

The Sophisticated and the Simple: The Profitability of Contrarian Strategies from a Portfolio Manager's Perspective



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Abstract

Valuation signals have been among the most popular with equity portfolio managers and have recently attracted significant interest from cross-asset managers. Given a large variation of techniques and theories with regard to how value is measured, this article investigates the efficacy of alternative value measures. We consider a cross-section of simple and sophisticated alternative measures and focus on comparison metrics that are of primary interest for equity portfolio managers. Our results show – although not universally – that sophisticated valuation models are superior to simple valuation models in many respects. Thus, we conclude that sophisticated models have interesting attributes and in general should be considered an additional if not primary perspective on equity valuation and portfolio management.

JEL classification: G11; G12; G14; M41

Keywords: Capital markets, valuation, market efficiency, portfolio strategies

We are grateful to Rahul Jalan comments and research assistance.

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1. Introduction

Valuation is the cornerstone of the investment industry. Investments are made on the basis of what an investor believes an asset is worth relative to its market price. The key is in knowing the value of the asset and the factors that determine that value. Given the developments in this field of research over the past years and the potential benefits associated with more sophisticated methodologies, academics as well as practitioners have been interested in exploring the incremental information contained in sophisticated valuation measures over their "primitive", simple counterparts.

A recent article by Dissanaïke and Lim (2010) despite a focus on the UK equity market is the most comprehensive study to our knowledge in the European space. The authors investigate in particular the efficacy of alternative valuation measures in the context of equity portfolio construction. Their valuation models include sophisticated approaches such as the residual income model (RIM hereafter) pioneered by Ohlson (1991, 1995) and Feltham and Ohlson (1995) as well as variants of RIM. They also include simple valuation measures such as book-to-market, cash flow-to-price and others. Dissanaïke and Lim (2010) conclude that, while signals obtained from the sophisticated models are more informative for the future cross-section of equity returns (in mid- to long-term horizons) than those obtained from simple factors, the difference is almost marginal.

Our analysis further investigates whether sophisticated valuation models provide incremental information. In addition, we shed light on several aspects that equity portfolio managers would be most concerned with. We differentiate ourselves from current studies on several grounds and thus our contributions are numerous.

First, we focus on Europe. Most of the prior studies have been carried out on the US market and the evidence on the predictability of alternative valuation measures on stock returns is rather limited for European stocks. Studies that have looked at the European market have primarily been country-specific (see, for example, Dissanaïke and Lim 2010 for the UK). Typical investment mandates, however, are more likely to be pan-European as opposed to country-specific, which makes our investigation potentially more realistic. Moreover, our investigation is undertaken with stocks that are or have been constituents of a broadly used benchmark index, (i.e., the MSCI Europe Index). While this choice restricts our universe to about 450 stocks on average per rebalancing period, it guarantees that the stocks in our sample: a) are those that the typical equity portfolio manager would be allowed to invest in, b) have a reasonable history of data to compute all relevant variables, and c) are available for sorting either directly or through derivatives.

Second, we organise our investigation in such a way that portfolios are formulated and evaluated in a manner that is more closely related to real-life equity portfolio management. Frequent, (i.e., monthly), rebalancing may be restrictive as to whether a month is sufficient for accounting-related information to be reflected in market prices; however, this choice is justified by the way practitioners, in general, manage money. Equity portfolios are typically revisited monthly or quarterly (thus our alpha decay analysis which follows) and the relevant question for the investment professional would relate to the measure that best captures firm value over a one- or a three-month horizon. In addition, our evaluation and robustness metrics extend the set of results presented in current published research by including measures such as signal consistency, alpha decay, portfolio turnover and others. Furthermore, we provide analysis and discussion of how each factor works before and after the global financial crisis (GFC hereafter) as well as the recent value rally and how sector or risk attributes of the constructed portfolios influence their profitability.

Third, for the first time we investigate with the recently introduced valuation approach of Hwang and Sohn (2010) [using European data]. Hwang and Sohn (2010) highlight that shareholders possess an option to liquidate their investment if they believe the long-term business prospects of the firm are so poor to the extent that the level of capitalized future dividends is expected to be below the firm's net asset value. They suggest that this option, termed the 'abandonment option', should be incorporated in the firm's intrinsic value calculation, thus the measurement of equity value should be undertaken with a real options model (ROM hereafter). Their analysis shows that including the abandonment option in the calculation of the firm's intrinsic value provides incremental predictability over the RIM.

Our empirical analysis provides important findings that we group in three categories. First, sophisticated models, i.e., RIM and ROM, produce equity valuations that are more able to predict the cross-section of short-term future equity returns more accurately than simple models. The superior quality of the signal translates into an improvement of the annualised monthly return that can be up to about 5%, (i.e. the difference in the hedge portfolio return between RIM and forward PE), or in the magnitude of about 50% or more in terms of Information Ratio, (i.e. the difference in the information ratios of RIM- and ROM-based portfolios relative to all others). Second, the signal obtained through RIM and ROM is characterised by superior *strength*. Equity valuations based on RIM and ROM are more capable of predicting the cross-section of short-term future equity returns than simple models are, even after accounting for transaction costs. When we focus on the information coefficients we conclude that although the difference is only marginal, sophisticated models and RIM in particular outperform all others. Finally, when we examine the efficacy of the valuation measures in the pre- and post-crisis periods we conclude that the sophisticated measures present with a relatively consistent ranking, ROM in particular. Third, our examination of the purity or uniqueness of the valuation signals concludes that sophisticated models, (i.e. RIM and ROM), are less vulnerable sector biases. When sector-bias is neutralised the improvements to information ratios of portfolios obtained through simple valuation models range from 34% to 96% while the improvements for sophisticated models are 20% at most. As expected, the correlations are almost identical among value-factor correlations, but there are differences with regard to the ex-value-factor correlations. ROM and to a lesser extent RIM appear to be the most appropriate valuation measures to combine with momentum signals. Our findings have significant implications for equity portfolio managers as well as for scholars researching in the area of equity valuation.

This article is organised as follows. Section 2 reviews the literature related to value investing. Section 3 discusses the valuation measures we use in our analysis. Section 4 details the dataset. In Section 5 we present the empirical results of our analysis and in Section 6 we conclude.

