty of forecasting the timing of the turnaround for a value firm, the authors conclude it may be preferable to react to sentiment changes rather than trying to predict them. However, Bird and Whitaker (2004) document an outperformance of the value loser portfolio when using 6-month past returns as a timing indicator and P/B as a measure for relative valuation. They argue that value loser stocks are late in their negative momentum cycle and will soon turn around and start generating positive abnormal returns.

More recently, Leivo and Pätäri (2011) document enhanced value premium in the Finnish stock market using 6-month price momentum. Best composite value measure tested during the period 1993-2008 is the combination of D/P (dividend yield), EBITDA/EV and B/P. The best risk adjusted performance would have been achieved by investing in that strategy with the inclusion of momentum. The average annual return during the 15 year test period would have been almost 25 percent which exceeds the average stock market return during the same period by a hefty 10 percentage points. During the same period, the annual volatility would have been 17.87 % which is nearly 4 percentage points lower than the Finnish stock market volatility. In addition, the average hit rate of value strategies improved from 49.9 % to a convincing 53.2 % when momentum is included as a secondary screen.

3 DATA AND METHODOLOGY

This section gives an overview of the sample data used for finding most efficient valuation criteria to screen genuinely undervalued stocks, a strategy enhanced by including a secondary screen, price momentum, to improve timing for entry. All strategies are based on a weekly return time series extending from May 1, 2001 to April 30, 2011. First, details on composing the value, momentum and value momentum portfolios constituting of SPI Index companies employing IFRS standards are presented. This is followed by a discussion on the characteristics of the relative performance measures employed in the study. Next, the statistical tests employed to calculate the significance levels of the potential performance differences are introduced. Finally, the characteristics unique to the selected sample are described.

3.1 Portfolio Formation

The portfolios are constructed of those Swiss companies that employ IFRS standards in their financial statements and are included in the SPI Index. The SPI Index is considered among investors the most comprehensive market index for Swiss equities. However, an average return of the sample stocks is used as a market return due to the relatively heavy weight of financials in SPI Index. During the sample period, the correlation between the SPI Total Return Index and the SPI Financials Total Return Index is tremendeously high exceeding 0.8 and thus presents no representative benchmark for the sample stocks. In addition, a constructed market index provides more challenging benchmark since the financial sector has severely underperformed against the SPI Index during the sample period. Due to the fact that the financial companies' balance sheets are treated differently compared to non financial companies, banks and insurance companies are excluded from the sample.

The sample also includes the stocks of the companies that were delisted during the observation period in order to avoid survivorship bias. Additionally, firms having a fiscal year starting from other month than January are omitted from the sample. The final sample size ranges from 81 (2010) to 93 (2005) which may indicate of increased M&A activity during 2005-2010 because the sample size gradually decreases from 2005 to 2010. Weekly total return data is retrieved from the Bloomberg database. A minimum portfolio size of 14 stocks, achieved in the six quintile value portfolio division, is estimated to be enough to avoid serious idiosyncratic risk in the sample portfolios. Due to lacking Swiss market interest rate, the most comparable 1 month SNB (Swiss National Bank) interest rate data is employed as a proxy for risk free rate of return in the study.

The whole analysis is divided in two different parts. First part analyses the results on value-only and momentum-only strategies and the performance differences between the comparable extreme portfolios (the five quintile portfolios are denoted as Q1, Q2, Q3, Q4 and Q5). Second part analyses the performance differences of value-only strategies and the comparable value strategies after the inclusion of best momentum indicator (P1 denotes for value winner, P2 for value loser, P3 for growth winner and P4 for growth loser). In the second part, the middle portfolio is practically omitted from examination and the comparison is rather done against market portfolio since it is the benchmark. In the second part, the added value of the inclusion of momentum is analysed for both individual value measures and composite value measures. The stocks are ranked according to their relative valuation based either on individual or composite measures at the date of portfolio (re) formation on the first trading day of May of each year. The stocks are then divided into quintile portfolios based on the selected formation criterion. All the ratios are based on the financial statements of the previous calendar year. Even though a value investor would be more into a longer investment period, this thesis aims to contribute more to the portfolio managerial benefit of shorter term value investing. Five different price momentum indicators are tested to reveal their relative predictive power. Momentum measure providing largest premium is included as a secondary criterion to time entry for value stocks.

In order to examine the diagonal effect of value and momentum, the effect of including momentum as a secondary screening criterion, stocks are first ranked according to relative valuation indicated by several individual value measures and several composite value measures. Ranked stocks are then divided into three quantiles: value stocks, middle portfolio and growth stocks. Value and growth portfolios are further divided into two groups according to the most efficient momentum indicator during the sample period 2001-2011; value stocks are divided into value winner (P1) and value loser (P2) stocks and growth portfolio is split into growth winner (P3)

and growth loser (P4) stocks. This means that some stocks in the sample are not included in the portfolios which accounts for approximately one third of each year's sample size.

3.2 Performance Evaluation

Performance of each portfolio is analysed by using the Sharpe ratio and the Jensen alpha, The Sharpe ratio is calculated by subtracting the risk free rate (i.e. 1-month SNB interest rate) from the rate of return for a portfolio and dividing the result by the standard deviation of the portfolio returns:

$$Sharpe\ ratio = \frac{R_i - R_f}{\sigma_i} \qquad \text{(Eq. 9)}$$

where

R_i = the average weekly return of a portfolio *i*

R_f = the average weekly risk free rate of return

σ_i = the volatility of the weekly excess return of a portfolio *i*

The Sharpe ratio or the Sharpe Index measures risk adjusted performance of a risky asset or a trading strategy. It indicates whether a portfolio's returns are due to a superior investment strategy or an outcome of excess risk. The greater the Sharpe ratio, the more superior its risk adjusted performance observed ex post has been. The Sharpe ratio has also been criticised of oversimplifying the concept of risk. If the return distribution is left skewed, standard deviation penalises from the upside return potential that would be positive from investor's point of view. Subsequently, the adjusted Sharpe ratio is employed to account for the skewness and kurtosis characteristics of return distributions. Applying the framework of Favre and Galeano (2002), the adjusted *Z* value (i.e. Z_{CF}) is first determined. Z_{CF} is calculated by employing the fourth order Cornish Fisher expansion:

$$Z_{CF} = Z_C + \frac{1}{6}\left(Z_C{}^2 - 1\right)S + \frac{1}{24}\left(Z_C{}^3 - 3Z_C\right)K - \frac{1}{36}\left(2Z_C{}^3 - 5Z_C\right)S^2 \quad \text{(Eq. 10)}$$

where

Z_C = critical value for the probability based on normal distribution

S = skewness of the return distribution

K = excess kurtosis of the return distribution

Sample skewness and kurtosis are determined, respectively, as follows:

$$S = \frac{1}{T}\sum_{t=1}^{T}\left(\frac{r_t - r}{\sigma}\right)^3 \quad \text{(Eq. 11)}$$

$$K = \frac{1}{T}\sum_{t=1}^{T}\left(\frac{r_t - \bar{r}}{\sigma}\right)^4 - 3 \quad \text{(Eq. 12)}$$

Next, the skewness and kurtosis adjusted deviation (SKAD) is calculated by multiplying the standard deviation by the Z_{CF}/Z_c relative. The 95 % confidence level is employed to reach an approximate Z_{CF}/Z_c level of 1.96 as suggested by Favre and Galeano (2002). Finally, SKAD is substituted for standard deviation and the skewness and kurtosis adjusted Sharpe ratio (SKASR) can be written as follows (Pätäri, 2011):

$$SKASR = \frac{R_i - R_f}{SKAD_i^{(ER/|ER|)}} \quad \text{(Eq. 13)}$$

where

$SKAD_i$ = skewness and kurtosis adjusted deviation of the weekly excess returns of a portfolio i

Jensen's alpha measures the excess return (ex post) on a portfolio over its theoretical expected return predicted by the traditional CAPM given the portfolio's weighted beta and the average market risk premium. A positive value of Jensen's alpha translates into superior performance of the portfolio. Correspondingly, negative Jensen's measure is indicative of

underperformance in terms of expected return of the portfolio modelled in by the traditional CAPM. Jensen's alpha is calculated as follows:

$$\alpha_i = R_i - R_f - \beta_i \left(R_m - R_f\right) \quad \text{(Eq. 14)}$$

where

R_i = the return of portfolio *i*

α_i = the Jensen alpha of portfolio *i*

β_i = the beta coefficient of a portfolio *i*

R_m = the stock market return

The two factor model is used to eliminate the potential size effect in the measured Jensen alpha. The SMB factor is constructed by employing MSCI Switzerland Small Cap Total Return and MSCI Switzerland Large Cap Total Return indices. The weekly return difference between these indices is used as a proxy for the SMB factor. The two factor model is as follows:

$$\alpha_i = R_i - R_f - \beta_{i1} \left(R_m - R_f\right) - \beta_{i2} SMB \quad \text{(Eq. 15)}$$

where

αi = the two factor alpha

SMB = the return difference between small and large cap stocks

β_{i1} = factor sensitivity to stock market

β_{i2} = factor sensitivity to SMB factor

3.3 Statistical Tests

In the spirit of Pätäri et al. (2008), the statistical significances of differences between compared pairs of the Sharpe ratios are indicated by the Jobson Korkie test. Typographical error in the original article (Jobson and Korkie, 1981) is considered and thus the corrective procedure by Memmel (2003) is applied:

$$z_{JK} = \frac{Sh_i - Sh_j}{\sqrt{V}} \qquad \text{(Eq. 16)}$$

where

V = asymptotic variance of the Sharpe ratio difference:

$$V = \frac{1}{n}\left[2 - 2\rho_{ij} + \frac{1}{2}\left(Sh_i^2 + Sh_j^2 - 2Sh_i Sh_j \rho_{ij}^2\right)\right] \qquad \text{(Eq. 17)}$$

where

Sh_p = the Sharpe ratio of a portfolio p

ρ_{ij} = correlation between returns of portfolios i and j

n = number of observations

In addition, statistical significance of differences between portfolio alphas (i.e. alpha spread) is tested by applying the Welch's t test:

$$t = \frac{\alpha_i - \alpha_j}{\sqrt{SE_{\alpha i}^2 + SE_{\alpha j}^2}} \qquad \text{(Eq. 18)}$$

where

α_p = the Jensen alpha of a portfolio p

SE_p = the standard error of a portfolio p

The degrees of freedom for the t statistic are calculated as follows:

$$v = \frac{\left(SE_{\alpha i}^2 + SE_{\alpha j}^2\right)^2}{\frac{SE_{\alpha i}^4}{v_i} + \frac{SE_{\alpha j}^4}{v_j}} \qquad \text{(Eq. 19)}$$

where

v_i, v_j = the degrees of freedom defined on the basis of number of time series returns in samples i and j ($v = n - 1$)

Newey West (1987) standard errors are used in statistical tests to avoid econometric problems stemming from autocorrelation and heteroskedasticity. In addition, Jarque and Bera (1980) normality test is conducted for each regression (Appendices 1, 2 and 3). Due to the relatively high frequency of weekly data, kurtosis is considerably high for all the portfolios tested during the sample period. Interestingly, the value portfolio returns tend to possess lower kurtosis than the market portfolio and the growth portfolio and thus favours value strategies in relative terms. However, the value portfolio returns are prone to negative skewness more than the returns on growth portfolios which may at least in some cases offset the positive relative difference in kurtosis. During the sample period, the variance inflation factors (VIF) between the market return and the SMB factor was 1.14, on average, for both the market return and the SMB factor showing practically no multicollinearity indicating that there is only little correlation between these two explanatory factors. Even though variance inflation factor works better for regressions with more than two explanatory variables, the low VIF ratio indicates that the level of multicollinearity is low enough from the viewpoint of statistical inference.

3.4 Sample Description

The descriptive statistics of the 10 year sample data for the extreme portfolios is exhibited in Table 1 where Q1 and Q5 sample characteristics are documented, respectively. Since the extreme values of sample characteristics are included in the study, the most informative metrics illustrated in Table 1 is the median. It indicates the characteristic valuation of the three quantile portfolios as well as that of the whole sample during the period examined (i.e. 2001-2011). Yearly descriptive statistics (not reported) would reveal the time varying nature of the median value indicating the relative value of each valuation class at the time of portfolio (re) formation. The descriptive statistics for the portfolios based on individual criteria are presented in the Panel A. The corresponding

Table 1. Descriptive statistics for portfolio formation (2001-2011).

Panel A

	minimum	mean	median	maximum
E/P				
ALL	-9.8011	-0.0122	0.0487	0.7635
Q1	0.0615	0.1496	0.1048	0.7635
Q5	-9.8011	-0.3411	-0.1109	0.0284
EBITDA/EV				
ALL	-0.6271	0.1061	0.1028	1.1632
Q1	0.1031	0.2358	0.1884	1.1632
Q5	-0.6271	-0.0317	0.0230	0.0641
CF/P				
ALL	-0.8942	0.1121	0.0870	1.2732
Q1	0.0921	0.3274	0.2527	1.2732
Q5	-0.8942	-0.0554	-0.0059	0.0436
B/P				
ALL	-2.3701	0.6986	0.5627	3.6931
Q1	0.6268	1.4820	1.3711	3.6931
Q5	-2.3701	0.2020	0.2123	0.4870
Relative B/P				
ALL	-5.4288	1.1544	1.0000	12.1884
Q1	0.8382	2.0421	1.7403	12.1884
Q5	-5.4288	0.5799	0.6061	1.1286
S/P				
ALL	0.0000	1.8734	1.1014	30.8207
Q1	1.2013	5.2743	3.8590	30.8207
Q5	0.0000	0.2570	0.2159	1.1306
2A (E/P * B/P)				
ALL	-8.0227	-0.0366	0.0193	1.4502
Q1	0.0290	0.1584	0.0939	1.4502
Q5	-8.0227	-0.4100	-0.0805	0.0082
2B (EBITDA/EV B/P)				
ALL	-13.8266	1.3356	0.8911	30.3353
Q1	1.6087	4.2517	3.2943	30.3353
Q5	-13.8266	-0.5726	0.0456	0.4241
2C (CF/P B/P)				
ALL	-25.6665	1.8254	0.8434	42.2891
Q1	1.8044	7.1986	4.3432	42.2891
Q5	-25.6665	-0.9525	-0.0395	0.4000

Panel B

	minimum	mean	median	maximum
2D (CF/P S/P)				
ALL	-103.3463	2.8420	0.8579	216.3838
Q1	2.7315	13.3434	5.9043	216.3838
Q5	-103.3463	-2.0482	-0.0124	0.1541
2E (EBITDA/EV S/P)				
ALL	-13.7518	1.6952	0.9601	37.4338
Q1	1.9093	5.6942	3.9361	37.4338
Q5	-13.7518	-0.4916	0.0251	0.3005
3A (CF/P B/P S/P)				
ALL	-297.5181	4.7149	0.7643	298.9084
Q1	3.3901	25.7596	10.1717	298.9084
Q5	-297.5181	-5.4984	-0.0117	0.1203
3B (EBITDA/EV B/P S/P)				
ALL	-3.7185	3.1471	0.9750	75.9818
Q1	2.7266	11.9971	7.6779	75.9818
Q5	-3.7185	-0.0718	0.0157	0.2067
Current price to 52-week high ratio				
ALL	0.0815	0.8011	0.8694	1.7037
Q1	0.7265	0.9773	0.9879	1.7037
Q5	0.0815	0.5678	0.5850	0.8996
50 day MA to 200 day MA ratio (AR)				
ALL	0.1894	1.0021	1.0173	2.1213
Q1	0.8889	1.1668	1.1744	2.1213
Q5	0.1894	0.8315	0.8346	1.0488
Composite - SQRT(52-week high * AR)				
ALL	0.1242	0.8921	0.9499	1.4574
Q1	0.8221	1.0441	1.0474	1.4574
Q5	0.1242	0.6928	0.7120	0.9713
Past 12-month return				
ALL	-89.64 %	9.38 %	2.35 %	366.82 %
Q1	-21.88 %	62.92 %	57.56 %	366.82 %
Q5	-89.64 %	-33.71 %	-33.33 %	13.99 %
Past 6-month return				
ALL	-82.59 %	8.37 %	5.84 %	320.25 %
Q1	-2.34 %	44.48 %	42.53 %	320.25 %
Q5	-82.59 %	-21.23 %	-19.15 %	8.33 %

The table exhibits minimum, mean, median and maximum values for both each individual valuation multiple and each composite measure as well as for the pure momentum portfolios (Panel A and B) employed as a basis of portfolio formation for the full sample period (May 2001 - May 2011). The comparable figures for value portfolio (Q1) and growth portfolio (Q5) are also reported separately.

statistics for the portfolios based on the composite value measures are exhibited in the Panel B.