2. Literature review

Since the publication of research by Basu (1977), and soon after by Ball (1978), which concluded that earnings/price and dividend/price ratios respectively predict future returns in the cross-section of stocks, a large number of papers have investigated the relationship between firms' fundamentals and their future stock returns. Earlier studies have focused on straight measures of fundamental value such as, debt/equity ratio (Bhandari, 1988), book value of equity/market value of equity (Chan *et al.*,1991), cash flow/price (Fama, 1990) among others. The common ground of these studies has been to try to identify variables that better reflect the real value of a firm and thus better predict future equity or price returns.

Recent research efforts have been more sophisticated in the way they propose to compute the real value of a firm. Ohlson (1991, 1995) and Feltham and Ohlson (1995) have pioneered an alternative valuation model, the (discounted) residual income model (RIM). The RIM assumes an accounting identity, the clean surplus relation, which states that the change in book value

of equity is equal to the difference between accounting earnings and dividends. The residual income, or abnormal earnings, is defined as the difference between accounting earnings and the previous-period book value multiplied by the cost of equity. The RIM maintains that the current stock price should equal the current book value of equity plus the present discounted value of (infinite) expected future residual income (Jiang and Lee, 2005). In contrast to a simple dividend discount model, the RIM accounts for all forms of cash payouts to shareholders, given that it broadly defines dividends as the difference between earnings and the change in book value.

Frankel and Lee (1998) developed this concept by proposing the following: The empirical application of the model, the infinite sum of discounted residual income could be approximated with a truncated sum of short-horizon earnings forecasts of up to three years—which are available with relatively good precision and moreover for a large cross-section of stocks. Frankel and Lee (1998) find empirically that firms' fundamental value estimates obtained through the RIM provide better forecasts of long-term cross-sectional returns compared with a straight book/price ratio. The findings presented in Frankel and Lee (1998) have motivated a large number of researchers in the subsequent years. Lee *et al.* (1999) find that value/price, where value is based on the RIM, has superior predictive power over traditional market multiples (e.g., B/P, E/P, and D/P ratios) for Dow 30 stocks. Francis *et al.* (2000) find that valuations from the RIM model are more accurate and explain more of the variation in security prices relative to valuations obtained with either the discounted dividend model or the discounted free cash-flow model. Ali *et al.* (2003) also find that RIM valuations predict mid-and long-term cross-sectional returns and that this is primarily attributed to the model's ability to identify mispriced stocks (as opposed to stocks with certain risk characteristics).

One recent development in this strand of literature is due to Hwang and Sohn (2010). The authors posit that a more accurate valuation model should incorporate the value of the abandonment option effectively held by shareholders. Motivated by Burgstahler and Dichev (1997), the authors suggest that shareholders have the option to liquidate net assets at all times. If the long-term business prospect of a firm is so poor that the level of capitalized future dividends (i.e., cash flows for shareholders) is expected to be below the net asset value, shareholders can opt to liquidate the net assets of the firm. If the contrary is true, shareholders can exercise their call option to take the underlying asset with the payment of the exercise price of net assets of the firm. This model predicts that the value of a company is always higher than its net assets. Hwang and Sohn (2010) find that the value-to-price (V/P) ratio from the real options model has an enhanced predictability for future abnormal stock returns relative to the RIM. In particular, they find that for firms in the same RIM-based V/P quintile, those in the highest real options model-based V/P quintile exhibit higher future 36-month buy-and-hold abnormal returns than those in the lowest quintile by 14% to 50%. A follow-up study by the same authors (Hwang and Sohn, 2009) concludes that the predictability of this factor is stronger for stocks with high idiosyncratic volatility.

3. Valuation Measures

In this article we investigate the predictive ability of certain valuation measures over the cross-section of future equity returns. Our analysis in line with Dissanaike and Lim (2010) involves valuation measures that can be classified as 'simple' or 'sophisticated'.

Our 'simple' valuation measures include 'forward PE', 'book yield' and 'fair PE'. 'forward PE' is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS forecast divided by month end closing price. 'Book yield' is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month end closing price. And 'fair PE' i.e. (forecast PE/market PE), is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market capitalisation (risk and liquidity proxy) as inputs.

We provide the details of this model in the appendix.

The 'sophisticated' models include RIM and ROM. Under the RIM, the value of a firm is function of its current book value (as used as a proxy for net assets) plus its residual income:

$$Vf_t = BV_t + RI_t$$

The firm's residual income is calculated as:

$$RI_t = \frac{(FROE_{t+1} - r_t)BV_t}{(1+r_t)} + \frac{(FROE_{t+2} - r_t)BV_{t+1}}{(1+r_t)^2} + \frac{(FROE_{t+3} - r_t)BV_{t+2}}{(1+r_t)^2 r_t}$$

where $FROE_{t+n}$ is the forecast ROE at time $t+n$,¹ BV_t is the reported book value at time t , and r_t is the forecasted at time t industry-specific cost of equity which we compute following Fama and French (1997) as we detail in the appendix.

Under the ROM, a firm's value is not a linear function of accounting earnings but a convex function of both earnings and book value because it has option-like characteristics. As mentioned earlier, shareholders have the option to liquidate the firm's (net) assets if the long-term business prospects of the firm are poor to the extent that the level of capitalized future dividends is expected to be below the net asset value (NAV). However, if the future dividend or cash flow stream is greater than the NAV, the shareholders 'exercise' the option by 'paying' the exercise price and deploying the net assets for future business operations. The option is viewed as a call option to buy future dividends or cash flow streams with the payment being the net assets. Shareholders consider this call option by continuously comparing the long-term expected levels of the future dividends/cash flow and the net asset value. Formally, the value of a firm can be expressed as $V = NAV + CO$, where CO is the call option premium of an option with the capitalized future cash flow stream as its underlying asset and NAV (which is proxied by the book value) as its strike price.

The option price or valuation is modeled using the standard Black and Scholes (1973) option-pricing model. The call price is calculated as:

$$CO_t(Vf_t, BV_t) = Vf_t N(d_1) - BV_t e^{-R_f T} N(d_2)$$

where Vf_t is the 'price' (of the underlying asset) within the Black-Scholes equation and is a function of the book value plus the residual income, BV_t is the 'strike' and is the current book value of the firm, R_f is the risk-free rate, σ is the standard deviation of the historical percentage change in Vf_t , T is the maturity of option—the period during which shareholders compare the values of BV_t and Vf_t and d_1, d_2 are computed as follows

$$d_1 = \ln(Vf_t/BV_t) + \left(R_f + \frac{\sigma^2}{2} \right) T / \sigma \sqrt{T}, \quad d_2 = d_1 - \sigma \sqrt{T}.$$

Within the ROM, the value of a firm can be expressed as:

$$V_o_t = BV_t + CO(Vf_t, BV_t)$$

These factors are obviously not independent of each other, although they are based on different rationales. Book yield could be viewed as the least related to the others in a sense. Although the book value is a variable of both RIM and ROM, valuations between the three approaches may vary depending on the sign and magnitude of residual income. Forward earnings yield, on the other hand, relies on FY1 and FY2 EPS forecasts which are at the core of RIM and ROM valuations. However, in the latter two, industry risk is accounted for explicitly through the industry cost of equity discount factor. Fair PE is also based on EPS, in particular EPS growth; hence one of its constituents can be seen as common with constituents of forward PE, ROM, and RIM valuations.

1 - Following Hwang and Sohn's (2010) methodology, forecast ROE is calculated as the consensus EPS forecast for fiscal year $t+n$ divided by the book value per share at time $t+n-1$. Additionally, the forecast book value at time $t+1$ is equal to the BV at t plus the EPS forecast at $t+1$ less the payout multiplied by EPS forecast at $t+1$.

These observations suggest that quantitative strategies based on either of these factors are not expected to be dramatically different in terms of their risk/return attributes, especially in the relatively short (considering the motivation of each factor) investment horizon we consider. However, any improvement we possibly see should provide support to the rationale and the theory behind the construction of each factor and its capacity to reveal value that is not captured by its peers nor priced (or not initially priced) by the stock market.

4. Data

For the reasons we discussed earlier we focus our analysis on all stocks that are or have been constituents of the MSCI Europe Index for the period January 1990 to April 2010. Survivorship bias has been accounted for by using the MSCI Europe Index constituents at the time of backtest rebalance. We source reported fundamental data from Worldscope while forecast data comes from I/B/E/S.

We apply several standard filters to maintain a sensible dataset. Thus we remove all stocks with missing data or negative book values. To account for extreme payout ratios we set all ratios that are greater than 100% to equal 100% as well as all ratios that are less than 0% to equal 0%. Forecast EPS data for three fiscal years out is limited. We create a proxy EPS FY3e forecast by multiplying the forecast EPS growth by the last forecast EPS (FY2):

$$\begin{aligned} epsG &= 1 + (epsFY2 - epsFY1) / abs(epsFY1) \\ epsFY3 &= epsFY2 * epsG \end{aligned}$$

One of the main potential restrictions with the ROM is the requirement to model a stock's residual income over time. This is required as we need to measure the volatility of the residual income as it is a key input into the option pricing model. Following Hwang and Sohn (2010) we use five years of data to calculate the volatility of the residual income of a firm. This choice is consistent with the idea that five years of operation are necessary to convince shareholders of the real expected level of long-term future dividends/cash flow. Given this requirement, before we can start to empirically test the ROM we therefore require five years of data. Clean surplus accounting is assumed in the calculation of forecast book values and we assume a constant payout ratio. Given the data and the adjustments that we have made, on average our stock coverage relative to the MSCI Europe is 86% and in terms of capitalisation coverage it is slightly more at 88%. In our comparison of other valuation metrics we adopt this adjusted universe as the basis for all our analysis. This ensures that any differences in performance or risk profile are a result of the model or technique rather than due to differences in sample data.

5. Empirical analysis

We study the predictability of valuation signals in the context of calendar time portfolios. Stocks are ranked with respect to the ratio

$$\left[\frac{\text{Value}}{\text{Stock Price}} \right]_t,$$

where value is derived by either of 'forward PE', 'book yield', 'fair PE', 'RIM' and 'ROM' at the end of each month. We then split the universe into five portfolios. The top quintile portfolio based on 'forward PE' comprises stocks with high earnings yield while the bottom quintile comprises stocks with low earnings yield. We then calculate the subsequent month's total return for each group of stocks (equally weighted) and rebalance these portfolios monthly.

We organise our experiments and discussion in three different groups. The first group is concerned with the examination of the *quality* of the valuation signal, i.e., the performance of

the constructed portfolio. The second group of tests deals with the *strength* of each valuation signal, i.e., the consistency of the signal across the cross-section of stocks and through time as well as its capacity after transaction costs are accounted for. Finally, we also concern ourselves with the uniqueness of the signals, i.e., with how the trading strategies arising from the different valuation measures overlap and correlate with other alpha sources.

5.1. Signal quality

Table 1 reports return and risk statistics for three portfolios that we focus our attention on. The top quintile portfolio, Q5, which is of particular interest to long-only portfolio managers. The bottom quintile portfolio, Q1, which is of interest to managers able to short stocks as well as for long-only managers wishing to identify/avoid future underperformers. We note that the returns we report for the bottom and the top quintile are spread over the market returns, i.e., over the MSCI Europe Index returns.

Table 1 - Spread returns for portfolios formulated on value sorts

This table presents the spread returns of portfolios sorted on the basis of alternative valuation measures for the period January 2000 to April 2010. These measures include: 'forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month-end closing price; 'book yield' which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month-end closing price; 'fair PE', i.e., forecast PE/Market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM', which is obtained through the residual income model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM', which is obtained through the real options model (see Hwang and Sohn, 2010). The top quintile portfolio, i.e., Q5, comprises stocks with high 'earnings yield' while the bottom quintile, i.e., Q1, comprises stocks with low 'earnings yield'. The returns of the bottom and the top quintile are spreads over the market returns, i.e., over the MSCI Europe Index returns.