For calculating the different variants of EBITDA/EV, E/P, CF/P, B/P and S/P (inverses of the traditional multiples to eliminate the nonlinearity around zero denominators), the absolute values are median adjusted to balance the influence of both valuation multiples in the composite value measure. Comparable median standardised figures are multiplied by each other. In the E/P B/P composite value measure, the unadjusted E/P and B/P values are multiplied as it is the original purpose of the Graham measure (Graham, 1949). Composite momentum measure is calculated as a square root of the product of 50 day moving average to 200 day moving average ratio and the current price to 52-week high ratio.

4 PERFORMANCE COMPARISON

In this section, the relative performance of the five quintile value-only and momentum-only portfolios (in respect to all performance metrics employed in the study) formed both on the basis of individual valuation s and composite value measures as well as on the basis of several price momentum indicators. For each selection criteria the performance of five quintile portfolios is illustrated, especially for the extreme five quintile portfolios. The first part sheds light on the relative performance of value based strategies, the second part on the performance of several momentum strategies while the third part reveals whether momentum as a timing indicator can add value to top six quintile value strategies and to what extent. Six quintiles (i.e the extreme three quantiles are divided into two groups by momentum indicator) are used in order to achieve diversification of similar degree between value-only (i.e. Q1) and value momentum portfolios (i.e. P1 and P2). All the extreme five quintile portfolios as well as the value momentum portfolios are compared to each

other and to the market portfolio in the Markowitzian risk return framework at the end of each section.

4.1 Results from Value Based Investing

In the first part of valuation based strategies, the relative performance of individual valuation multiples is examined to find out which measures should be combined into a new composite value measure. In the second part, these composite measures are investigated in order to trace the added value from combining multiple valuation metrics. Results are documented in Tables 2 and 3, respectively.

4.1.1 Strategies Based on Individual Multiples

The comparison of individual valuation ratios reveals CF/P to be the best selection criterion for value portfolio (Table 3). Investing in the CF/P (Q1) would have yielded annually 21.70 %, on average, against 20.07 % of EBITDA/EV (Q1) and 18.69 % of E/P (Q1). CF/P (Q1) portfolio would have returned almost 10 percentage points more than the market during the sample period 2001-2011. Alpha spread between the CF/P extreme portfolios was 13.80 % (at 1 % level, see Table 2). Traditional Sharpe difference would have allowed the largest value premium title for CF/P but taking into account the distributional asymmetries, EBITDA/EV reveals to be more efficient (both at 5 % level). It also provides the best quintile consistency among earnings multiples with regard to all return and performance metrics (see Table 3). Interestingly, the traditional Sharpe ratio would have granted E/P a significant value premium but taking into account both skewness and kurtosis, the SKASR difference is no longer significant (even at 10 % level). Somewhat surprisingly, even S/P offers larger SKASR difference than E/P which deviates from the results gained from the Finnish stock market by Pätäri and Leivo (2009). Measured by alpha spread, using B/P as a screening criterion would have led to the

Table 2. Performance Comparison of Value (Q1) and Growth (Q5) Portfolios as well as Winner (Q1) and Loser (Q5) Portfolios (2001-2011).

Variable	Sharpe difference		SKASR difference		Alpha spread		Two factor alpha spread		Two factor beta (Rm)		Two factor beta (SMB)	
	Z (Q1 vs. Q5)	(sign.)	Z (Q1 vs. Q5)	(sign.)	Q1 vs. Q5	(sign.)	Q1 vs. Q5	(sign.)	Q1	Q5	Q1	Q5
Panel A												
E/P	2.0160	(0.044)	1.6352	(0.102)	8.37 %	(0.029)	8.11 %	(0.033)	0.89	1.05	0.03**	0.01
EBITDA/EV	2.8239	(0.005)	2.4038	(0.016)	12.65 %	(0.003)	12.00 %	(0.002)	0.90	1.09	0.05**	-0.02
CF/P	3.0975	(0.002)	2.3113	(0.021)	13.80 %	(0.004)	13.34 %	(0.002)	0.83	1.06	0.05**	0.00
B/P	2.6665	(0.008)	2.3412	(0.019)	15.05 %	(0.001)	14.07 %	(0.001)	0.78	1.17	0.01	-0.09***
Relative B/P	0.0135	(0.989)	-0.2278	(0.820)	-0.39 %	(0.935)	-0.43 %	(0.924)	1.06	1.00	0.01	0.01
S/P	2.5913	(0.010)	1.9050	(0.057)	11.66 %	(0.004)	10.90 %	(0.003)	0.96	1.00	0.05**	-0.04
Panel B												
2A (E/P * B/P)	2.4031	(0.016)	1.9143	(0.056)	9.54 %	(0.036)	9.12 %	(0.023)	0.82	1.07	0.05***	0.00
2B (EBITDA/EV B/P)	3.1955	(0.001)	2.6459	(0.008)	15.67 %	(0.001)	14.58 %	(0.000)	0.82	1.15	0.05*	-0.07***
2C (CF/P B/P)	3.5747	(0.000)	2.7366	(0.006)	15.75 %	(0.001)	15.19 %	(0.000)	0.81	1.08	0.04*	-0.02
2D (CF/P S/P)	3.1069	(0.002)	2.4180	(0.016)	14.20 %	(0.002)	13.77 %	(0.001)	0.90	1.05	0.04*	-0.01
2E (EBITDA/EV S/P)	2.0964	(0.036)	1.6729	(0.094)	9.79 %	(0.023)	8.96 %	(0.021)	0.89	1.09	0.07***	-0.02
3A (CF/P B/P S/P)	3.0142	(0.003)	2.4135	(0.016)	14.03 %	(0.002)	13.50 %	(0.002)	0.85	1.05	0.04*	-0.02
3B (EBITDA/EV B/P S/P)	2.9700	(0.003)	2.3067	(0.021)	15.11 %	(0.001)	14.13 %	(0.001)	0.86	1.08	0.05**	-0.06***
Panel C												
Current price to 52-week high ratio	5.3302	(0.000)	3.8025	(0.000)	28.04 %	(0.000)	27.70 %	(0.000)	0.63	1.37	0.01	-0.03
50-day MA to 200-day MA ratio (AR)	2.9047	(0.004)	2.3965	(0.017)	16.28 %	(0.001)	15.65 %	(0.001)	0.80	1.20	0.04*	-0.03
Composite SQRT(52-week high * AR)	5.3680	(0.000)	3.9332	(0.000)	28.43 %	(0.000)	27.91 %	(0.000)	0.69	1.37	0.03*	-0.03
Past 12-month return	2.7080	(0.007)	1.8565	(0.063)	14.70 %	(0.002)	14.17 %	(0.004)	0.78	1.30	0.04**	-0.02
Past 6-month return	3.6666	(0.000)	2.9702	(0.003)	19.96 %	(0.000)	19.16 %	(0.000)	0.86	1.21	0.05*	-0.04*

Notes: The table presents performance differences between value (Q1) and growth (Q5) portfolios (Panel A for individual ratios whereas Panel B for composite measures), as well as between winner (Q1) and loser (Q5) portfolios (Panel C) on the basis of several performance metrics (i.e., the Sharpe ratio, the SKASR, the Jensen alpha, and size adjusted two factor alpha) for each portfolio formation criterion (significance levels are in parentheses). In addition, corresponding two factor betas are reported in the two last columns. Statistical significance of SMB betas are reported as follows: *** is significant at 1 % level, ** is significant at 5 % level and * is significant at 10 % level.

largest value premium within the individual measure discipline in the Swiss equity market which is consistent with the finding of Fama and French (1998). The annual alpha spread during the 10 year sample period was 15.05 % and still 14.07 % after controlling for size (both at 1 % level). Also the SKASR difference reveals to be statistically significant (at 5 % level). This suggests that there might at least to some extent market specific persistence in that which criterion sustains as the most efficient one over time when measured by alpha spread. Investing in the stocks measured by B/P returned annually 17.93 %, on average, and an annual alpha of 5.40 % (at 5 % level), whereas having the 20 % most expensive stocks in the portfolio would have generated only an average annual return of 2.86 % and an annual alpha of -9.86 %. The B/P selection criterion offers best quintile consistency in terms of SKAD and market risk (beta) which could provide added value with regard to composite value measures. No evidence that relative B/P would provide assistance for screening stocks as such is reported which is shown by relatively even returns of corresponding quintile portfolios. This is also witnessed in the risk adjusted framework (Figure 1) between Q1 and Q5.

The S/P screening appears to have no significant discrimination power (Figure 1). Even though the average annual return distribution between quintile portfolios appears to show good consistency, both the annual alpha and the adjusted Sharpe comparison reveal that S/P (Q3) would have been the most successful S/P strategy during the sample period 2001-2011. Somewhat expectedly, S/P (Q5) strategy returned least among individual screen quintile portfolios recording an annual average return of only 0.41 % which is over 10 percentage points less than the average market return during the same period.

During the sample period May 2001 to May 2011, the value (Q1) and growth (Q5) portfolios clearly form separate clusters in terms of risk return characteristics which is illustrated in Figure 1. All the value portfolios dominate the market portfolio in the return SKAD framework while

Table 3. Return, risk and performance metrics of five quantile portfolios on individual value indicators (2001-2011).

Variable	Average annual return	Annual volatility	Sharpe	Sharpe difference – Z (Qi vs. Market)	Annual alpha	Beta	Annual SKAD	SKASR	SKASR difference – Z (Qi vs. Market)
E/P									
Q1	18.69 %	16.66 %	0.6849	1.6754*	4.68%**	0.91	19.56 %	0.5841	1.7468*
Q2	12.51 %	16.08 %	0.5100	0.4293	1.73 %	0.88	20.32 %	0.4041	0.4628
Q3	4.46 %	16.11 %	0.0484	-2.7109***	-5.67 %***	0.87	21.63 %	0.0361	-2.0479**
Q4	12.25 %	16.19 %	0.4103	-0.2135	0.55 %	0.83	19.20 %	0.3466	-0.0483
Q5	9.43 %	20.73 %	0.1970	-1.3851	-3.69 %	1.05	23.88 %	0.1712	-0.9187
EBITDA/EV									
Q1	20.07 %	17.33 %	0.7491	1.9331*	6.15 %**	0.93	18.95 %	0.6858	2.2384**
Q2	14.96 %	15.68 %	0.5720	0.7621	2.86 %	0.83	19.91 %	0.4513	0.7007
Q3	9.48 %	16.18 %	0.3184	-0.8640	-1.28 %	0.87	19.80 %	0.2606	-0.5135
Q4	6.95 %	15.99 %	0.1772	-1.5147	-3.19 %	0.82	21.03 %	0.1348	-1.1343
Q5	6.07 %	20.79 %	0.0722	-2.2238**	-6.50 %**	1.08	25.19 %	0.0596	-1.7991**
CF/P									
Q1	21.70 %	16.30 %	0.8999	2.7399***	8.35 %***	0.86	19.51 %	0.7530	2.5249**
Q2	15.17 %	15.45 %	0.5755	0.7770	2.89 %	0.81	18.85 %	0.4727	0.8256
Q3	9.85 %	15.84 %	0.3776	-0.4459	-0.22 %	0.84	21.93 %	0.2731	-0.4071
Q4	3.86 %	17.41 %	-0.0118	-3.3145***	-7.27 %***	0.96	22.63 %	-0.0091	-2.5039**
Q5	8.05 %	21.63 %	0.1109	-1.7218**	-5.44 %	1.06	22.89 %	0.1049	-1.1891
B/P									
Q1	17.93 %	16.21 %	0.6923	1.2201	5.40 %**	0.79	17.36 %	0.6473	1.5493
Q2	13.03 %	16.82 %	0.4837	0.2211	1.54 %	0.89	19.11 %	0.4263	0.5574
Q3	14.66 %	16.17 %	0.6049	0.9170	3.58 %	0.84	19.46 %	0.5031	0.9701
Q4	9.66 %	16.99 %	0.2607	-1.2125	-2.28 %	0.91	21.61 %	0.2052	-0.8573
Q5	2.86 %	21.19 %	-0.0669	-3.1258***	-9.65 %***	1.11	26.79 %	-0.0530	-2.3747**
Relative B/P									
Q1	12.80 %	20.41 %	0.2829	-0.9993	-2.13 %	1.07	20.39 %	0.2835	-0.3285
Q2	9.74 %	16.64 %	0.3151	-0.8367	-1.27 %	0.88	26.54 %	0.1979	-0.8784
Q3	12.96 %	13.55 %	0.6168	0.9505	3.23 %	0.69	16.61 %	0.5042	0.9401
Q4	13.79 %	16.68 %	0.4844	0.2142	1.64 %	0.87	19.30 %	0.4192	0.4866
Q5	9.96 %	19.95 %	0.2865	-0.8856	-1.74 %	1.01	26.55 %	0.2155	-0.6694
S/P									
Q1	17.43 %	19.00 %	0.4564	0.0462	1.37 %	0.99	21.77 %	0.3988	0.3599
Q2	15.01 %	17.79 %	0.5290	0.5494	2.29 %	0.97	20.05 %	0.4700	0.9031
Q3	13.88 %	14.31 %	0.6526	1.1545	3.93 %*	0.73	20.58 %	0.4546	0.6612
Q4	11.30 %	17.51 %	0.4083	-0.2064	0.79 %	0.86	21.03 %	0.3403	-0.0122
Q5	0.41 %	18.04 %	-0.1706	-4.1468***	-10.29 %***	0.97	24.42 %	-0.1261	-3.1181***
Market	12.42 %	16.48 %	0.4486				21.88 %	0.3513	
Rf	1.17 %	0.13 %							

Notes: Average annual return, three risk measures (i.e., volatility, SKAD, and beta) and corresponding performance metrics (the Sharpe ratio, the SKASR, and the Jensen alpha) are presented over the full sample period for every five quintile portfolio formed on the basis of individual valuation ratios. In addition, the Sharpe ratio differences and the SKASR differences between five quintile portfolios and market portfolio are reported. Statistical significances are reported as follows: *** is significant at 1 % level, ** is significant at 5 % level and * is significant at 10 % level.

the market portfolio dominates all the growth portfolios. The mean SKAD efficient set is formed by three portfolios: B/P (Q1) which has the lowest SKAD, CF/P (Q1) which provides highest average return and the best SKASR and EBITDA/EV (Q1). Consistently with the results of Capaul et al. (1993) and Pätäri and Leivo (2009), the value portfolios formed on the basis of individual selection criteria have substantially lower market risk than the corresponding growth portfolios (except for S/P and relative B/P criteria). However, the average returns of value portfolios are significantly higher than those of growth portfolios which is against the fundamental message of the traditional CAPM model. The slightly higher market risk of S/P value portfolio compared to that of S/P growth portfolio would have been compensated by remarkably higher returns of the former portfolio.

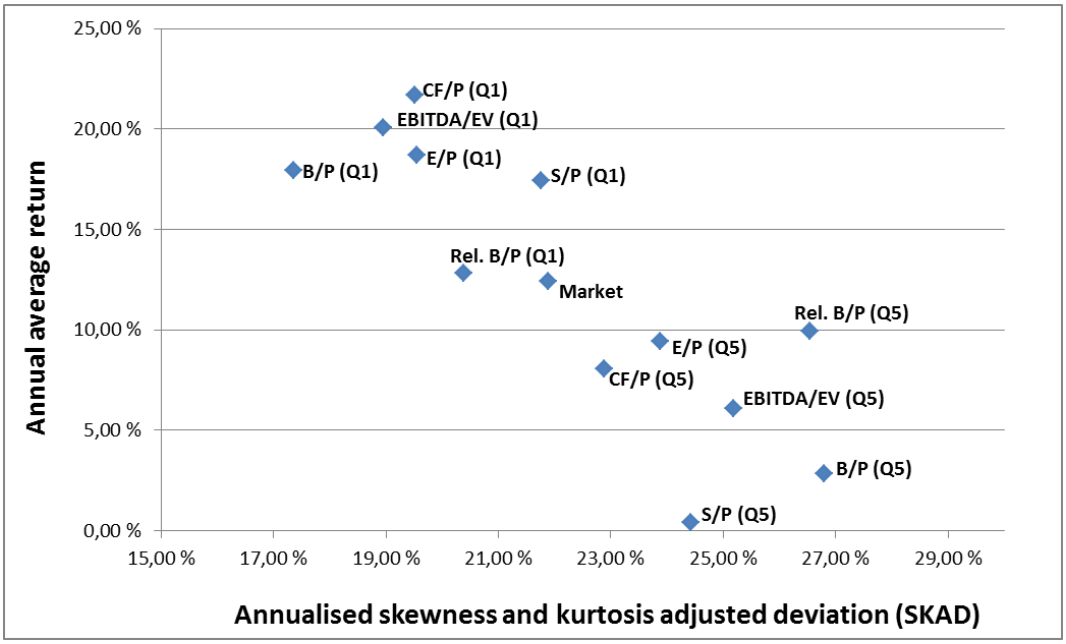

Figure 1. Risk return characteristics of value (Q1) and growth (Q5) portfolios based on individual valuation ratios (2001-2011).