Top Quintile Q5 – Market	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	7.06%	8.92%	7.34%	9.02%	9.92%
t-Statistic	1.74	1.84	1.86	2.58	2.40
Annualized Volatility	14.6%	18.0%	13.9%	11.7%	14.0%
Information Ratio	0.48	0.50	0.53	0.77	0.71
Maximum Drawdown	-15.1%	-10.4%	-14.2%	-11.8%	-10.4%
Hit Rate	64.5%	58.9%	62.9%	64.5%	65.3%
Bottom Quintile Q1 – Market	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	-1.05%	-0.89%	-1.68%	-3.72%	-1.80%
t-Statistic	-0.16	-0.29	-0.57	-1.00	-0.50
Annualized Volatility	10.5%	7.1%	7.8%	10.5%	9.1%
Information Ratio	-0.10	-0.13	-0.22	-0.36	-0.20
Maximum Drawdown	9.7%	6.3%	9.2%	8.8%	9.5%
Hit Rate	52.4%	50.8%	50.0%	47.6%	50.8%
Top-Bottom Quintiles Q5-Q1	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	7.05%	9.07%	8.34%	11.94%	10.98%
t-Statistic	1.52	1.84	1.80	2.53	2.25
Annualized Volatility	17.8%	18.0%	16.9%	16.0%	16.9%
Information Ratio	0.40	0.50	0.49	0.75	0.65
Maximum Drawdown	-19.1%	-15.6%	-16.8%	-16.5%	-17.9%
Hit Rate	55.6%	59.7%	62.1%	60.5%	56.5%

On a long-only basis portfolios formulated with the sophisticated models, i.e., RIM and ROM, outperform the portfolios based on simple models. Their spread returns are on average 9.02% and 9.92%, annualized with t-statistics of 2.58 and 2.40 respectively. A less statistically significant return is obtained through book yield, i.e. the t-statistic is just 1.84, while the average return obtained through forward PE and fair PE is only marginally significant, i.e., the t-statistics are 1.74 and 1.86 respectively. In terms of the risk/return relationship, RIM- and ROM based portfolios are better by a factor of almost 1.5.

The results in the bottom quintile are far from impressive across all valuation metrics. The RIM shows the best information ratio but in general the wealth curve for all valuation factors suggests that all models have been poor in identifying over-valued companies in the short-term investment horizon.

When we turn our eye to assess the performance of hedge portfolios, we conclude that RIM- and ROM-based portfolios rank higher than the portfolios obtained through the simple measures. Portfolios constructed on the basis of RIM have the highest annual return (higher by about 1% and 2% relative to the second and third best factors, i.e., ROM and book yield). In terms of return volatility RIM again ranks best. Thus, risk/return-wise RIM ranks best, with an information ratio (IR) of 0.75 (relative to 0.65 and 0.50 for the second and third best, ROM and Book Yield, respectively).

Table 2 - Risk-adjusted returns for the Q5-Q1 portfolio

This table presents the risk-adjusted returns of portfolios sorted on the basis of alternative valuation measures for the period January 2000 to April 2010. These measures include: 'forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month-end closing price; 'book yield', which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month-end closing price; 'fair PE', i.e., forecast PE/market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM', which is obtained through the residual income model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM', which is obtained through the real options model (see Hwang and Sohn, 2010). Market returns are represented by MSCI Europe index, Value premiums are computed through the spread of the MSCI Europe Value and Growth index returns, and Size premiums are computed through the spread of the MSCI Europe Large Cap and Small Cap index returns. Momentum returns are proxied with the spread return difference between the Q5 (high) portfolio and the Q1 (low) portfolio 12-month price return of companies in the MSCI Europe Index. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Alpha	Market	(Value - Growth)	(Large - Small Cap)	Momentum
ROM	0.66%*	-0.29***	1.00***	-0.05	-0.32***
Forward PE	0.28%	-0.17*	1.08***	-0.19	-0.12
Book Yield	0.40%	-0.07	1.23***	-0.20	-0.32***
RIM	0.86%**	-0.36***	0.69***	0.06	-0.13
Fair PE	0.36%	-0.04	1.07***	-0.23	-0.21**

To get additional insight with regard to what drives the return of each portfolio and to rule out that the return of the portfolio is pure compensation for known risks, we calculate the risk-adjusted return of the hedge portfolio as in Fama and French (1993) and Carhart (1997) and report the results in Table 2. The results indicate that the long/short (or Q5/Q1) risk-adjusted returns (alphas) of RIM and ROM are significant, at level of 5% and 10% significance respectively. We interpret this finding as an indication that RIM and ROM are able to unhide value that is not captured by traditional measures—such as those used to construct value/growth indices. Another observation that is worth highlighting is that the size risk factor is not statistically significant for any of the valuation measures. The implication being that the positive returns of the strategies are not a result of small cap exposure and therefore trading costs may not significantly reduce the after-cost returns of these strategies.

In summary, our analysis of the signal *quality* concludes that sophisticated models, RIM and ROM, produce equity valuations that are more able to predict the cross-section of short-term future equity returns than simple models are. The superior *quality* of the signal translates to an improvement in the annualised monthly return that can be up to about 5% (the difference in the hedge portfolio return between RIM and forward PE), or in the magnitude of about 50% or more in terms of IR (the difference in the IRs of RIM- and ROM-based portfolios relative to all others).

5.2. Signal strength

We examine the valuation factor strength or robustness from three different angles. First, to address concerns suggesting that transaction costs may have a significant impact on the profitability of possibly high turnover strategies, we examine how the turnover of the portfolios based on each valuation measure affects portfolio returns. Second, we carry out an analysis of a typical measure of ex-post signal strength evaluation, the rank information coefficient (IC hereafter), which is the cross-sectional correlation of the ranks upon portfolio formation and next rebalance. The IC enables us to see if the signal is consistent across the cross-section of stocks that we are considering at a point in time. Third, given the unique event of the GFC

and the tremendous impact on valuation-based equity strategies, we study how each valuation measure performs pre- and post-crisis.

Determining the likely transaction costs of a strategy within an empirical framework is difficult. Transaction costs are a function of fund size, the alpha signal, market conditions, and in some cases, they are firm-specific. However, we can make some broad assumptions in order to gauge the potential costs of a strategy. The key variable within this research framework is turnover. We assume in our analysis, that all things equal, the higher the turnover, the higher the transaction costs. While we recognise that transaction costs are non-linear relative to transaction size and fund size, for this exercise and for simplicity, we apply a fixed, 'all-in', transaction cost to our analysis. We simply assume transaction costs are a function of turnover² and subtract the cost of trading off the monthly return of the strategy. For the fixed transaction cost through the period of analysis we use 50bps, which comprises commission, spread, borrow (where applicable) and market impact costs.³

Table 3 tabulates the results of this analysis and, in particular, the pre- and post-transaction cost strategy returns. This analysis concludes that ROM presents with the second-lowest average turnover (second to book yield) and RIM with the second-highest (fair PE is associated with the highest turnover portfolio strategy). While the RIM model in general has the highest turnover, given our transaction cost assumptions, the higher returns of this strategy more than compensate for this. Focusing on the top quintile (long), we conclude that, after costs, the ROM model has the highest risk-adjusted returns.

Table 3 - Impact of portfolio turnover on returns

This table presents the spread returns of portfolios sorted on the basis of alternative valuation measures and turnover statistics for the period January 2000 to April 2010. These measures include: 'forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month end closing price; 'book yield' which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month end closing price; 'fair PE', i.e., forecast PE/market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM', which is obtained through the residual income model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM', which is obtained through the real options model (see Hwang and Sohn, 2010). The top quintile portfolio, i.e., Q5, comprises stocks with high 'earnings yield' while the bottom quintile, i.e., Q1, comprises stocks with low 'earnings yield'. The returns of the bottom and the top quintile are spreads over the market returns, i.e., over the MSCI Europe Index returns. The turnover is computed as the total buys and sells divided by the (2*number of stocks in a portfolio). For example, if all the stocks were traded then the turnover would be 100%. We consider fixed transaction cost through the period of analysis we use 50bps, which comprises commission, spread, borrow (where applicable) and market impact costs.

Top Quintile Q5 – Market	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	7.06%	8.92%	7.34%	9.02%	9.92%
t-statistic	1.74	1.84	1.86	2.58	2.40
Annualized Volatility	14.6%	18.0%	13.9%	16.0%	14.0%
Information Ratio	0.48	0.50	0.53	0.56	0.71
Maximum Drawdown	-15.1%	-10.4%	-14.2%	-11.8%	-10.4%
Hit Rate	64.5%	58.9%	62.9%	64.5%	65.3%
Average Monthly					
Turnover	15%	10%	18%	15%	15%
Returns After Costs	5.2%	7.6%	5.1%	7.0%	8.0%
% Reduction in Returns	-26.4%	-14.5%	-30.4%	-22.1%	-19.6%
Bottom Quintile Q1 – Market	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	-1.05%	-0.89%	-1.68%	-3.72%	-1.80%
t-statistic	-0.16	-0.29	-0.57	-1.00	-0.50
Annualized Volatility	10.5%	7.1%	7.8%	11.7%	9.1%
Information Ratio	-0.10	-0.13	-0.22	-0.32	-0.20
Maximum Drawdown	9.7%	6.3%	9.2%	8.8%	9.5%
Hit Rate	52.4%	50.8%	50.0%	47.6%	50.8%
Average Monthly					
Turnover	13%	8%	16%	15%	12%
Returns After Costs	0.5%	0.1%	0.2%	-1.9%	-0.4%
% Reduction in Returns	-146%	-111%	-112%	-48%	-76.1%

2 - Total buys and sells divided by the (2*number of stocks in a portfolio). For example, if all the stocks were traded then the turnover would be 100%. However for High-Low strategies this could be up to 200%.

3 - An exercise that incorporates transaction costs in a more explicit way is beyond the scope of this article. However, we refer the reader to De Groot et al. (2010) for a detailed investigation along these lines.

Top – Bottom Quintile Q5 – Q1	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	7.05%	9.07%	8.34%	11.94%	10.98%
t-statistic	1.52	1.84	1.80	2.53	2.25
Annualized Volatility	17.8%	18.0%	16.9%	16.0%	16.9%
Information Ratio	0.40	0.50	0.49	0.75	0.65
Maximum Drawdown	-19.1%	-15.6%	-16.8%	-16.5%	-17.9%
Hit Rate	55.6%	59.7%	62.1%	60.5%	56.5%
Average Monthly					
Turnover	28%	18%	33%	31%	26%
Returns After Costs	3.6%	6.7%	4.1%	7.9%	7.5%
% Reduction in Returns	-49.3%	-26.1%	-50.8%	-33.7%	-31.5%

Our second test of signal strength involves the analysis of the IC. We calculate the rank IC for all valuation measures and show, in table 4, the average IC over the period of analysis, the standard deviation of the IC and lastly the t-statistic. The later corresponds to the t-test of the null hypothesis that the mean IC is zero. While in general the ICs are relatively low, most of this can be attributed to the deep underperformance of value through the GFC. Restricting our analysis to the period spanning 2000 to mid 2007, most of the ICs are twice what they are for the entire sample. Having said this, it's also apparent that the ICs have been falling prior to the GFC (see Jones, 2010 for a detailed analysis of falling IRs).

Table 4 - Rank Information Coefficients – Descriptive Statistics

This table presents statistics of the rank Information Coefficient which is the cross-sectional correlation of the ranks of stocks upon portfolio formation and next rebalance. We present the average IC, the standard deviation of the IC, and the t-statistic (for a t-test of the null hypothesis that the mean IC is zero) of stocks sorted on the basis of alternative valuation measures for the period January 2000 to April 2010. These measures include: 'forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month end closing price; 'book yield' which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month end closing price; 'Fair PE' i.e., forecast PE/market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM', which is obtained through the residual income model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM' which is obtained through the real options model (see Hwang and Sohn, 2010).

	Average	Stdev	t-stat
Forward PE	3.9%	14.7%	2.93
Book Yield	2.5%	14.4%	1.90
Fair PE	3.6%	13.8%	2.88
RIM	4.1%	14.3%	3.16
ROM	3.6%	13.6%	2.93

We complement this analysis with an investigation of the IC decay. Traditionally, accounting-based valuation methodologies such as RIM and ROM are advocated to provide a better value estimate when value needs to be measured in the mid- to long-term. To this extent, prior studies such as those by Hwang and Sohn (2010) and Dissanaike and Lim (2010) have shown (or have challenged) the merits of these methodologies for portfolio strategies that rebalance every year, two or three years. To investigate this angle, we calculate the IC decay. As in the previous section we calculate the rank correlation in the cross-section of stocks for up to 24 months in the future. The analysis indicates that the IC decay of Forward PE is more pronounced, whereas ROM seems to possess ICs that maintain their magnitude for up to 24 months after portfolio formation.