4.1.2 Added Value of Composite Value Measures

The composite measure including CF/P and B/P (i.e. 2C) generates the largest value premium among all value measures, the alpha spreads being 15.75 % and 15.19 % (both at 1 % level) after controlling for size. Those

are 0.70 and 1.16 percentage points larger than the alpha spreads resulting from the B/P ranking, respectively. The SKASR difference agrees with that of the alpha spread (See Table 4). The CF/P (Q1) returns annually 23.73 %, on average, which is over 2 percentage points more than the best Q1 strategy (CF/P) based on individual multiples. The consistency between 2C quintile portfolios is, however, not as good that of its components with regard to relative quintile returns as well as the relative risk adjusted performance. Combining E/P and B/P to form the Graham ratio (2A), improves both the average annual return and the risk adjusted performance compared to E/P (Q1) and B/P (Q1) portfolios. The annual alpha of Q1 strategy is also significantly enhanced after combining the multiples (significant at 1 % level). The added value for 2A is somewhat limited as it can't provide the consistency that B/P can in terms of total risk measured by the annual SKAD. In addition, the risk adjusted performance of Q5 portfolio is slightly better than the performance of the portfolios formed based on the components of Graham ratio separately.

Similarly, when EBITDA/EV is combined with B/P, the composite screening criterion adds value in that it somewhat improves both the average annual return and the risk adjusted performance of the corresponding Q1 portfolios based on individual valuation ratios. The annual alpha of Q1 strategy can be somewhat enhanced by combining EBITDA/EV and B/P into one composite value measure. The latter provides relatively good consistency allowing only the Q2 and Q3 portfolios to have a tight battle in both the average annual return and in the risk adjusted framework. Surprisingly, the annual alpha levels of portfolios resulting from combining B/P with any earnings multiple tested are very similar varying from 6.78 % to 7.06 %. Adding a third component, S/P, to 2B or 2C doesn't add value to either the size of the value premium or to the performance of the Q1 strategies. What it does, is that it ranks the

Table 4. Return, risk and performance metrics of five quintile portfolios based on composite valuation measures (2001-2011).

Variable	Average annual return	Annual volatility	Sharpe	Sharpe difference – Z (Qi vs. Market)	Annual alpha	Beta	Annual SKAD	SKASR	SKASR difference – Z (Qi vs. Market)
2A (E/P * B/P)									
Q1	19.92 %	16.09 %	0.8263	2.3283**	7.03 %***	0.85	19.27 %	0.6910	2.1797**
Q2	12.78 %	15.39 %	0.4887	0.2560	1.47 %	0.82	17.69 %	0.4256	0.5603
Q3	8.40 %	16.49 %	0.2159	-1.4787	-2.92 %	0.88	19.42 %	0.1836	-0.9817
Q4	7.04 %	17.57 %	0.1524	-1.8325*	-4.18 %	0.93	21.91 %	0.1223	-1.3355
Q5	10.17 %	21.23 %	0.2540	-1.0527	-2.51 %	1.07	26.96 %	0.2003	-0.7452
2B (EBITDA/EV B/P)									
Q1	21.27 %	16.55 %	0.7904	1.9693**	6.78 %**	0.86	17.97 %	0.7293	2.2554**
Q2	12.36 %	16.27 %	0.4676	0.1265	1.14 %	0.88	19.08 %	0.3993	0.4081
Q3	12.89 %	16.25 %	0.5111	0.3935	1.94 %	0.86	19.01 %	0.4374	0.6267
Q4	8.38 %	16.27 %	0.2265	-1.2003	-2.37 %	0.82	21.16 %	0.1743	-0.8851
Q5	3.59 %	21.49 %	-0.0301	-2.8018***	-8.89 %***	1.12	27.19 %	-0.0238	-2.1206**
2C (CF/P B/P)									
Q1	23.73 %	15.89 %	0.9608	3.0634***	7.06 %**	0.83	19.06 %	0.8025	2.7846***
Q2	11.10 %	15.41 %	0.4237	-0.1486	-1.50 %	0.80	18.57 %	0.3523	0.0858
Q3	13.49 %	16.68 %	0.5230	0.5059	-0.03 %	0.90	23.95 %	0.3647	0.1826
Q4	3.49 %	17.35 %	-0.0224	-2.8055***	-9.17 %***	0.90	20.90 %	-0.0186	-2.1271**
Q5	6.34 %	21.33 %	0.0621	-2.0826**	-8.69 %***	1.07	23.22 %	0.0571	-1.5149
2D (CF/P S/P)									
Q1	22.72 %	17.56 %	0.8078	2.2387**	5.24 %**	0.93	20.81 %	0.6826	2.1511**
Q2	14.11 %	15.67 %	0.5397	0.5689	0.25 %	0.83	19.95 %	0.4246	0.5416
Q3	10.08 %	15.98 %	0.3865	-0.4009	-2.22 %	0.85	20.96 %	0.2951	-0.2771
Q4	6.33 %	16.41 %	0.1159	-2.0673**	-6.59 %**	0.87	21.13 %	0.0901	-1.5418
Q5	4.82 %	20.88 %	0.0416	-2.1783**	-8.95 %***	1.05	22.94 %	0.0379	-1.6076
2E (EBITDA/EV S/P)									
Q1	17.79 %	17.51 %	0.5842	0.8435	1.31 %	0.93	19.82 %	0.5169	1.1137
Q2	19.11 %	17.33 %	0.7323	1.7942**	3.81 %*	0.92	19.45 %	0.6534	1.9965**
Q3	9.69 %	14.61 %	0.3447	-0.7001	-2.88 %	0.79	18.86 %	0.2674	-0.4759
Q4	6.18 %	15.91 %	0.1498	-1.6951*	-5.73 %**	0.81	22.17 %	0.1076	-1.3078
Q5	5.59 %	20.57 %	0.0749	-2.2285**	-8.48 %***	1.07	25.14 %	0.0614	-1.6512*
3A (CF/P B/P S/P)									
Q1	22.80 %	16.73 %	0.8350	2.3176**	5.43 %**	0.88	19.78 %	0.7076	2.2205**
Q2	14.45 %	16.50 %	0.5295	0.5112	0.18 %	0.88	19.67 %	0.4448	0.6755
Q3	9.50 %	15.81 %	0.3634	-0.5758	-2.66 %	0.85	21.36 %	0.2693	-0.4641
Q4	6.83 %	16.79 %	0.1490	-1.8102**	-6.09 %**	0.88	21.56 %	0.1161	-1.3413
Q5	5.22 %	20.66 %	0.0552	-2.1098**	-8.61 %***	1.04	22.62 %	0.0505	-1.5434

3B (EBITDA/EV B/P S/P)									
Q1	20.25 %	17.29 %	0.7145	1.5011	3.74 %	0.88	19.58 %	0.6321	1.6615*
Q2	14.63 %	17.31 %	0.5226	0.4795	0.12 %	0.93	19.24 %	0.4710	0.8627
Q3	14.19 %	16.73 %	0.5235	0.4780	0.09 %	0.89	21.45 %	0.4090	0.4539
Q4	6.97 %	15.58 %	0.1804	-1.4939	-5.14 %**	0.79	19.40 %	0.1450	-1.0757
Q5	1.76 %	20.36 %	-0.0759	-2.9891***	-11.37 %***	1.05	26.81 %	-0.0577	-2.2585**
Market	12.42 %	16.46 %	0.4486				21.05 %	0.3513	
Rf	1.17 %	0.13 %							

Notes: Average annual return, three risk measures (i.e., volatility, SKAD, and beta) and corresponding performance metrics (the Sharpe ratio, the SKASR, and the Jensen alpha) are presented over the full sample period for every five quintile portfolio formed on the basis of composite valuation ratios. In addition, the Sharpe ratio differences and the adjusted Sharpe ratio differences between each five quintile portfolio and market portfolio are reported. Statistical significances are reported as follows: *** is significant at 1 % level, ** is significant at 5 % level and * is significant at 10 % level.

quintiles correctly both in absolute and risk adjusted terms providing thus better consistency of quintile rankings than do the two component measures. 3A, constituting of CF/P, B/P and S/P, seems to provide somewhat better consistency than 3B which includes EBITDA/EV, B/P and S/P. Using 3B as a screening criterion generates an alpha spread of 15.11 % which is over 1 percentage points larger than that resulting from 3A ranking (both at 1 % level). However, the SKASR difference disagrees with alpha spread on the relative efficiency of those two three composite criteria (both at 5 % level).

In the applied Markowitzian return SKAD framework the added value of composite value measures becomes fairly visible (Figure 2). As with the individual valuation ratios, the value portfolios based on the composite measures dominate the market portfolio during the sample period. Combining B/P with either EBITDA/EV (2B) or CF/P (2C) adds value to the risk adjusted performance. The annual average return is improved at the cost of somewhat increased SKAD with regard to the B/P (Q1) strategy. 2C (Q1) recorded the best SKASR and the highest return that is over 2 percentage points higher than that of Q1 portfolio based on CF/P criterion solely. B/P (Q1) has still the lowest risk measured by annualised SKAD. The return SKAD efficient set is thus formed by B/P, 2B and 2C. Similarly to the results based on individual valuation ratios, relatively higher beta of

growth portfolios (Q5) compared to value portfolios (Q1) is not rewarded by higher return which violates the CAPM assumption. Namely, all value portfolios formed on the basis of composite measure have much lower market risk than the comparable growth portfolios but those generate much higher returns.

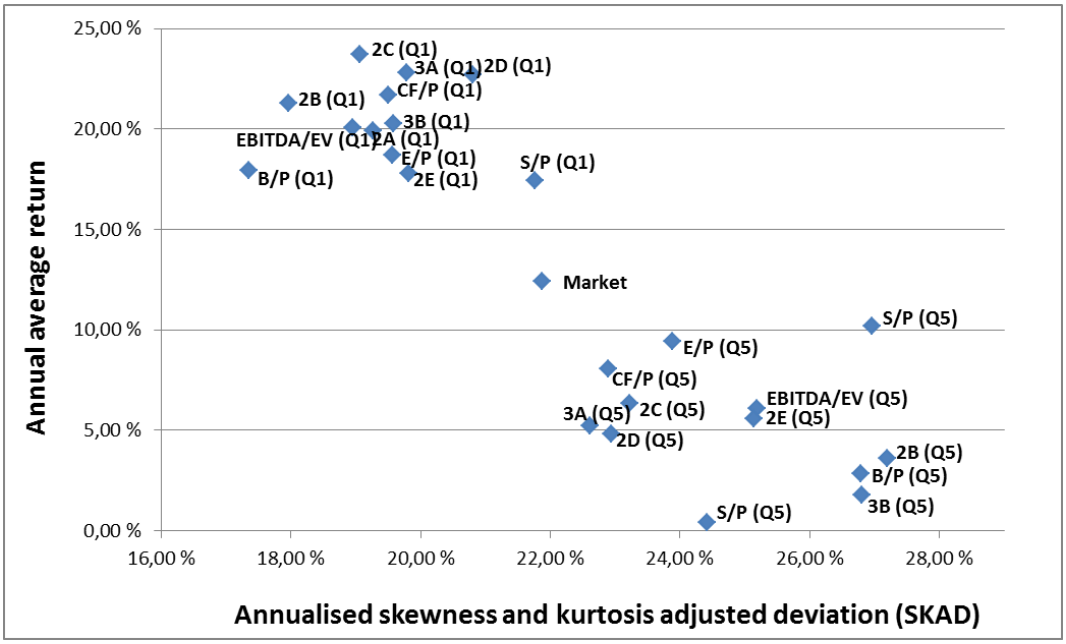

Figure 2. Risk return characteristics of value (Q1) and growth (Q5) portfolios based on both individual and composite value measures (2001-2011).

Figure 3 illustrates the relation between the five quintile value portfolios and the adjusted R-square. It shows that the market return intuitively explains relatively best the average middle five quintile portfolio. It is noteworthy that investing in the extreme quintile portfolios Q1 and Q5 requires acceptance of increased idiosyncratic risk (1 - Adj. R2) compared to the middle portfolio (i.e. Q3). The average growth portfolio carries significantly higher idiosyncratic risk than the average middle portfolio or the average value portfolio. This is an interesting finding as the comparable extreme five quintile portfolios always include the same amount of companies.

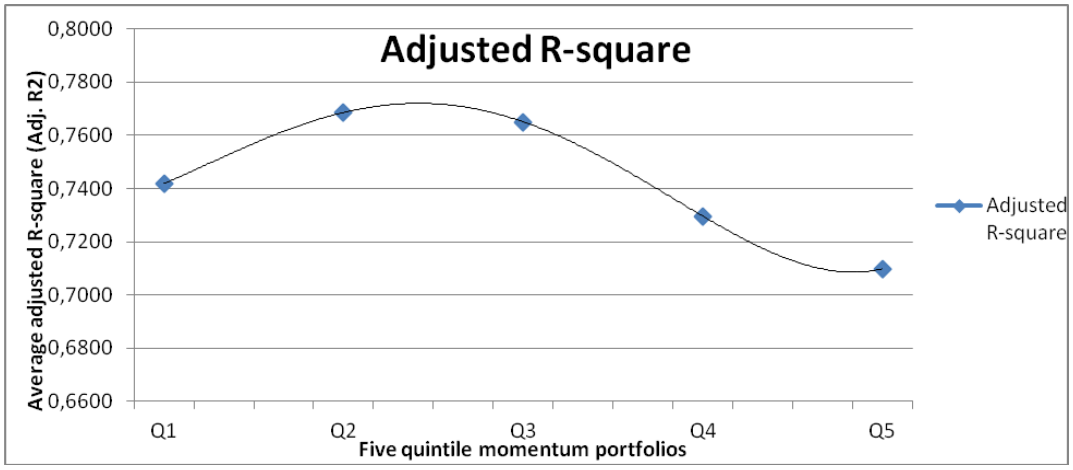

Figure 3. The relation between adjusted R-square and the five quintile value portfolios during the sample period (2001-2011).

4.2 Results from Momentum Strategies

Value stocks turn typically very slowly around which is why a wide variety of scholars has started to examine whether different momentum indicators could act as an efficient timing indicator for entry. In this study, several momentum indicators were tested during the sample period 2001-2011 to reveal the most appropriate measure for predicting future returns with regard to momentum anomaly and to assist in timing value stocks entry. Also acceleration rate is examined to test it separately and whether it could add value when it is combined with the anchoring effect of the 52-week high. Greatest alpha spread and SKASR difference between Q1 and Q5 portfolio is provided by the composite of the current price to 52-week high ratio and the 50 day moving average to 200 day moving average (AR) ratio (both significant at 1 % level, see Table 2). Adding the AR to the 52-week high adds value in that it improves relatively more the Q1 portfolio performance than it improves the Q5 portfolio performance. The annual alpha of Q1 (AR) portfolio would have been 3 percentage points greater than that of the Q1 (52-week high) portfolio without the AR component. Including the moving average increases the annual SKAD of Q1 portfolios by only 0.69 percentage points which suggests that it genuinely adds value to winner portfolio in the risk adjusted framework (see Table 5).

Past return comparison analysis reveals that the 6-month return works better than the 12-month return. The Q1 (6-month past return) strategy would have returned annually on average 18.27 % against 16.90 % of the Q1 (12-month past return) strategy. Also the SKASR shows better performance for the Q1 (6-month momentum) portfolio. Interestingly, both annual alpha and standard Sharpe ratio would have preferred the Q1 (12-month momentum) portfolio over the corresponding Q1 (6-month momentum) portfolio. The 12-month past return strategy would have generated relatively more negative skewness but relatively higher kurtosis than the 6-month strategy highlighting the importance of the third and fourth moments on comparisons of non normal return distributions. The 6-month past return sorting offers the best consistency with regard to quintile order on both absolute and risk adjusted basis. However, combining the current price to 52-week high ratio and the 50 day moving average to 200 day moving average significantly improves the consistency from what the components individually generate. Interestingly, the composite momentum indicator also provides added value in that it efficiently and most consistently divides stocks by their market risk. For the Q1 portfolio beta is 0.70, while it is 1.35 for the corresponding Q5 portfolio.

The econometric analysis reveals that the skewness and kurtosis properties of momentum quintiles are very similar to those presented by Harvey and Siddique (2000) in the US during a sample period 1927-1997. The Q1 quintile would have produced more negative skewness than the Q5 quintile. Only the past 6-month return strategy would have generated relatively more negatively skewed return distribution for the Q5 portfolio. As for kurtosis features, both the winner and loser portfolios yield positive excess kurtosis for all the momentum strategies employed, partly due to weekly data. The results suggests that in a momentum based trading strategy, at least for this sample, buying the Q1 stocks requires acceptance of increased negative skewness (see Appendices 1 and 3).

Table 5. Return, risk and performance metrics of five quintile portfolios based on several momentum indicators (2001-2011).

Variable	Average annual return	Annual volatility	Sharpe	Sharpe difference – Z (Qi vs. Market)	Annual alpha	Beta	Annual SKAD	SKASR	SKASR difference – Z (Qi vs. Market)
Current price to 52-week high ratio									
Q1	20.95 %	13.27 %	1.2340	3.8390***	9.57 %***	0.64	17.53 %	0.9352	2.9338***
Q2	9.51 %	13.57 %	0.4362	-0.0720	-1.36 %	0.87	18.94 %	0.3130	-0.1454
Q3	12.17 %	16.24 %	0.4496	0.0063	-1.20 %	0.87	19.61 %	0.3729	0.2262
Q4	12.56 %	21.00 %	0.2875	-0.9049	-3.97 %	1.07	25.39 %	0.2381	-0.5613
Q5	1.56 %	25.28 %	-0.2504	-4.5811***	-18.47 %***	1.36	28.72 %	-0.2206	-3.6726***
50 day MA to 200 day MA ratio (AR)									
Q1	18.69 %	16.38 %	0.8056	1.9397*	5.01 %*	0.83	19.20 %	0.6878	1.9035*
Q2	15.11 %	14.77 %	0.7702	1.7602*	3.77 %	0.75	18.79 %	0.6060	1.4699
Q3	5.88 %	16.10 %	0.1414	-1.9235*	-6.12 %***	0.85	20.67 %	0.1102	-1.4271
Q4	10.90 %	18.43 %	0.2010	-1.5373	-5.58 %**	0.97	22.31 %	0.1664	-1.0663
Q5	7.23 %	22.93 %	-0.0197	-2.6835***	-11.27 %***	1.18	28.28 %	-0.0160	-2.0311**
Composite SQRT(52-week high * AR)									
Q1	25.80 %	14.46 %	1.3727	4.6025***	12.57 %***	0.70	18.11 %	1.0978	3.8048***
Q2	9.73 %	14.56 %	0.4164	-0.1959	-1.67 %	0.76	19.83 %	0.3061	-0.1936
Q3	10.48 %	15.64 %	0.4020	-0.2994	-1.96 %	0.83	19.76 %	0.3186	-0.1241
Q4	7.54 %	18.14 %	0.0735	-2.2564**	-7.77 %***	0.95	19.17 %	0.0697	-1.6158
Q5	4.68 %	25.35 %	-0.1486	-3.8208***	-15.86 %***	1.35	30.70 %	-0.1228	-2.9556***
Momentum (12-month return)									
Q1	16.90 %	15.52 %	0.8133	2.0856**	4.64 %*	0.80	20.38 %	0.6202	1.6176
Q2	9.90 %	14.97 %	0.4254	-0.1271	-1.32 %	0.76	19.22 %	0.3318	-0.0334
Q3	10.92 %	15.46 %	0.3840	-0.4368	-2.32 %	0.83	18.98 %	0.3132	-0.1674
Q4	9.29 %	16.85 %	0.2519	-1.2165	-4.41 %*	0.89	21.43 %	0.1983	-0.8642
Q5	11.31 %	24.66 %	0.0634	-2.3070**	-10.05 %**	1.29	27.37 %	0.0572	-1.6836*
Momentum (6-month return)									
Q1	18.27 %	17.37 %	0.7598	1.7382*	4.57 %	0.89	20.02 %	0.6599	1.8004*
Q2	16.10 %	15.14 %	0.7430	1.9397*	3.16 %	0.81	19.10 %	0.5900	1.6636*
Q3	14.12 %	15.43 %	0.5767	0.7929	0.80 %	0.81	18.51 %	0.4815	0.8891
Q4	8.61 %	17.21 %	0.1225	-1.7685*	-6.39 %*	0.87	20.40 %	0.1035	-1.2725
Q5	0.67 %	22.10 %	-0.2029	-4.3249***	-15.39 %***	1.19	28.90 %	-0.1554	-3.2862***
Market	12.42 %	16.46 %	0.4486				21.05 %	0.3513	
Rf	1.17 %	0.13 %							

Notes: Average annual return, three risk measures (i.e., volatility, SKAD and beta) and corresponding performance metrics (the Sharpe ratio, the SKASR and the Jensen alpha) are presented over the full sample period for every five quintile portfolio formed on the basis of several momentum indicators. In addition, the Sharpe ratio differences and the SKASR differences between each five quintile portfolio and market portfolio are reported. Statistical significances are reported as follows: *** is significant at 1 % level, ** is significant at 5 % level and * is significant at 10 % level.

The return SKAD analysis (see Figure 4) on extreme momentum portfolios reveals that returns of each winner portfolio are higher than returns to the comparable loser portfolios and the market portfolio. The winner portfolios dominate the corresponding loser portfolios also in terms of total risk. The annualised SKAD measure is distinctly lower for all winner portfolios compared to the loser counterparts. The composite momentum strategy formed on the basis of the 52-week high and the acceleration rate.

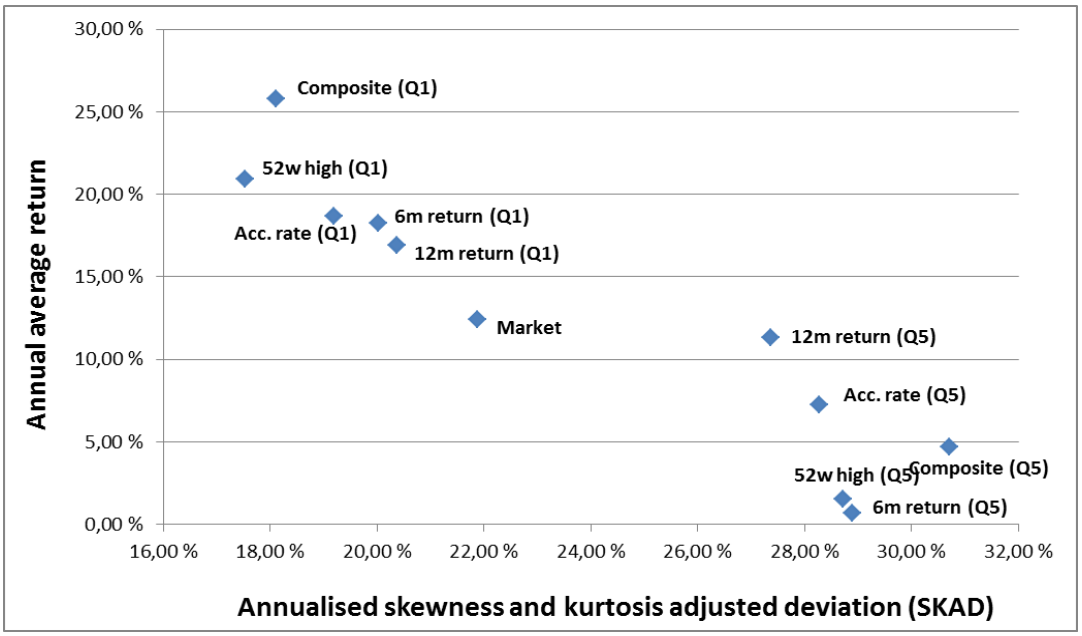

Figure 4. Risk return characteristics of winner (Q1) and loser (Q5) portfolios based on several momentum indicators (2001-2011).

Figure 5 illustrates the relation between the five quintile momentum portfolios and the adjusted R-square. It reveals that similarly to the growth strategy, the average Q1 portfolio includes more idiosyncratic risk than the average middle portfolio (i.e. Q3) and the average Q5 portfolio. This may indicate that the growth stocks are most often stocks with a relatively stronger momentum compared to value stocks which is consistent with the conclusion of Rousseau and van Rensburg (2004). Namely, the authors argue that currently high E/P stocks are more likely to exhibit a negative price momentum than stocks with low E/P. Interestingly, investing in the average loser portfolio would have exposed to approximately same idiosyncratic risk as investing in the average middle portfolio.

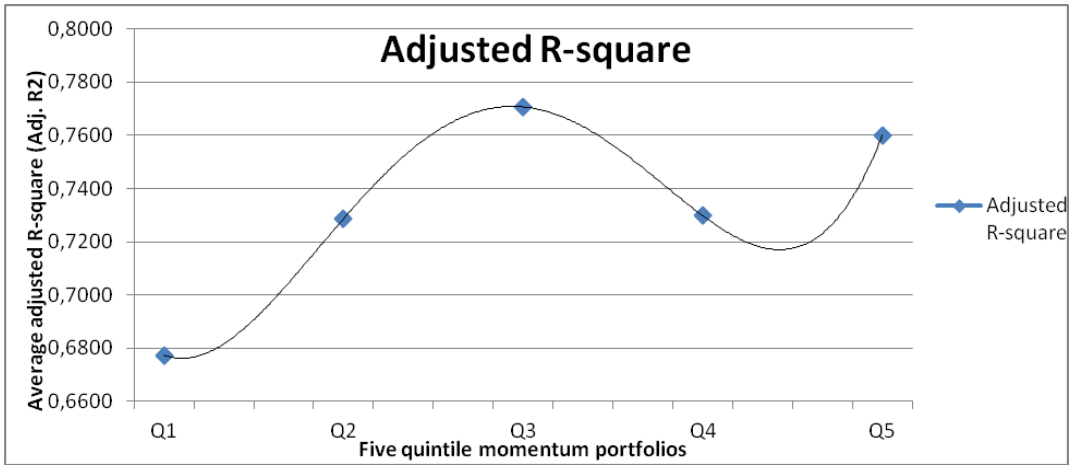

Figure 5. The relation between the five quintile momentum portfolios and the adjusted R-square during the sample period (2001-2011).

4.3 Diagonal Effect of Value and Momentum

Combining the composite momentum indicator with the valuation indicators improves the performance of value portfolios suggesting that the composite momentum measure possesses timing ability for value stock entry. Including the momentum indicator as a secondary selection criterion increased the average return of all 12 value portfolios (Table 6). The average gain in annual average return is 3.98 percentage points during the sample period. At the same time, the annual volatility decreased (in all 12 cases) nearly 2 percentage points, on average. Also the market risk measured by beta decreased substantially. The results are consistent with the Finnish evidence reported by Leivo and Pätäri (2011). The authors document a 2.84 percentage points increase in average annual return and a volatility decrease in six out of nine cases using 6-month past return as a momentum indicator. Similarly, the volatility decreases are much smaller than the corresponding increases in average returns, except for 2D and 3A criteria.

During the sample period 2001-2011, the inclusion of momentum, however, increases the asymmetry of return distributions of the top six quintile value portfolios due to the negative skewness of winner portfolios (see Appendix 3). Given the negative skewness stemming from

momentum effect, it is somewhat surprising that also the total risk of the value momentum portfolios is lower than that of value-only portfolios on the basis of SKAD values. It is noteworthy that the relative decrease in SKAD is still smaller than the corresponding decrease in volatility which is consistent with the results of Harvey and Siddique (2000). Leivo and Pätäri (2011) also reported increases in SKAD values after including momentum (6-month past return) as a secondary criterion besides value criteria. In addition, different portfolio division and the type of momentum indicators employed may also affect the results substantially.

For all value portfolios which were enhanced by the momentum indicator the risk adjusted performance improved and to the extent which exceeds the corresponding market portfolio performance. Namely, all these portfolios were superior to overall market (at 1 % level) measured by the SKASR (See Table 6). The greatest performance improvement with momentum inclusion was achieved with two composite value measures. Even though three composite measures were able to predict future returns better than individual valuation multiples, individual valuation multiples worked better than three composite value measures when momentum was included as a secondary stock selection criterion. The best risk adjusted performance would have been achieved by investing in the value momentum portfolio formed on the basis of a combination of CF/P and B/P value criterion and the composite momentum indicator.

The average annual return for the value winner portfolio, based on CF/P and B/P, over the 10 year sample period would have been over 27 % which exceeds the average market return by almost 15 percentage points. The annualised volatility during the same time would have been only 15.51 % which is nearly 1 percentage point less than that of the overall market. As a result, the risk adjusted performance of this particular value winner portfolio is significantly superior to Swiss stock market in general as well as to value loser, growth winner and growth loser portfolios (see Appendix 5). This particular portfolio achieved an annual alpha of 13.57 %

Table 6. Return, risk and performance metrics for portfolios composed purely on the basis of valuation (ex. momentum) and both on the basis of valuation and momentum (incl. momentum).

Value indicator	Style	Comparable portfolios		Average annual return			Annual volatility			Annual SKAD			Z (Sharpe vs. Market)		Z (SKASR vs. Market)	
				ex. momentum	incl. momentum	diff.	ex. momentum	incl. momentum	diff.	ex. momentum	incl. momentum	diff.	ex. momentum	incl. momentum	ex. momentum	incl. momentum
E/P	Value	Q1	P1	18.69 %	24.55 %	5.86 %	16.66 %	15.09 %	-1.57 %	19.56 %	19.15 %	-0.41 %	1.6754*	4.1256***	1.7468*	3.3603***
	Growth	Q5	P3	9.43 %	16.07 %	6.64 %	20.73 %	16.40 %	-4.33 %	23.88 %	18.88 %	-5.00 %	-1.3851	1.3793	-0.9187	1.4865
EBITDA/EV	Value	Q1	P1	20.07 %	25.89 %	5.82 %	17.33 %	15.65 %	-1.68 %	18.95 %	19.51 %	0.56 %	1.9331*	3.9585***	2.2384**	3.3166***
	Growth	Q5	P3	6.07 %	10.11 %	4.04 %	20.79 %	15.85 %	-4.94 %	25.19 %	21.33 %	-3.86 %	-2.2238**	-0.1935	-1.7991**	-0.1664
CF/P	Value	Q1	P1	21.70 %	25.13 %	3.43 %	16.30 %	14.46 %	-1.84 %	19.51 %	16.91 %	-2.60 %	2.7399***	4.3787***	2.5249**	3.9982***
	Growth	Q5	P3	8.05 %	13.75 %	5.70 %	21.63 %	16.21 %	-5.42 %	22.89 %	18.31 %	-4.58 %	-1.7218**	1.0323	-1.1891	1.2290
B/P	Value	Q1	P1	17.93 %	21.96 %	4.03 %	16.21 %	13.98 %	-2.23 %	17.36 %	15.93 %	-1.43 %	1.2201	3.6743***	1.5493	3.5127***
	Growth	Q5	P3	2.86 %	9.30 %	6.44 %	21.19 %	17.10 %	-4.09 %	26.79 %	21.41 %	-5.38 %	-3.1258***	-0.8766	-2.3747**	-0.5744
S/P	Value	Q1	P1	17.43 %	22.37 %	4.94 %	19.00 %	16.66 %	-2.34 %	21.77 %	18.37 %	-3.40 %	0.0462	2.8554***	0.3599	2.9785***
	Growth	Q5	P3	0.41 %	9.88 %	9.47 %	18.04 %	15.55 %	-2.49 %	24.42 %	21.14 %	-3.28 %	-4.1468***	-0.0477	-3.1181***	-0.0779
2A (E/P * B/P)	Value	Q1	P1	19.92 %	25.36 %	5.44 %	16.09 %	14.52 %	-1.57 %	19.27 %	17.33 %	-1.94 %	2.3283**	4.5116***	2.1797**	3.9993***
	Growth	Q5	P3	10.17 %	14.32 %	4.15 %	21.23 %	16.97 %	-4.26 %	26.96 %	19.49 %	-7.47 %	-1.0527	0.9107	-0.7452	1.0982
2B (EBITDA/EV B/P)	Value	Q1	P1	21.27 %	23.92 %	2.65 %	16.55 %	14.77 %	-1.78 %	17.97 %	17.19 %	-0.78 %	1.9693**	3.6441***	2.2554**	3.3991***
	Growth	Q5	P3	3.59 %	10.01 %	6.42 %	21.49 %	16.33 %	-5.16 %	27.19 %	21.52 %	-5.67 %	-2.8018***	-0.3889	-2.1206**	-0.2788

Table 6. Return, risk and performance metrics for portfolios composed purely on the basis of valuation (ex. momentum) and both on the basis of valuation and momentum (incl. momentum).