With our last test, we wish to explore the predictability of each valuation measure in the pre-and post-GFC period. Our aim is to determine if our conclusions, with respect to the relative ranking of valuation measures, are driven by the prevailing market conditions. Table 5 reports the results of our investigation where we split the sample into two periods: 2000 to 2006; and 2007 to 2010. As shown, the difference in spread returns of the value strategies between the two periods is stark. We observe that ROM has done fairly well in capturing value in the pre-crisis period, although it is not ranked best among its peers. Fair PE, forward PE and book yield have performed better on a risk-adjusted basis over this period. In the second period ROM has also done fairly well in the sense that it has been (along with RIM and book yield) among the least value-destructing factors. Interestingly, the factors that perform best in the pre-crisis period, i.e., fair PE and forward PE, are the worst performers in the (post-) crisis period. Therefore, this analysis

concludes that RIM and ROM in particular maintain a reasonably good and consistent rank in the entire study period.⁴

Table 5 - Portfolio performance relative to the Global Financial Crisis: 2000 to 2006 vs. 2007 to 2010

This table presents the spread returns of portfolios sorted on the basis of alternative valuation measures for the period January 2000 to April 2010. These measures include: 'Forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month end closing price; 'Book Yield' which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month end closing price; 'Fair PE' i.e. Forecast PE / Market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM' which is obtained through the Residual Income Model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM' which is obtained through the Real Options Model (see Hwang and Sohn, 2010). The top quintile portfolio, i.e. Q5, comprises stocks with high 'earnings yield' while the bottom quintile, i.e. Q1, comprises stocks with low 'earnings yield'. The returns of the bottom and the top quintile are spreads over the market returns, i.e. over the MSCI Europe Index returns.

01/2000 to 12/2006	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	20.35%	17.91%	19.79%	19.38%	19.45%
t-Statistic	3.24	2.91	3.46	2.98	3.17
Annualized Volatility	16.3%	14.3%	14.7%	17.1%	16.0%
Information Ratio	1.25	1.25	1.34	1.13	1.22
Maximum Drawdown	-19.1%	-15.6%	-16.8%	-16.5%	-17.9%
Hit Rate	65.5%	72.6%	71.4%	63.1%	64.3%
01/2007 to 04/2010	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	-16.28%	-7.39%	-12.26%	-2.20%	-4.91%
t-Statistic	-1.55	-0.40	-1.05	-0.21	-0.35
Annualized Volatility	18.7%	23.5%	19.5%	12.5%	18.1%
Information Ratio	-0.87	-0.31	-0.63	-0.18	-0.27
Maximum Drawdown	-14.1%	-10.9%	-13.6%	-7.5%	-9.3%
Hit Rate	35.0%	32.5%	42.5%	55.0%	40.0%

In summary, our analysis of the signal *strength* concludes that sophisticated models, i.e. RIM and ROM, produce equity valuations that are more able to predict the cross-section of short-term future equity returns than simple models even after accounting for transaction costs. When we focus on the ICs we conclude that although the difference is only marginal sophisticated models and in particular RIM outperforms all others. Finally, when we examine the efficacy of the valuation measures in the pre- and post-crisis periods we conclude that the sophisticated measures present with a relatively consistent ranking, ROM in particular.

5.3 Signal uniqueness

ROM as well as the other value factors may be systematically selecting attributes of the stocks that are not related to stock-specific value. In this section we investigate the influence that sector exposure has on the returns to the various strategies that we are considering. We also address the concern that signals overlap as well as correlate with other predictive factors.

First, we repeat our analysis, but neutralise sector biases in our results. The methodology we employ to create sector-neutral portfolios is straightforward. We create sector-relative portfolios by sorting the stocks in each of the 10 MSCI sectors by their respective valuation metric, grouping the stocks within each sector into quintiles, and then aggregating the stocks from the same quintiles. Thus, the first aggregated or sector-relative quintile contained the stocks from the first quintile of each sector, while the fifth sector-relative quintile contained the stocks from the fifth quintile of each sector. We then equally weight the sector-relative quintiles and measure their total returns during the following month. Table 6 depicts the results from this analysis. The risk-adjusted returns fall (observed across all portfolios) is to a large extent expected. This decrease has no impact on the relative rank of each model. The varying degree of the influence that sector neutrality has on the performance of each portfolio is, however, a surprise.

Table 6 Sector-neutral portfolio returns

4 -An analysis of the time series of portfolio returns which is available on request finds that RIM and ROM have performed the best in the period following the large value sell-off from August 2007 and in particular, during 3rd quarter 2008. This result favours the explanation that typical value factors have been over-crowded and thus hampered during liquidity squeezes. Less attended factors, on the other hand, like RIM and ROM have presented some resistance. A second observation is that RIM, ROM, and Book Yield have been strong performers in the value rally starting in March 2009. The performance of ROM, in particular, implies that it has been able to identify companies with the highest price appreciation. Our results suggest that (current) Book Values – as opposed to earnings expectations – have primarily driven prices up in the recent value rally. All three factors, although to a varying extent, have been able to capture this potential – to some degree this can be explained by the Financials sector. Moderate earnings (and earnings growth) expectations – published under uncertain global economic conditions in early 2009 – appear not to have sufficed to distinguish RIM and Book Yield valuations. The volatility in past residual income, however, seems to have determined significant option values for ROM, which delivered different and more correct, as it turned out, valuations than RIM. Should RIM and ROM deviate between each other though? In theory, the top quintile of RIM and ROM should present with significant overlap as it contains profitable firms with low probability of liquidation. In other words, the value of the option should be a smaller fraction of the overall value of the firm, thus, RIM and ROM valuations should be almost identical in theory. It appears, however, that for the top basket in two instances, i.e. March 09 onwards as mentioned earlier and (about) January 03 to (about) August 2007, ROM outperforms RIM.