Value indicator	Style	Comparable portfolios		Average annual return			Annual volatility			Annual SKAD			Z (Sharpe vs. Market)		Z (SKASR vs. Market)	
				ex. momentum	incl. momentum	diff.	ex. momentum	incl. momentum	diff.	ex. momentum	incl. momentum	diff.	ex. momentum	incl. momentum	ex. momentum	incl. momentum
2C (CF/P B/P)	Value	Q1	P1	23.73 %	27.19 %	3.46 %	15.89 %	13.38 %	-2.51 %	19.06 %	15.58 %	-3.48 %	3.0634***	5.0647***	2.7846***	4.5874***
	Growth	Q5	P3	6.34 %	11.23 %	4.89 %	21.33 %	17.24 %	-4.09 %	23.22 %	21.39 %	-1.83 %	-2.0826**	-0.0786	-1.5149	-0.0679
2D (CF/P S/P)	Value	Q1	P1	22.72 %	23.99 %	1.27 %	17.56 %	15.51 %	-2.05 %	20.81 %	18.22 %	-2.59 %	2.2387**	3.6585***	2.1511**	3.3683***
	Growth	Q5	P3	4.82 %	13.01 %	8.19 %	20.88 %	15.77 %	-5.11 %	22.94 %	18.55 %	-4.39 %	-2.1783**	0.6722	-1.6076	0.7987
2E (EBITDA/EV S/P)	Value	Q1	P1	17.79 %	23.98 %	6.19 %	17.51 %	16.49 %	-1.02 %	19.82 %	19.17 %	-0.65 %	0.8435	2.9859***	1.1137	2.8351***
	Growth	Q5	P3	5.59 %	8.21 %	2.62 %	20.57 %	15.57 %	-5.00 %	25.14 %	22.94 %	-2.20 %	-2.2285**	-0.5142	-1.6512*	-0.5281
3A (CF/P B/P S/P)	Value	Q1	P1	22.80 %	23.43 %	0.63 %	16.73 %	14.77 %	-1.96 %	19.78 %	17.57 %	-2.21 %	2.3176**	3.5756***	2.2205**	3.2212***
	Growth	Q5	P3	5.22 %	12.25 %	7.03 %	20.66 %	15.83 %	-4.83 %	22.62 %	19.44 %	-3.18 %	-2.1098**	0.5802	-1.5434	0.6186
3B (EBITDA/EV B/P S/P)	Value	Q1	P1	20.25 %	24.31 %	4.06 %	17.29 %	15.84 %	-1.45 %	19.58 %	18.24 %	-1.34 %	1.5011	3.4112***	1.6615*	3.2521***
	Growth	Q5	P3	1.76 %	8.70 %	6.94 %	20.36 %	15.07 %	-5.29 %	26.81 %	21.74 %	-5.07 %	-2.9891***	-0.3698	-2.2585**	-0.4040
Value average				20.36 %	24.34 %	3.98 %	16.93 %	15.09 %	-1.83 %	19.45 %	17.76 %	-1.69 %				
Growth average				5.36 %	11.40 %	6.04 %	20.74 %	16.16 %	-4.58 %	24.84 %	20.51 %	-4.33 %				

Notes: Average annual return, two risk measures (that is, volatility and SKAD) and corresponding performance metrics (the Sharpe ratio and the SKASR) are presented for every fraction portfolio formed on the basis of each portfolio formation criterion. The Sharpe ratio and the SKASR are followed by significance levels and indicate performance differences between each fraction portfolio and market portfolio. The results for the indicators of relative value (Q1 for value and Q5 for growth portfolios) are followed by the results for the combination of value and momentum indicators (P1 for value winner and P3 for growth winner, respectively). More detailed metrics for all value momentum portfolios are presented in Appendix 5. Statistical significances are reported as follows: *** is significant at 1 % level, ** is significant at 5 % level and * is significant at 10 % level.

(at 1 % level) together with the SKASR of 1.3068. There is no other combination of portfolio selection criteria that would, after the inclusion of momentum, be close to this performance measured either on the absolute or risk adjusted basis. The second best value winner portfolio was formed on the basis of the traditional E/P and B/P (i.e. Graham ratio) which achieved an annual alpha of 11.72 % (significant at 1 % level) and SKASR of 1.1046.

Style specific comparison reveals that both the increase in average return and the decrease in volatility and SKAD are stronger among growth stocks than among value stocks. Namely, the average increase in average return for growth stocks was over 6 percentage points and the decrease in volatility and SKAD was over 4 percentage points for both. The corresponding relative impacts still remain: the increase in average return remains larger than the decrease in volatility. Similarly, the decrease in the SKAD measure is relatively lower than the corresponding decrease in volatility indicating the relationship skewness and momentum which is in line with the previous academic literature.

Figure 6 illustrates the risk return characteristics of value (Q1) and value momentum (P1) portfolios. Each momentum enhanced value portfolio distinctly dominates the corresponding value portfolio and thus also the market portfolio. Cross comparison of value and value momentum portfolios reveals that all portfolios formed by the inclusion of momentum outperform all the value portfolios in the return SKAD framework when compared by SKASR. Interestingly, picking winners from the value portfolio formed on the basis of B/P and CF/P would have allowed not only for the highest return but also for the lowest risk.

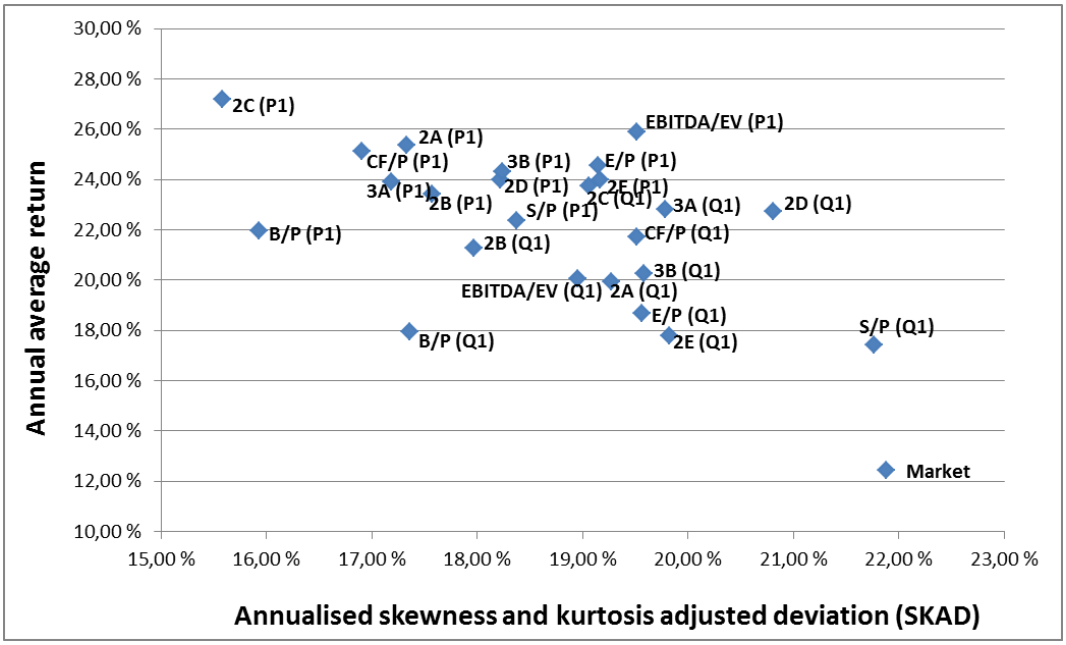

Figure 6. Risk return characteristics of value (Q1) and value momentum (P1) portfolios (2001-2011).

Table 7 shows the proportion of stocks whose absolute returns have been higher than those of the overall market (i.e. the hit rate) for each fraction portfolio. The results reveal that the inclusion of momentum as a secondary selection criterion improves the annual average hit rate of the value portfolios by 4.5 percentage points. 2D and 3A are the only measures whose hit rate is worsened after the inclusion of momentum. The average minimum hit rate of all value portfolios is improved from 22.4 % to 34.2 % whereas the average maximum hit rate of the same portfolios is improved from 78.5 % to 85.6 % (see Appendix 6). The result proves that the inclusion of momentum improves relatively more the average minimum than the average maximum hit rate which is particularly beneficial for consistency over time.

The highest hit rates are documented for those portfolio formation criteria which provide the best absolute and risk adjusted performance. CF/P and 2C (CF/P and B/P) have the highest average proportions both recording an annual hit rate of 63.8 %, on average. However, 2C combined with momentum has over 6 percentage points higher minimum hit rate than CF/P and over 12 percentage points higher than the average minimum

Table 7. The average proportions of outperforming stocks (i.e. the hit rate) in fraction portfolios (2001-2011).

Variable	Q1	Q2	Q3	Q4	Q5
Panel A					
E/P	55.7 %	49.4 %	39.2 %	41.5 %	45.9 %
EBITDA/EV	56.0 %	52.5 %	42.2 %	39.1 %	42.3 %
CF/P	59.7 %	53.7 %	44.2 %	36.9 %	40.0 %
B/P	52.2 %	49.3 %	49.4 %	48.1 %	33.0 %
S/P	52.0 %	51.3 %	52.1 %	42.4 %	34.8 %
2A (E/P * B/P)	56.2 %	48.9 %	39.1 %	43.8 %	45.4 %
2B (EBITDA/EV B/P)	55.5 %	49.2 %	48.0 %	41.7 %	38.9 %
2C (CF/P B/P)	57.3 %	50.8 %	50.1 %	37.5 %	37.6 %
2D (CF/P S/P)	62.5 %	49.6 %	45.6 %	36.8 %	38.7 %
2E (EBITDA/EV S/P)	54.9 %	53.7 %	45.6 %	37.2 %	43.1 %
3A (CF/P B/P S/P)	59.7 %	50.6 %	46.7 %	39.2 %	37.7 %
3B (EBITDA/EV B/P S/P)	54.9 %	51.0 %	50.0 %	40.2 %	37.2 %
Average	56.4 %	50.8 %	46.0 %	40.4 %	39.6 %
Panel B					
52-week high	57.0 %	47.3 %	48.9 %	47.6 %	32.9 %
Acceleration rate	53.8 %	56.1 %	43.0 %	41.7 %	37.6 %
Composite	62.6 %	48.5 %	47.4 %	38.3 %	36.4 %
12-month return	54.9 %	48.7 %	44.6 %	46.1 %	38.0 %
6-month return	57.3 %	54.5 %	47.9 %	38.8 %	38.0 %
Average	57.1 %	51.0 %	46.4 %	42.5 %	36.6 %

Variable	P1	P2	-	P3	P4
Panel C					
E/P & Momentum	61.7 %	45.2 %	-	49.8 %	37.2 %
EBITDA/EV & Momentum	63.5 %	45.9 %	-	45.7 %	34.1 %
CF/P & Momentum	63.8 %	50.7 %	-	51.0 %	28.2 %
B/P & Momentum	59.7 %	41.1 %	-	42.8 %	30.7 %
S/P & Momentum	58.2 %	45.7 %	-	47.0 %	28.8 %
2A & Momentum	62.2 %	37.7 %	-	49.9 %	40.5 %
2B & Momentum	60.1 %	42.0 %	-	47.6 %	33.5 %
2C & Momentum	63.8 %	46.0 %	-	45.6 %	28.6 %
2D & Momentum	59.6 %	50.7 %	-	49.8 %	28.0 %
2E & Momentum	60.0 %	47.9 %	-	45.0 %	32.8 %
3A & Momentum	58.3 %	48.0 %	-	47.8 %	28.6 %
3B & Momentum	59.5 %	45.9 %	-	46.4 %	28.7 %
Average	60.9 %	45.6 %		47.4 %	31.6 %

Variable	P1 - Q1 diff.	P2 - Q1 diff.	-	P3 - Q5 diff.	P4 - Q5 diff.
Panel D					
E/P	6.0 %	-10.5 %	-	3.9 %	-8.7 %
EBITDA/EV	7.5 %	-10.1 %	-	3.4 %	-8.2 %
CF/P	4.1 %	-9.0 %	-	11.0 %	-11.8 %
B/P	7.5 %	-11.1 %	-	9.8 %	-2.3 %
S/P	6.2 %	-6.3 %	-	12.2 %	-6.0 %
2A (E/P * B/P)	6.0 %	-18.5 %	-	4.5 %	-4.9 %
2B (EBITDA/EV B/P)	4.6 %	-13.5 %	-	8.7 %	-5.4 %
2C (CF/P B/P)	6.5 %	-11.3 %	-	8.0 %	-9.0 %
2D (CF/P S/P)	-2.9 %	-11.8 %	-	11.1 %	-10.7 %
2E (EBITDA/EV S/P)	5.1 %	-7.0 %	-	1.9 %	-10.3 %
3A (CF/P B/P S/P)	-1.4 %	-11.7 %	-	10.1 %	-9.1 %
3B (EBITDA/EV B/P S/P)	4.6 %	-9.0 %	-	9.2 %	-8.5 %
Average	4.5 %	-10.8 %		7.8 %	-7.9 %

Notes: The table shows the average proportions of stocks whose returns have been higher than those of the stock market average for each fraction portfolio. Panel A presents the results for the indicators of relative value while. Panel B exhibits the results for pure momentum strategies. Panel C presents the results based on the combination of momentum and value indicators. Panel D shows the differences (in percentage points) between the corresponding proportions for value and growth portfolios, separately. The positive (negative) sign indicates that the inclusion of the momentum indicator in addition to the value indicator increases (decreases) the proportion of stocks that outperform the stock market average during the year following the portfolio formation. The lowest rows in Panels A and B indicate the average proportions calculated as an arithmetic mean of proportions based on the 12 portfolio formation criteria examined above. The corresponding average differences (in percentage points) are shown in the lowest row in Panel D for both value and growth portfolios, separately. P1 represents value winner, P2 value loser, P3 growth winner and P4 growth loser.

among the value winner portfolios contributing to better consistency. Picking losers from the value portfolios decreases the average minimum from 22.4 % to 12.8 % and the average maximum from 78.5 % to 75.0 % (Appendix 6). The value loser portfolio performed relatively best during the stock market turns 2003-2004 and 2009-2010 as the value loser stocks are at that time typically the most cyclical and depressed ones and usually rally the most during the beginning of a new bull market.

A value growth comparison reveals that momentum has discriminating power also among the growth stocks intensifying the bullishness of some growth stocks trading at high multiples. The momentum inclusion improves the hit rate by 7.8 percentage points, on average, suggesting that the inclusion of momentum is even more beneficial for the growth managers in

the hit rate framework (Table 7). However, it is noteworthy that the average minimum hit rate increases after the inclusion of momentum by over 5 percentage points (see Appendix 6). Picking the loser stocks from growth portfolio decreases the average hit rate by 7.9 percentage points. It also decreases both the average minimum over 12 percentage points and the average maximum hit rate by 3 percentage points.

Figure 7 exhibits how the inclusion of momentum affects the level of adjusted R-square and thus the level of idiosyncratic risk of the average value portfolio. Including momentum as a secondary stock selection criterion appears to increase level of the idiosyncratic risk compared to the average value-only portfolio, which is witnessed by sharply lowered adjusted R-square (average number of stocks in value-only portfolios is 17.6 against the average of 14.6 in value momentum portfolios). Interestingly, picking losers from the value portfolio, on the contrary, seems to decrease idiosyncratic risk slightly. In all 12 cases of the value winner portfolio compositions, deviating clearly from the market portfolio, however, produces a significantly improved risk adjusted performance average annual return being improved significantly simultaneously with substantially lowered level of total risk measured by annualised SKAD.

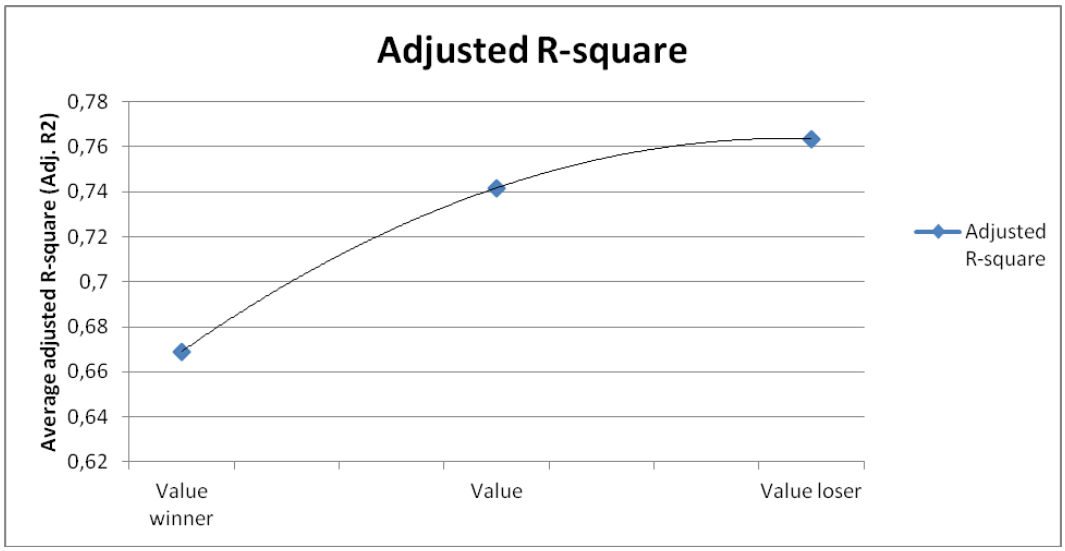

Figure 7. The impact of inclusion of momentum to the level of adjusted R-square in the average value portfolio during the sample period (2001-2011).

4.4 Impact of Firm Size Effect

After Banz (1981) first documented a relationship between value and firm size anomaly among the NYSE stocks over a fourty year sample period, also Loughran (1997) and Phalippou (2008) report that value premium is mostly explained by firm size effect. Large value premiums found in this study in the Swiss stock market employing the standard CAPM model remain, however, almost as large and significant after SMB factor is included in the model as a control variable (see Table 2). Somewhat surprisingly, alpha spreads between extreme portfolios are generally more significant based on two factor model than based on single factor model. This finding is partly explained by systematically smaller standard errors of two factor alphas. Consistently, Pätäri and Leivo (2009) reported that the value premium is not significantly explained by the SMB factor in the Finnish stock market.

In spite of the large and significant two factor alpha spreads, two factor betas are significant for value portfolios formed on the basis of any earnings multiple only, S/P only, 2A, 2E and 3B, while those are negative and/or insignificant for growth portfolios formed on the basis of any value measure. Interestingly, SMB factor values of value-only portfolios are small but the corresponding standard errors are low enough to grant the statistical significance at 5 % level. This indicates that the value portfolio performance is significantly explained by size effect in the Swiss stock market. Moreover, value portfolios formed on the basis of 2A and 2E would have exposed to the SMB factor even at 1 % significance level. Somewhat surprisingly, the B/P value portfolio was not significantly exposed to the SMB factor during the sample period. When B/P is combined with either CF/P or EBITDA/EV criterion the value portfolio is no longer significantly (at 5 % level) affected by the firm size effect.

5 SUMMARY AND CONCLUDING REMARKS

The performance of several equity investment strategies was evaluated in the Swiss stock market during a sample period 2001-2011. For the particular sample period, CF/P is the most successful selection criterion of the six individual valuation ratios examined. All the performance metrics employed in the study agree on the significant outperformance of CF/P value portfolio over the market portfolio during the full 10 year sample period. Based on the SKASR, the greatest performance difference between top and bottom quintile portfolio is reported for EBITDA/EV criterion but the greatest alpha spread is generated between the B/P extreme portfolios in the single multiple comparison. Consistently with the results of Dhatt et al. (2004) and Pätäri and Leivo (2009), the results provide evidence that the performance of value strategies can be somewhat enhanced with composite value measures. The greatest alpha is achieved by combining CF/P and B/P. The combination generates both larger alpha spread and greater SKASR difference than any other individual or composite value measure. The added value of S/P seems to be in the consistency it provides when added to the two composite measures. Higher market risk doesn't provide explanation for the outperformance of the value portfolios over the corresponding growth the sample period. In spite of the fact that firm size effect doesn't significantly explain the value premium in the Swiss stock market, SMB factor significantly (at 5 % level) explains the outperformance of the value portfolios except for B/P, 2B, 2C, 2D and 3A selection criteria.

This thesis documents undisputable evidence that taking simultaneously into account both the anchoring effect of the 52-week high momentum strategy and the acceleration rate, price momentum works efficiently as a timing indicator for value stocks entry in the Swiss stock exchange. For this particular sample period, the inclusion of momentum as a secondary stock selection criterion improves the average annual returns of value

portfolios by 3.98 percentage points, on average, which is consistent with the findings of both Bird and Casavecchia (2007) in 7 European countries and Pätäri and Leivo (2011) in the Finnish stock market. At the same time, the inclusion of momentum results in lowered volatility in all 12 cases. In spite of the increased asymmetry in return distributions, the skewness and kurtosis adjusted deviation (SKAD) decreases. However, the decrease in SKAD value is somewhat smaller than the comparable decrease in volatility which indicates that negative skewness of winner portfolios still has a negative impact on SKAD values for the value winner portfolios compared to the corresponding value loser portfolios. Inclusion of momentum also lowers the kurtosis with only two exceptions.

The outperformance of the value winner portfolios over the corresponding value-only portfolios and the market portfolio remains significant in spite of the increased distributional asymmetries. The largest improvement in the risk adjusted performance is achieved with two composite value measures. Interestingly, individual valuation multiples worked better than the three composite measures after the inclusion of momentum despite the fact that the three composites were able to predict future returns better than the individual ratios before the inclusion. The best risk adjusted performance during the 10 year sample period would have been achieved by investing in a portfolio formed on the basis of CF/P and B/P including the composite momentum measure as a timing indicator. In this case, the average annual return increases by 3.46 percentage points and volatility decreases by 2.51 percentage points compared to the value-only portfolio. SKAD value decreased by 3.48 percentage points which, exceptionally, is more than the decrease in volatility for the value winner portfolios.

This thesis poses several extensions for further research. First, it would be interesting to examine whether the acceleration rate would provide better assistance in timing value stock entry when it is used as a third stock screening criterion instead of combining it into a one composite measure with the 52-week high ratio. This would require a broader stock market

than Switzerland, in spite of its maturity. On the other hand, a correlation of 0.78 between the components speaks for one composite momentum measure. Second, a further division into different size groups would provide interesting information whether the market value of a company matters in a one year investment frame. Third, the trading volume and analyst dispersion as additional sorting criteria could reveal valuable information for more enhanced portfolio formation.

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APPENDICES

Softwares: Bloomberg, Microsoft Excel 2010, EViews 6.0.

Appendix 1. Sample statistics of portfolio returns based on individual valuation ratios (EViews 6.0).

E/P
Date: 09/10/11 Time: 17:24
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002197	0.001579	0.000150	0.001279	0.000786
Median	0.004241	0.003863	0.003178	0.002582	0.003300	0.000972
Maximum	0.083080	0.086139	0.074693	0.078217	0.089253	0.212063
Minimum	-0.178378	-0.187113	-0.165753	-0.177042	-0.151283	-0.192431
Std. Dev.	0.022881	0.023156	0.022352	0.022385	0.022505	0.028805
Skewness	-1.507828	-1.645977	-1.447395	-1.743887	-1.049433	0.148959
Kurtosis	12.49751	12.73549	10.35961	12.78376	8.765458	13.34583
Jarque-Bera	2159.708	2297.164	1360.323	2346.533	818.7948	2329.970
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.146865	0.824435	0.078403	0.667828	0.410426
Sum Sq. Dev.	0.272769	0.279357	0.260292	0.261056	0.263874	0.432299
Observations	522	522	522	522	522	522

EBITDA/EV
Date: 09/11/11 Time: 11:36
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002500	0.001728	0.000992	0.000545	0.000289
Median	0.004241	0.003294	0.003169	0.002924	0.002629	0.001714
Maximum	0.083080	0.101399	0.118125	0.060542	0.082374	0.192562
Minimum	-0.178378	-0.177566	-0.156456	-0.167581	-0.147075	-0.221822
Std. Dev.	0.022881	0.024087	0.021802	0.022495	0.022220	0.028889
Skewness	-1.507828	-1.161255	-1.077520	-1.537046	-1.071786	-0.601121
Kurtosis	12.49751	10.31708	10.59365	10.80390	10.05668	14.56963
Jarque-Bera	2159.708	1281.809	1355.192	1530.131	1183.017	2942.815
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.304880	0.901870	0.517948	0.284715	0.150826
Sum Sq. Dev.	0.272769	0.302273	0.247636	0.263641	0.257224	0.434824
Observations	522	522	522	522	522	522

CF/P
Date: 09/11/11 Time: 12:08
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002825	0.001713	0.001152	-3.96E-05	0.000462
Median	0.004241	0.004266	0.003825	0.003825	0.002743	0.000611
Maximum	0.083080	0.082232	0.104328	0.099851	0.090863	0.235520
Minimum	-0.178378	-0.172689	-0.142027	-0.161217	-0.143493	-0.248070
Std. Dev.	0.022881	0.022661	0.021487	0.022019	0.024189	0.030053
Skewness	-1.507828	-1.403812	-0.939308	-1.375107	-1.035611	-0.335877
Kurtosis	12.49751	10.93036	8.246625	11.75643	7.875598	19.05957
Jarque-Bera	2159.708	1539.319	675.4739	1832.192	610.3358	5619.353
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.474741	0.894340	0.601209	-0.020667	0.241087
Sum Sq. Dev.	0.272769	0.267539	0.240539	0.252592	0.304848	0.470566
Observations	522	522	522	522	522	522

B/P
Date: 09/11/11 Time: 12:48
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002161	0.001567	0.001883	0.000853	-0.000273
Median	0.004241	0.003045	0.003559	0.004339	0.002803	0.001027
Maximum	0.083080	0.118411	0.076613	0.100661	0.077168	0.184829
Minimum	-0.178378	-0.150318	-0.173296	-0.179749	-0.176831	-0.189357
Std. Dev.	0.022881	0.022534	0.023382	0.022468	0.023611	0.029438
Skewness	-1.507828	-0.476585	-1.192331	-1.321314	-1.560323	-0.375334
Kurtosis	12.49751	8.923330	9.760710	13.41858	11.03643	11.14484
Jarque-Bera	2159.708	782.8776	1117.815	2512.786	1616.518	1455.118
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.128169	0.817862	0.982889	0.445182	-0.142472
Sum Sq. Dev.	0.272769	0.264557	0.284841	0.263016	0.290443	0.451510
Observations	522	522	522	522	522	522

Relative B/P
Date: 09/11/11 Time: 13:18
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.001111	0.001010	0.001610	0.001556	0.001100
Median	0.004241	0.002062	0.003312	0.003036	0.004177	0.002047
Maximum	0.083080	0.110490	0.104139	0.057501	0.071900	0.197999
Minimum	-0.178378	-0.201061	-0.171554	-0.133943	-0.172060	-0.191115
Std. Dev.	0.022881	0.028364	0.023134	0.018845	0.023182	0.027721
Skewness	-1.507828	-0.694893	-1.503705	-1.174552	-1.386759	-0.357767
Kurtosis	12.49751	9.774127	13.87603	8.964816	10.10992	13.89170
Jarque-Bera	2159.708	1040.092	2769.484	893.8665	1266.794	2591.321
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	0.580198	0.527180	0.840644	0.812042	0.574319
Sum Sq. Dev.	0.272769	0.419139	0.278819	0.185032	0.279989	0.400360
Observations	522	522	522	522	522	522

S/P
Date: 09/11/11 Time: 13:53
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.001670	0.001812	0.001799	0.001376	-0.000592
Median	0.004241	0.004102	0.003759	0.003656	0.001948	0.001609
Maximum	0.083080	0.112052	0.074927	0.101179	0.176996	0.087589
Minimum	-0.178378	-0.195431	-0.179135	-0.120649	-0.156103	-0.224778
Std. Dev.	0.022881	0.026407	0.024731	0.019895	0.024325	0.025060
Skewness	-1.507828	-1.144110	-1.139177	-0.999836	0.067956	-2.031847
Kurtosis	12.49751	10.35092	9.003828	9.166850	13.45133	17.80476
Jarque-Bera	2159.708	1289.164	896.9014	914.1249	2376.161	5126.356
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	0.871607	0.946104	0.938932	0.718292	-0.309240
Sum Sq. Dev.	0.272769	0.363319	0.318655	0.206223	0.308287	0.327197
Observations	522	522	522	522	522	522

Appendix 2. Sample statistics of portfolio returns based on composite value measures (EViews 6.0).

Graham

Date: 09/11/11 Time: 15:53
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002561	0.001448	0.000686	0.000515	0.001038
Median	0.004241	0.003442	0.002721	0.004244	0.002421	0.002129
Maximum	0.083080	0.082001	0.101802	0.103720	0.108521	0.212063
Minimum	-0.178378	-0.186015	-0.157289	-0.178670	-0.136843	-0.217668
Std. Dev.	0.022881	0.022367	0.021391	0.022921	0.024409	0.029503
Skewness	-1.507828	-1.674378	-1.030852	-1.400599	-0.781115	-0.331262
Kurtosis	12.49751	14.34484	9.973037	12.07680	7.514220	15.05678
Jarque-Bera	2159.708	3043.250	1150.007	1962.611	496.3076	3171.255
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.336619	0.755960	0.357918	0.268958	0.541990
Sum Sq. Dev.	0.272769	0.260652	0.238401	0.273722	0.310409	0.453479
Observations	522	522	522	522	522	522

EBITDA/EV B/P

Date: 09/11/11 Time: 16:15
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002520	0.001466	0.001599	0.000709	-0.000125
Median	0.004241	0.003529	0.003806	0.003205	0.002889	0.001856
Maximum	0.083080	0.129090	0.086061	0.067827	0.088604	0.200597
Minimum	-0.178378	-0.169426	-0.172306	-0.195133	-0.140654	-0.212153
Std. Dev.	0.022881	0.023012	0.022622	0.022585	0.022601	0.029860
Skewness	-1.507828	-0.823065	-1.225940	-1.688992	-0.923804	-0.464598
Kurtosis	12.49751	10.73160	11.18726	14.47831	8.065895	13.10523
Jarque-Bera	2159.708	1359.099	1588.685	3113.783	632.4237	2239.793
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.315415	0.765032	0.834777	0.370170	-0.065028
Sum Sq. Dev.	0.272769	0.275904	0.266614	0.265747	0.266134	0.464528
Observations	522	522	522	522	522	522

CF/P B/P
Date: 09/11/11 Time: 16:48
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002538	0.000855	0.001277	-0.000478	-0.000148
Median	0.004241	0.003708	0.002860	0.003707	0.001665	0.000120
Maximum	0.083080	0.092453	0.090876	0.081745	0.081721	0.211239
Minimum	-0.178378	-0.167412	-0.169668	-0.153072	-0.151929	-0.226044
Std. Dev.	0.022881	0.022055	0.021393	0.023156	0.024080	0.029608
Skewness	-1.507828	-1.437251	-1.266580	-1.315164	-0.994846	-0.286061
Kurtosis	12.49751	11.21878	11.72628	9.973939	7.785701	14.72199
Jarque-Bera	2159.708	1648.890	1795.786	1208.309	584.2443	2995.680
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.324926	0.446241	0.666596	-0.249377	-0.077248
Sum Sq. Dev.	0.272769	0.253433	0.238439	0.279351	0.302110	0.456712
Observations	522	522	522	522	522	522

CF/P S/P
Date: 09/11/11 Time: 17:05
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002329	0.001226	0.000787	-3.70E-05	-0.000236
Median	0.004241	0.003987	0.004628	0.003815	0.002048	0.000457
Maximum	0.083080	0.097618	0.086219	0.077879	0.094027	0.219824
Minimum	-0.178378	-0.186163	-0.144346	-0.145710	-0.145670	-0.247058
Std. Dev.	0.022881	0.024375	0.021745	0.022181	0.022772	0.028985
Skewness	-1.507828	-1.384735	-1.058745	-1.208352	-0.999607	-0.559216
Kurtosis	12.49751	11.05714	8.254695	8.843871	9.408533	19.61960
Jarque-Bera	2159.708	1578.777	698.0788	869.8104	980.1887	6034.799
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.215922	0.640017	0.410599	-0.019304	-0.123163
Sum Sq. Dev.	0.272769	0.309544	0.246355	0.256342	0.270180	0.437712
Observations	522	522	522	522	522	522

EBITDA/EV S/P
Date: 09/11/11 Time: 17:34
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.001568	0.002042	0.000567	5.58E-05	-0.000106
Median	0.004241	0.003790	0.004636	0.002295	0.001580	0.001629
Maximum	0.083080	0.111666	0.095188	0.056388	0.097603	0.193533
Minimum	-0.178378	-0.181443	-0.142874	-0.176445	-0.152768	-0.235866
Std. Dev.	0.022881	0.024307	0.024062	0.020275	0.022084	0.028559
Skewness	-1.507828	-1.263001	-0.730797	-2.039872	-1.019978	-0.833838
Kurtosis	12.49751	10.79819	6.372628	15.51048	10.51072	17.00786
Jarque-Bera	2159.708	1461.438	293.8617	3766.152	1317.448	4328.276
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	0.818329	1.065724	0.295976	0.029150	-0.055420
Sum Sq. Dev.	0.272769	0.307819	0.301656	0.214171	0.254084	0.424939
Observations	522	522	522	522	522	522

CF/P B/P S/P
Date: 09/11/11 Time: 17:53
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002289	0.001280	0.000703	7.86E-05	-0.000183
Median	0.004241	0.004388	0.003187	0.002283	0.001750	0.000572
Maximum	0.083080	0.100442	0.092346	0.079739	0.091142	0.211035
Minimum	-0.178378	-0.168984	-0.172449	-0.152330	-0.147190	-0.225774
Std. Dev.	0.022881	0.023227	0.022902	0.021941	0.023309	0.028681
Skewness	-1.507828	-1.296087	-1.037707	-1.376628	-1.062597	-0.365688
Kurtosis	12.49751	10.18998	10.27173	9.992564	8.877940	16.23011
Jarque-Bera	2159.708	1270.531	1243.781	1228.361	849.6992	3818.664
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.194730	0.668140	0.367126	0.041017	-0.095742
Sum Sq. Dev.	0.272769	0.281084	0.273254	0.250819	0.283072	0.428581
Observations	522	522	522	522	522	522

EBITDA/EV B/P S/P
Date: 09/11/11 Time: 18:09
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.001977	0.001340	0.001284	0.000138	-0.000701
Median	0.004241	0.003965	0.002800	0.002941	0.002133	0.001312
Maximum	0.083080	0.123397	0.080690	0.078106	0.093907	0.190175
Minimum	-0.178378	-0.186220	-0.140057	-0.202182	-0.128429	-0.216002
Std. Dev.	0.022881	0.024007	0.024029	0.023227	0.021622	0.028262
Skewness	-1.507828	-1.164294	-0.711621	-1.949424	-0.896047	-0.636288
Kurtosis	12.49751	11.78582	5.812531	16.43885	7.943375	15.42879
Jarque-Bera	2159.708	1796.830	216.1069	4258.731	601.3562	3395.051
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.032096	0.699243	0.670155	0.072081	-0.365685
Sum Sq. Dev.	0.272769	0.300265	0.300819	0.281071	0.243571	0.416150
Observations	522	522	522	522	522	522

Appendix 3. Sample statistics of portfolio returns based on momentum indicators (EViews 6.0).