This table presents the spread returns of portfolios sorted on the basis of alternative valuation measures for the period January 2000 to April 2010. These measures include: 'Forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month end closing price; 'Book Yield' which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month end closing price; 'Fair PE' i.e. Forecast PE / Market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM' which is obtained through the Residual Income Model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM' which is obtained through the Real Options Model (see Hwang and Sohn, 2010). The top quintile portfolio, i.e. Q5, comprises stocks with high 'earnings yield' while the bottom quintile, i.e. Q1, comprises stocks with low 'earnings yield'. The returns of the bottom and the top quintile are spreads over the market returns, i.e. over the MSCI Europe Index returns. Portfolio returns are neutralised with respect to sector biases. We create sector-relative portfolios by sorting the stocks in each of the 10 MSCI sectors by their respective valuation metric, grouping the stocks within each sector into quintiles, and then aggregating the stocks from the same quintiles. Thus, the first aggregated or sector-relative quintile contains the stocks from the first quintile of each sector, while the fifth sector-relative quintile contains the stocks from the fifth quintile of each sector. We then equally weight the sector-relative quintiles and measure their total returns during the following month.

Top Quintile Q5 – Market	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	9.01%	9.43%	9.59%	10.37%	10.00%
t-Statistic	2.54	2.27	3.01	2.93	2.63
Annualized Volatility	11.8%	12.4%	10.4%	11.9%	12.7%
Information Ratio	0.76	0.76	0.92	0.87	0.79
Maximum Drawdown	-10.5%	-10.1%	-9.9%	-10.0%	-9.6%
Hit Rate	61.3%	61.3%	63.7%	66.9%	62.1%

Top-Bottom Quintiles Q5-Q1	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	7.04%	8.31%	9.44%	10.77%	10.38%
t-Statistic	2.05	2.27	2.84	2.93	2.59
Annualized Volatility	11.8%	12.4%	10.9%	12.0%	13.4%
Information Ratio	0.60	0.67	0.87	0.89	0.78
Maximum Drawdown	-11.5%	-11.7%	-9.4%	-11.8%	-13.2%
Hit Rate	59.7%	56.5%	65.3%	69.4%	64.5%

For the long/short portfolio, the largest deviations in returns are observed for Book Yield, i.e. a drop from 9.07% to 8.31%, and for Fair PE, i.e. an increase from 8.34% to 9.44%. Significant deviations are observed in the return volatility, which, combined with the deviations in returns, result in substantial improvements on IRs. The change in IRs is 0.13, 0.20, 0.17, 0.14, and 0.38 for ROM, Forward PE, Book Yield, RIM and Fair PE, respectively. These figures represent improvements of 20%, 50%, 34%, 18.6% and 96% of the initial IRs. When we focus our attention on the 5th Quintile portfolio, apart from Book Yield, it is interesting to highlight that the performance numbers are very similar across the other four valuation metrics. This observation suggests that in the un-constrained space, the difference in performance arises from the capacity of models such as RIM and ROM to correctly identify stock-specific value and efficiently incorporate sector-wide risk in valuations. In line with this observation, from a different angle, though, Kim, *et al.* (2009) provide theoretical motivation and empirical evidence on why an implementation of RIM that accounts more explicitly for industry-wide valuations improves stock-specific valuations.

Our second concern in the context of signal *uniqueness* examination relates to the correlation of the portfolio returns for portfolios obtained with the different valuation measures, as well as to returns of portfolios obtained through other known predictive factors. The interaction of factors has important implications when constructing multifactor models. So far our analysis has been completed on a univariate basis and we now consider the return correlation of valuation metrics with other common style/factors. In general, we expect the five valuation signals to be highly correlated and as we see in Table 7 this is true – all of them are indeed highly, positively correlated.

This analysis shows some interesting results. First, it shows that ROM presents with a high correlation with all other factors, with 0.86 being the lowest with Forward PE and Fair PE. RIM on the other hand correlates well with ROM and Forward PE, with correlation coefficients of 0.87 and 0.84, respectively. RIM correlates relatively poorly, however, with Book Yield and Fair PE. The low correlation of RIM with BV taken together with the high correlation of ROM with Book Yield comes potentially from observations when residual income becomes negative. Negative residual income seems to result in significantly different RIM vs. Book Yield valuations, whereas negative residual income does not have a significant impact on ROM vs. BV valuations – even when residual income is negative the value of the firm within ROM will not fall below Book Yield. When looking

at the correlation with all other factors, RIM presents with the lowest pair-wise correlations. Taken together, these figures suggest that ROM, Forward PE, Book Yield and Fair PE share similar correlation attributes between them along with other quant factors. RIM seems to be a little off the line. The differences are almost marginal with regard to among-value-factor correlations, but are significant with regard to the ex-value-factor correlations. The highly negative correlation with the price momentum factor motivates further investigation of the – diversification and/or other – benefits of the combination of the two signals.

Table 7 Correlation among valuation signals and with other signals

This table presents correlation among the returns of the long-short portfolio obtained through alternative valuation measures as well with other known quantitative equity portfolio management signals for the period January 2000 to April 2010. The valuation measures include include: 'Forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month end closing price; 'Book Yield' which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month end closing price; 'Fair PE' i.e. Forecast PE / Market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM' which is obtained through the Residual Income Model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM' which is obtained through the Real Options Model (see Hwang and Sohn, 2010). 'Price Momentum' is a long-short portfolio strategy based on stocks' total return over the previous 12 months. 'Estimates Momentum' is a long-short portfolio strategy based on stocks' average of analysts' upward revisions minus downward revision for FY1 and FY2. 'Quality' is a long-short portfolio strategy based on accruals. 'Risk' is a long-short portfolio strategy based on stocks' betas with MSCI Europe, computed using monthly prices over 50 months. 'Growth' is a long-short portfolio strategy based on stocks' growth of reported earnings.