52-week high
Date: 09/11/11 Time: 18:35
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002749	0.000737	0.001003	0.000759	-0.001621
Median	0.004241	0.003471	0.002910	0.002643	0.002019	0.000322
Maximum	0.083080	0.058409	0.045011	0.070181	0.206565	0.203863
Minimum	-0.178378	-0.126284	-0.173536	-0.168142	-0.170603	-0.242529
Std. Dev.	0.022881	0.018413	0.018843	0.022542	0.029148	0.035087
Skewness	-1.507828	-1.258374	-2.483899	-1.329817	0.273574	-0.303108
Kurtosis	12.49751	9.696072	19.52627	10.52744	12.16207	10.50115
Jarque-Bera	2159.708	1112.978	6477.076	1386.259	1832.282	1231.806
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.435135	0.384930	0.523669	0.396389	-0.846299
Sum Sq. Dev.	0.272769	0.176638	0.184984	0.264736	0.442654	0.641386
Observations	522	522	522	522	522	522

50 day MA to 200 day MA ratio (AR)
Date: 09/12/11 Time: 13:56
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002137	0.001787	3.53E-05	0.000311	-0.000490
Median	0.004241	0.004417	0.003806	0.001949	0.001979	0.000172
Maximum	0.083080	0.071803	0.066072	0.090936	0.085112	0.191610
Minimum	-0.178378	-0.125277	-0.156230	-0.191370	-0.211103	-0.200672
Std. Dev.	0.022881	0.022730	0.020496	0.022342	0.025587	0.031835
Skewness	-1.507828	-0.890278	-1.557990	-1.832975	-1.566593	-0.171367
Kurtosis	12.49751	5.985906	11.31682	16.11106	13.28189	10.66423
Jarque-Bera	2159.708	262.8707	1715.614	4031.127	2512.867	1280.158
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.115511	0.932654	0.018429	0.162206	-0.255636
Sum Sq. Dev.	0.272769	0.269174	0.218864	0.260065	0.341091	0.528024
Observations	522	522	522	522	522	522

Composite SQRT(52-week high * AR)
Date: 09/12/11 Time: 14:29
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.003420	0.000764	0.000808	-0.000146	-0.001128
Median	0.004241	0.005368	0.002792	0.002522	0.001116	0.000842
Maximum	0.083080	0.052170	0.047968	0.084905	0.097962	0.194648
Minimum	-0.178378	-0.121140	-0.186888	-0.168254	-0.170105	-0.242529
Std. Dev.	0.022881	0.020075	0.020205	0.021716	0.025179	0.035193
Skewness	-1.507828	-1.048424	-2.501582	-1.421046	-0.611673	-0.489231
Kurtosis	12.49751	7.135596	19.43267	11.89246	9.089285	10.53834
Jarque-Bera	2159.708	467.6234	6417.648	1895.584	839.0274	1256.802
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.785099	0.398878	0.421801	-0.076330	-0.588872
Sum Sq. Dev.	0.272769	0.209971	0.212704	0.245686	0.330311	0.645279
Observations	522	522	522	522	522	522

Past 12-month return
Date: 09/12/11 Time: 15:06
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002028	0.000824	0.000740	0.000414	-0.000102
Median	0.004241	0.003919	0.002786	0.002941	0.001813	0.002097
Maximum	0.083080	0.050798	0.053434	0.077185	0.111559	0.201202
Minimum	-0.178378	-0.148715	-0.155211	-0.170390	-0.163536	-0.240968
Std. Dev.	0.022881	0.021540	0.020780	0.021454	0.023383	0.034235
Skewness	-1.507828	-1.496300	-1.598627	-1.571455	-0.857741	-0.323359
Kurtosis	12.49751	9.722215	10.54371	12.36873	10.54588	11.16484
Jarque-Bera	2159.708	1177.628	1460.079	2123.907	1302.460	1459.052
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.058393	0.429879	0.386354	0.216223	-0.053217
Sum Sq. Dev.	0.272769	0.241732	0.224969	0.239802	0.284857	0.610629
Observations	522	522	522	522	522	522

Past 6-month return
Date: 09/13/11 Time: 17:24
Sample: 5/04/2001 5/05/2011

	MARKET	Q1	Q2	Q3	Q4	Q5
Mean	0.001422	0.002138	0.001764	0.001311	3.09E-06	-0.001266
Median	0.004241	0.003903	0.004089	0.003027	0.001684	0.000260
Maximum	0.083080	0.087824	0.070419	0.068576	0.128478	0.124364
Minimum	-0.178378	-0.120728	-0.155758	-0.194439	-0.188803	-0.221016
Std. Dev.	0.022881	0.024113	0.021014	0.021425	0.023890	0.030683
Skewness	-1.507828	-0.711464	-1.404291	-2.001367	-1.277723	-1.049702
Kurtosis	12.49751	5.698771	10.20669	17.95915	14.10343	10.80625
Jarque-Bera	2159.708	202.4509	1301.183	5215.608	2823.510	1421.254
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.115867	0.920609	0.684535	0.001611	-0.661053
Sum Sq. Dev.	0.272769	0.302941	0.230064	0.239151	0.297343	0.490492
Observations	522	522	522	522	522	522

Appendix 4. Sample statistics of portfolio returns based on value-momentum division (EViews 6.0).

E/P & Momentum
Date: 09/12/11 Time: 15:35
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.003076	0.000329	0.001804	-0.000852
Median	0.004241	0.005092	0.001828	0.003476	0.000185
Maximum	0.083080	0.064808	0.109254	0.068244	0.239297
Minimum	-0.178378	-0.160362	-0.195496	-0.160249	-0.203287
Std. Dev.	0.022881	0.020946	0.026575	0.022759	0.033077
Skewness	-1.507828	-1.729772	-1.263950	-1.120661	0.282662
Kurtosis	12.49751	11.95189	10.61564	8.841283	13.25278
Jarque-Bera	2159.708	2003.280	1400.445	851.3844	2293.299
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.605558	0.171668	0.941822	-0.444834
Sum Sq. Dev.	0.272769	0.228582	0.367953	0.269861	0.570005
Observations	522	522	522	522	522

EBITDA/EV & Momentum
Date: 09/12/11 Time: 16:24
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.003159	0.000511	0.000852	-0.000916
Median	0.004241	0.006133	0.002164	0.002392	-0.000250
Maximum	0.083080	0.108034	0.116172	0.062102	0.230754
Minimum	-0.178378	-0.161329	-0.199498	-0.174679	-0.187185
Std. Dev.	0.022881	0.021728	0.026932	0.021999	0.033546
Skewness	-1.507828	-1.397999	-1.105406	-1.797081	0.167487
Kurtosis	12.49751	11.47982	10.34253	12.91435	11.08926
Jarque-Bera	2159.708	1734.017	1278.911	2418.869	1425.676
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.649020	0.266955	0.444820	-0.477926
Sum Sq. Dev.	0.272769	0.245958	0.377898	0.252147	0.586292
Observations	522	522	522	522	522

CF/P & Momentum
Date: 09/12/11 Time: 16:56
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.003230	0.000567	0.001605	-0.001414
Median	0.004241	0.003994	0.002449	0.002149	-0.000799
Maximum	0.083080	0.073075	0.120593	0.081977	0.241397
Minimum	-0.178378	-0.145318	-0.210522	-0.209513	-0.205500
Std. Dev.	0.022881	0.020066	0.026726	0.022494	0.035203
Skewness	-1.507828	-1.238923	-1.212680	-1.916650	0.263733
Kurtosis	12.49751	9.536024	12.21039	18.68354	10.64265
Jarque-Bera	2159.708	1062.691	1973.023	5669.521	1276.472
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.686205	0.295821	0.837984	-0.737983
Sum Sq. Dev.	0.272769	0.209776	0.372139	0.263626	0.645645
Observations	522	522	522	522	522

B-P & Momentum
Date: 09/12/11 Time: 17:23
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.002831	-0.000114	0.000603	-0.001393
Median	0.004241	0.003077	0.000493	0.002644	0.000516
Maximum	0.083080	0.076947	0.122996	0.087738	0.222860
Minimum	-0.178378	-0.116861	-0.231622	-0.184178	-0.178334
Std. Dev.	0.022881	0.019407	0.029002	0.023736	0.031754
Skewness	-1.507828	-0.718784	-1.114882	-1.500556	-0.078404
Kurtosis	12.49751	6.408452	12.23508	11.61819	11.59404
Jarque-Bera	2159.708	297.6302	1963.124	1811.336	1606.936
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.478027	-0.059696	0.314874	-0.727253
Sum Sq. Dev.	0.272769	0.196216	0.438232	0.293525	0.525335
Observations	522	522	522	522	522

Relative B/P & Momentum
Date: 09/12/11 Time: 17:42
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.001619	-0.000413	0.002904	-0.000553
Median	0.004241	0.003225	0.000811	0.005500	0.000432
Maximum	0.083080	0.114292	0.132065	0.090604	0.231748
Minimum	-0.178378	-0.165146	-0.221558	-0.149871	-0.207879
Std. Dev.	0.022881	0.023038	0.032084	0.022459	0.029754
Skewness	-1.507828	-0.918415	-0.751070	-1.123524	0.060692
Kurtosis	12.49751	11.24501	9.166924	8.891279	16.19273
Jarque-Bera	2159.708	1551.954	876.2505	864.7016	3785.869
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	0.845173	-0.215349	1.515977	-0.288797
Sum Sq. Dev.	0.272769	0.276519	0.536295	0.262795	0.461250
Observations	522	522	522	522	522

S/P & Momentum
Date: 09/13/11 Time: 09:36
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.002692	0.000164	0.000915	-0.001414
Median	0.004241	0.004118	0.002465	0.002032	-8.62E-06
Maximum	0.083080	0.065504	0.110590	0.084465	0.232205
Minimum	-0.178378	-0.155962	-0.222029	-0.168060	-0.224972
Std. Dev.	0.022881	0.023124	0.029761	0.021590	0.031403
Skewness	-1.507828	-1.139956	-1.039025	-1.557415	-0.142335
Kurtosis	12.49751	8.117660	10.16616	13.11503	16.08793
Jarque-Bera	2159.708	682.6986	1210.870	2436.348	3727.408
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.405118	0.085365	0.477553	-0.738176
Sum Sq. Dev.	0.272769	0.278590	0.461456	0.242847	0.513770
Observations	522	522	522	522	522

Graham & Momentum
Date: 09/13/11 Time: 10:23
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.003279	-0.000603	0.001585	-0.000838
Median	0.004241	0.004757	0.000116	0.003158	0.000569
Maximum	0.083080	0.057375	0.121195	0.072950	0.247441
Minimum	-0.178378	-0.158187	-0.206251	-0.168453	-0.188179
Std. Dev.	0.022881	0.020153	0.025520	0.023556	0.032668
Skewness	-1.507828	-1.656603	-1.185284	-1.079176	0.308923
Kurtosis	12.49751	12.07161	13.01296	8.621327	13.88732
Jarque-Bera	2159.708	2028.654	2302.865	788.6072	2586.410
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.711648	-0.314780	0.827546	-0.437183
Sum Sq. Dev.	0.272769	0.211611	0.339305	0.289105	0.556022
Observations	522	522	522	522	522

EBITDA/EV B/P & Momentum
Date: 09/13/11 Time: 10:56
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.002858	0.000243	0.000797	-0.001214
Median	0.004241	0.005139	0.001392	0.003263	1.70E-05
Maximum	0.083080	0.091508	0.127144	0.076870	0.227587
Minimum	-0.178378	-0.128619	-0.217036	-0.169975	-0.188000
Std. Dev.	0.022881	0.020508	0.027645	0.022673	0.033660
Skewness	-1.507828	-0.937442	-1.080014	-1.608556	0.118935
Kurtosis	12.49751	7.474807	11.95492	11.15271	11.09385
Jarque-Bera	2159.708	511.9751	1845.624	1670.758	1426.082
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.491937	0.126731	0.415875	-0.633787
Sum Sq. Dev.	0.272769	0.219124	0.398168	0.267829	0.590293
Observations	522	522	522	522	522

CF/P B/P & Momentum
Date: 09/13/11 Time: 11:25
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.003512	0.000190	0.001038	-0.001484
Median	0.004241	0.004429	0.001388	0.002281	-0.000323
Maximum	0.083080	0.074142	0.109166	0.068139	0.115134
Minimum	-0.178378	-0.096594	-0.225516	-0.195899	-0.186803
Std. Dev.	0.022881	0.018567	0.027705	0.023933	0.031631
Skewness	-1.507828	-0.679000	-1.352590	-1.611894	-0.418084
Kurtosis	12.49751	5.638375	13.12636	13.13796	7.190038
Jarque-Bera	2159.708	191.5129	2389.479	2461.470	397.0592
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.833109	0.099247	0.541864	-0.774802
Sum Sq. Dev.	0.272769	0.179611	0.399916	0.298428	0.521263
Observations	522	522	522	522	522

CF/P S/P & Momentum
Date: 09/13/11 Time: 11:43
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.002972	0.000605	0.001354	-0.001498
Median	0.004241	0.005285	0.003252	0.002981	-0.000597
Maximum	0.083080	0.090722	0.109417	0.069349	0.251559
Minimum	-0.178378	-0.140786	-0.223980	-0.201609	-0.206842
Std. Dev.	0.022881	0.021529	0.028694	0.021890	0.033427
Skewness	-1.507828	-1.105186	-1.225996	-1.990952	0.350481
Kurtosis	12.49751	8.020763	11.75518	18.02607	13.13955
Jarque-Bera	2159.708	654.5403	1797.975	5255.635	2246.816
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.551634	0.315681	0.706615	-0.781739
Sum Sq. Dev.	0.272769	0.241480	0.428958	0.249658	0.582134
Observations	522	522	522	522	522

EBITDA/EV S/P & Momentum
Date: 09/13/11 Time: 18:07
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.002815	0.000568	0.000656	-0.000829
Median	0.004241	0.004704	0.001341	0.001584	-0.000127
Maximum	0.083080	0.081913	0.127144	0.099949	0.240552
Minimum	-0.178378	-0.145256	-0.193205	-0.165659	-0.229249
Std. Dev.	0.022881	0.022891	0.028657	0.021619	0.033250
Skewness	-1.507828	-1.201497	-0.644364	-1.666669	-0.043017
Kurtosis	12.49751	8.170257	8.788059	14.30484	14.11636
Jarque-Bera	2159.708	707.0043	764.7833	3021.304	2687.885
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.469414	0.296253	0.342364	-0.432901
Sum Sq. Dev.	0.272769	0.272992	0.427851	0.243501	0.576001
Observations	522	522	522	522	522

CF/P B/P S/P & Momentum
Date: 09/13/11 Time: 18:25
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.002896	0.000158	0.001302	-0.001483
Median	0.004241	0.005521	0.002266	0.002628	-0.000947
Maximum	0.083080	0.071729	0.107216	0.068285	0.251559
Minimum	-0.178378	-0.120149	-0.213352	-0.177386	-0.200294
Std. Dev.	0.022881	0.020505	0.027834	0.021977	0.032961
Skewness	-1.507828	-1.022299	-1.082924	-1.518016	0.432356
Kurtosis	12.49751	6.664661	10.93864	12.62538	13.19728
Jarque-Bera	2159.708	383.0201	1472.755	2215.573	2277.926
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.511941	0.082432	0.679557	-0.774344
Sum Sq. Dev.	0.272769	0.219053	0.403632	0.251643	0.566014
Observations	522	522	522	522	522

EBITDA/EV B/P S/P & Momentum
Date: 09/13/11 Time: 18:45
Sample: 5/04/2001 5/05/2011

	MARKET	P1	P2	P3	P4
Mean	0.001422	0.002932	0.000251	0.000705	-0.001416
Median	0.004241	0.005849	0.001938	0.002244	-0.000552
Maximum	0.083080	0.081736	0.127144	0.082905	0.231434
Minimum	-0.178378	-0.135670	-0.218015	-0.142963	-0.222144
Std. Dev.	0.022881	0.021990	0.029466	0.020919	0.032571
Skewness	-1.507828	-1.037421	-0.825498	-1.502083	-0.082483
Kurtosis	12.49751	7.109314	10.23767	11.85165	13.76363
Jarque-Bera	2159.708	460.9136	1198.634	1900.442	2520.455
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.742283	1.530456	0.130883	0.367863	-0.739046
Sum Sq. Dev.	0.272769	0.251935	0.452366	0.228001	0.552699
Observations	522	522	522	522	522

Appendix 5. Return, risk and performance metrics of portfolios based on both valuation and momentum screening (2001-2011).

Variable	Average annual return	Annual volatility	Sharpe	Sharpe difference – Z (Pi vs. Market)	Annual alpha	Beta	Annual SKAD	SKASR	SKASR difference – Z (Pi vs. Market)
E/P & Momentum									
P1 (Value Winner)	24.55 %	15.09 %	1.1970	4.1256***	10.32 %***	0.77	19.15 %	0.9447	3.3603***
P2 (Value Loser)	11.06 %	19.15 %	0.1985	-1.7329*	-5.99 %**	1.04	22.88 %	0.1664	-1.1899
P3 (Growth Winner)	16.07 %	16.40 %	0.6993	1.3793	3.24 %	0.83	18.88 %	0.6079	1.4865
P4 (Growth Loser)	5.04 %	23.83 %	-0.0979	-2.6094***	-12.78 %***	1.13	28.90 %	-0.0808	-2.0018**
EBITDA/EV & Momentum									
P1 (Value Winner)	25.89 %	15.65 %	1.1815	3.9585***	10.59 %***	0.79	19.51 %	0.9495	3.3166***
P2 (Value Loser)	11.62 %	19.40 %	0.2447	-1.3375	-5.03 %**	1.04	22.02 %	0.2160	-0.8008
P3 (Growth Winner)	10.11 %	15.85 %	0.4113	-0.1935	-1.36 %	0.78	21.33 %	0.3059	-0.1664
P4 (Growth Loser)	3.38 %	24.17 %	-0.1102	-2.7367***	-13.34 %***	1.16	29.08 %	-0.0917	-2.1065**
CF/P & Momentum									
P1 (Value Winner)	25.13 %	14.46 %	1.3048	4.3787***	11.52 %***	0.71	16.91 %	1.1171	3.9982***
P2 (Value Loser)	13.56 %	19.25 %	0.2615	-1.2295	-4.69 %	1.03	23.01 %	0.2191	-0.7815
P3 (Growth Winner)	13.75 %	16.21 %	0.6440	1.0323	2.39 %	0.81	18.31 %	0.5704	1.2290
P4 (Growth Loser)	1.57 %	25.36 %	-0.2071	-3.5128***	-16.75 %***	1.27	27.57 %	-0.1907	-2.8371***
B/P & Momentum									
P1 (Value Winner)	21.91 %	13.98 %	1.2010	3.6743***	9.74 %***	0.67	15.93 %	1.0557	3.5127***
P2 (Value Loser)	10.39 %	20.89 %	0.0717	-2.1086**	-8.47 %**	1.07	23.75 %	0.0632	-1.5389
P3 (Growth Winner)	9.30 %	17.10 %	0.3057	-0.8766	-3.51 %	0.90	21.41 %	0.2443	-0.5744
P4 (Growth Loser)	0.54 %	22.88 %	-0.2249	-3.7214***	-15.83 %***	1.16	29.99 %	-0.1717	-2.8232***
S/P & Momentum									
P1 (Value Winner)	22.37 %	16.66 %	0.9647	2.8554***	7.73 %***	0.85	18.37 %	0.8758	2.9785***
P2 (Value Loser)	11.98 %	21.44 %	0.1372	-1.7988*	-7.33 %**	1.11	25.35 %	0.1162	-1.2823
P3 (Growth Winner)	9.88 %	15.55 %	0.4401	-0.0477	-1.12 %	0.79	21.14 %	0.3241	-0.0779
P4 (Growth Loser)	-0.91 %	22.62 %	-0.2323	-3.5068***	-15.59 %***	1.12	29.57 %	-0.1778	-2.6622***
2A (E/P * B/P) & Momentum									
P1 (Value Winner)	25.36 %	14.52 %	1.3169	4.5116***	11.72 %***	0.72	17.33 %	1.1046	3.9993***
P2 (Value Loser)	5.86 %	18.38 %	-0.0565	-3.3736***	-10.46 %***	0.99	21.28 %	-0.0489	-2.5892***
P3 (Growth Winner)	14.32 %	16.97 %	0.6084	0.9107	1.80 %	0.87	19.49 %	0.5306	1.0982
P4 (Growth Loser)	3.37 %	23.53 %	-0.0959	-2.7313***	-12.81 %***	1.15	30.43 %	-0.0743	-2.0704**
2B (EBITDA/EV B/P) & Momentum									
P1 (Value Winner)	23.92 %	14.77 %	1.1457	3.6441***	9.43 %***	0.74	17.19 %	0.9866	3.3991***
P2 (Value Loser)	10.94 %	19.92 %	0.1683	-1.7787**	-6.56 %**	1.06	21.20 %	0.1584	-1.1407
P3 (Growth Winner)	10.01 %	16.33 %	0.3815	-0.3889	-2.09 %	0.84	21.52 %	0.2898	-0.2788
P4 (Growth Loser)	0.77 %	24.25 %	-0.1738	-3.3039***	-15.27 %***	1.21	30.10 %	-0.1401	-2.5423**
2C (CF/P B/P) & Momentum									
P1 (Value Winner)	27.19 %	13.38 %	1.5190	5.0467***	13.57 %***	0.64	15.58 %	1.3068	4.5874***
P2 (Value Loser)	10.98 %	19.96 %	0.1543	-1.9584**	-6.95 %**	1.08	23.91 %	0.1290	-1.3920
P3 (Growth Winner)	11.23 %	17.24 %	0.4342	-0.0786	-1.03 %	0.87	21.39 %	0.3504	-0.0679
P4 (Growth Loser)	0.63 %	22.79 %	-0.2466	-3.7826***	-16.22 %***	1.15	24.94 %	-0.2255	-3.0721***

2D (CF/P S/P) & Momentum									
P1 (Value Winner)	23.99 %	15.51 %	1.1298	3.6585***	9.69 %***	0.78	18.22 %	0.9635	3.3683***
P2 (Value Loser)	14.60 %	20.67 %	0.2531	-1.2727	-5.03 %	1.11	23.91 %	0.2192	-0.7737
P3 (Growth Winner)	13.01 %	15.77 %	0.5786	0.6722	1.29 %	0.78	18.55 %	0.4923	0.7987
P4 (Growth Loser)	0.07 %	24.08 %	-0.2362	-3.3863***	-16.39 %***	1.16	25.98 %	-0.2191	-2.7588***
2E (EBITDA/EV S/P) & Momentum									
P1 (Value Winner)	23.98 %	16.49 %	1.0133	2.9859***	8.55 %***	0.82	19.17 %	0.8731	2.8351***
P2 (Value Loser)	13.12 %	20.64 %	0.2441	-1.2409	-5.05 %	1.08	21.51 %	0.2346	-0.6278
P3 (Growth Winner)	8.21 %	15.57 %	0.3531	-0.5142	-2.37 %	0.78	22.94 %	0.2400	-0.5281
P4 (Growth Loser)	2.94 %	23.95 %	-0.0925	-2.8405***	-13.11 %***	1.19	29.05 %	-0.0763	-2.1779**
3A (CF/P B/P S/P) & Momentum									
P1 (Value Winner)	23.43 %	14.77 %	1.1594	3.5756***	9.72 %***	0.72	17.57 %	0.9765	3.2212***
P2 (Value Loser)	12.28 %	20.05 %	0.1452	-1.9291*	-7.06 %**	1.07	23.62 %	0.1235	-1.3652
P3 (Growth Winner)	12.25 %	15.83 %	0.5594	0.5802	0.97 %	0.78	19.44 %	0.4559	0.6186
P4 (Growth Loser)	0.35 %	23.75 %	-0.2365	-3.3982***	-16.21 %***	1.15	25.83 %	-0.2175	-2.7599***
3B (EBITDA/EV B/P S/P) & Momentum									
P1 (Value Winner)	24.31 %	15.84 %	1.0929	3.4112***	9.39 %***	0.79	18.24 %	0.9509	3.2521***
P2 (Value Loser)	12.99 %	21.23 %	0.1599	-1.7166*	-6.87 %*	1.11	22.59 %	0.1504	-1.1160
P3 (Growth Winner)	8.70 %	15.07 %	0.3818	-0.3698	-1.99 %	0.77	21.74 %	0.2650	-0.4040
P4 (Growth Loser)	-0.60 %	23.46 %	-0.2243	-3.4529***	-15.90 %***	1.16	29.06 %	-0.1812	-2.6691***
Market	12.42 %	16.46 %	0.4486				21.05 %	0.3513	
Rf	1.17 %	0.13 %							

Notes: Average annual return, three risk measures (i.e., volatility, SKAD, and beta) and corresponding performance metrics (the Sharpe ratio, the SKASR, and the Jensen alpha) are presented over the full sample period for every top six quintile value portfolio enhanced by momentum. In addition, the Sharpe ratio differences and the SKASR differences between each six quintile portfolio and market portfolio are reported.

Appendix 6. The hit rate variation scale in fraction portfolios during the sample period employed (2001-2011).

Variable	Q1	Q2	Q3	Q4	Q5
Panel A					
E/P	17.6 % - 76.5 %	21.1 % - 73.7 %	11.8 % - 55.6 %	15.8 % - 68.8 %	33.3 % - 62.5 %
EBITDA/EV	23.5 % - 72.2 %	31.6% - 75.0 %	17.6 % - 62.5 %	17.6 % - 82.4 %	33.3 % - 52.9 %
CF/P	35.3 % - 82.4 %	29.4 % - 76.5 %	17.6 % - 63.2 %	22.2 % - 58.8 %	27.8 % - 58.8 %
B/P	33.3 % - 64.7 %	21.1 % - 68.8 %	23.5 % - 70.6 %	29.4 % - 66.7 %	22.2 % - 58.8 %
S/P	17.6 % - 75.0 %	33.3 % - 75.0 %	29.4 % - 76.5 %	22.2 % - 58.8 %	11.1 % - 58.8 %
2A (E/P * B/P)	23.5 % - 83.3 %	33.3 % - 61.1 %	29.4 % - 55.6 %	21.1 % - 70.6 %	33.3 % - 75.0 %
2B (EBITDA/EV B/P)	23.5 % - 76.5 %	26.3 % - 63.2 %	29.4 % - 76.5 %	17.6 % - 58.8 %	22.2 % - 52.9 %
2C (CF/P B/P)	17.6 % - 77.8 %	31.6 % - 82.4 %	33.3 % - 66.7 %	11.8 % - 58.8 %	27.8 % - 41.1 %
2D (CF/P S/P)	23.5 % - 88.9 %	29.4 % - 76.5 %	23.5 % - 64.7 %	17.6 % - 76.5 %	27.8 % - 58.8 %
2E (EBITDA/EV S/P)	11.8 % - 77.8 %	38.9 % - 81.3 %	31.3 % - 68.8 %	17.6 % - 88.2 %	27.8 % - 58.8 %
3A (CF/P B/P S/P)	17.6 % - 83.3 %	29.4 % - 66.7 %	29.4 % - 70.6 %	21.1 % - 76.5 %	27.8 % - 58.8 %
3B (EBITDA/EV B/P S/P)	23.5 % - 83.3 %	26.3 % - 81.3 %	29.4 % - 70.6 %	22.2 % - 82.4 %	22.2 % - 52.9 %
Average	22.4 % - 78.5 %	29.3 % - 73.5 %	25.5 % - 66.8 %	22.1 % - 70.6 %	26.4 % - 57.5 %
Panel B					
52-week high	27.8 % - 88.2 %	17.6 % - 70.6 %	29.4 % - 82.4 %	29.4 % - 76.5 %	11.8 % - 50.0 %
Acceleration rate (AR)	29.4 % - 82.4 %	29.4 % - 81.3 %	23.5 % - 88.9 %	17.6 % - 70.6 %	22.2 % - 64.7 %
Composite (52-week high * AR)	33.3 % - 82.4 %	17.6 % - 70.6 %	29.4 % - 64.7 %	17.6 % - 64.7 %	11.8 % - 64.7 %
12-month return	23.5 % - 76.5 %	17.6 % - 82.4 %	17.6 % - 70.6 %	16.7 % - 76.5 %	11.8 % - 58.8 %
6-month return	41.2 % - 82.4 %	38.9 % - 81.3 %	35.3 % - 70.6 %	0.0 % - 66.7 %	23.5 % - 58.8 %
Average	31.0 % - 82.4 %	24.2 % - 77.2 %	27.0 % - 75.4 %	16.3 % - 71.0 %	16.2 % - 59.4 %

Variable	P1	P2	-	P3	P4
Panel C					
E/P & Momentum	35.7 % - 85.7 %	14.3 % - 78.6 %	-	28.6 % - 78.6 %	18.8 % - 57.1 %
EBITDA/EV & Momentum	35.7 % - 87.5 %	14.3 % - 71.4 %	-	20.0 % - 71.4 %	21.4 % - 46.7 %
CF/P & Momentum	40.0 % - 92.9 %	14.3 % - 78.6 %	-	13.3 % - 86.7 %	13.3 % - 50.0 %
B/P & Momentum	40.0 % - 78.6 %	7.1 % - 71.4 %	-	14.3 % - 71.4 %	6.7 % - 53.3 %
S/P & Momentum	33.3 % - 78.6 %	14.3 % - 71.4 %	-	28.6 % - 85.7 %	7.1 % - 53.3 %
2A (E/P * B/P) & Momentum	40.0 % - 92.9 %	13.3 % - 71.4 %	-	25.0 % - 85.7 %	25.0 % - 57.1 %
2B (EBITDA/EV B/P) & Momentum	35.7 % - 87.5 %	13.3 % - 71.4 %	-	26.7 % - 78.6 %	21.4 % - 57.1 %
2C (CF/P B/P) & Momentum	46.7 % - 85.7 %	14.3 % - 78.6 %	-	21.4 % - 64.3 %	14.3 % - 53.3 %
2D (CF/P S/P) & Momentum	26.7 % - 78.6 %	7.1 % - 71.4 %	-	20.0 % - 78.6 %	14.3 % - 60.0 %
2E (EBITDA/EV S/P) & Momentum	21.4 % - 93.3 %	20.0 % - 78.6 %	-	21.4 % - 78.6 %	14.3 % - 60.0 %
3A (CF/P B/P S/P) & Momentum	26.7 % - 85.7 %	14.3 % - 85.7 %	-	13.3 % - 78.6 %	7.1 % - 53.3 %
3B (EBITDA/EV B/P S/P) & Momentum	28.6 % - 80.0 %	7.1 % - 71.4 %	-	26.7 % - 78.6 %	7.1 % - 53.3 %
Average	34.2 % - 85.6 %	12.8 % - 75.0 %		21.6 % - 78.1 %	14.2 % - 54.5 %

Notes: Panel A presents the variation scale for the hit rate of all value strategies employed in the study. Panel B illustrates the variation scale of corresponding portions for outperforming stocks with regard to momentum based strategies. Panel C exhibits the variation scale for six-quintile portfolios' hit rates of value-momentum portfolios.