	Forward PE	Book Yield	Fair PE	RIM	ROM
Forward PE	1				
Book Yield	0.86	1			
Fair PE	0.88	0.76	1		
RIM	0.87	0.84	0.60	1	
ROM	0.86	0.93	0.84	0.74	1
Price Momentum	-0.45	-0.30	-0.59	-0.12	-0.49
Estimates Momentum	-0.30	-0.16	-0.49	0.05	-0.32
High Quality	-0.25	-0.10	-0.48	0.07	-0.28
Low Risk	-0.25	-0.13	-0.54	0.14	-0.37
Growth	-0.65	-0.60	-0.70	-0.54	-0.60

To test the implications of the latter observation we conduct a simple test of creating an equal-weighted score between value and momentum and empirically testing this strategy. For momentum we simply use 12-month price momentum (see Appendix). Table 8 shows the results from this analysis. While this analysis may not be as detailed, it does show that the ROM, when combined with price momentum, has the best risk-adjusted results and also has some of the highest hit rates. Additionally, the average rank IC for RIM is the highest with ROM's IC being second best relative to the other valuation factors (see Table 9).

Table 8 Spread returns for portfolios formulated on combined value/momentum signals

This table presents the spread returns of portfolios sorted on the basis of alternative valuation measures and momentum for the period January 2000 to April 2010. These measures include: 'Forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month end closing price; 'Book Yield' which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month end closing price; 'Fair PE' i.e. Forecast PE / Market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM' which is obtained through the Residual Income Model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM' which is obtained through the Real Options Model (see Hwang and Sohn, 2010). The top quintile portfolio, i.e. Q5, comprises stocks with high 'earnings yield' while the bottom quintile, i.e. Q1, comprises stocks with low 'earnings yield'. The returns of the bottom and the top quintile are spreads over the market returns, i.e. over the MSCI Europe Index returns.

Top Quintile Q5 – Market	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	7.9%	8.2%	7.2%	8.2%	8.2%
t-Statistic	2.58	1.83	2.62	2.89	2.93
Annualized Volatility	10.2%	14.6%	9.1%	18.2%	9.2%
Information Ratio	0.78	0.56	0.80	0.45	0.90
Maximum Drawdown	-12.0%	-9.6%	-12.1%	-11.1%	-9.8%
Hit Rate	66.1%	69.4%	70.2%	68.5%	69.4%
Bottom Quintile Q1 – Market	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	0.2%	-0.6%	-2.1%	-1.8%	-2.9%
t-Statistic	0.25	0.00	-0.50	-0.23	-0.60
Annualized Volatility	13.3%	11.3%	10.2%	9.2%	12.0%
Information Ratio	0.01	-0.06	-0.20	-0.20	-0.24
Maximum Drawdown	14.4%	11.4%	9.5%	13.75%	11.8%
Hit Rate	49.2%	50.8%	45.2%	46.8%	48.4%

Top-Bottom Quintiles Q5-Q1	Forward PE	Book Yield	Fair PE	RIM	ROM
Annualized Returns	8.2%	7.5%	5.8%	7.8%	9.7%
t-Statistic	1.96	1.83	1.31	1.63	2.12
Annualized Volatility	14.7%	14.6%	17.5%	18.2%	16.1%
Information Ratio	0.56	0.52	0.33	0.43	0.61
Maximum Drawdown	-12.6%	-13.6%	-13.1%	-17.6%	-10.5%
Hit Rate	59.7%	56.5%	58.9%	58.1%	61.3%

Table 9 Rank Information Coefficients when combined with Momentum – Descriptive Statistics

This table presents statistics of the rank Information Coefficient which is the cross-sectional correlation of the ranks of stocks upon portfolio formation and next rebalance. We present the average IC, the standard deviation of the IC, and the t-statistic (for a t-test of the null hypothesis that the mean IC is zero) of stocks sorted on the basis of alternative valuation measures and momentum for the period January 2000 to April 2010. These measures include: 'Forward PE' which is the next twelve months (weighted between FY1 and FY2) I/B/E/S consensus EPS divided by month end closing price; 'Book Yield' which is the last twelve months (weighted between FY0 and FY-1) reported BPS divided by month end closing price; 'Fair PE' i.e. Forecast PE / Market PE, which is a theoretical PE estimated by a cross-sectional model (similar to a Gordon-Growth framework), using expected earnings growth and market cap (risk and liquidity proxy) as inputs; 'RIM' which is obtained through the Residual Income Model (see Ohlson, 1991, 1995 and Feltham and Ohlson, 1995); and 'ROM' which is obtained through the Real Options Model (see Hwang and Sohn, 2010).

	Average	Stdev	t-stat
Forward PE	4.0%	16.0%	2.96
Book Yield	3.4%	13.9%	2.44
Fair PE	4.3%	14.1%	2.53
RIM	4.7%	17.8%	1.81
ROM	4.4%	15.9%	2.18

In summary, our analysis of the signal *uniqueness* concludes that sophisticated models, i.e. RIM and ROM, are less vulnerable sector biases. When sector-bias is neutralised the improvements to IRs of portfolios obtained through simple valuation models range from 34% to 96% while the improvements for sophisticated models are 20% at most. As expected, the correlations are almost identical among-value-factor correlations, but there are differences with regard to the ex-value-factor correlations. ROM and to a lesser extend RIM appear to be the most appropriate valuation measures to combine with momentum signals.

6. Conclusion

Valuation signals have been among the most popular between equity portfolio managers and have recently attracted significant interest among cross-asset managers. Given a large variation of techniques and theories with regard to how value is measured and in light of recent developments in the academic literature, this article puts the efficacy of alternative valuation measures under the microscope.

Our approach to the problem takes a more practical stance and while we carry out an empirical investigation within the framework of academic rigour we set up our experiments in a way that is more appealing for an equity portfolio manager. In particular we empirically investigate the predictive ability of sophisticated and simple valuation measures over the cross-section of future equity returns, but we: a) focus on the constituents of a broadly used benchmark index, i.e. the MSCI Europe Index to replicate what a typical manager would do; b) 'shorten' the investment horizon to comply with standard practice; c) consider a Pan-European investment space; d) use a large number of "goodness" metrics to extend our insights and judge performance within an industry standard setting; e) carry out a comprehensive robustness analysis for different market regimes as well as for the impact of sector or risk attributes and f) investigate the correlation and interaction among several value and non-value factors.

We consider a comprehensive cross-section of alternative measures that include Forward PE, Book Yield, Fair PE, RIM and ROM. Equity portfolios obtained through RIM or ROM stock rankings outperform all others on a long-only and on a long-short basis, even after accounting for transaction costs. They have performed rather consistently following the massive value sell-off

from August 2007 (doing particularly well during Fall 2008) and stood out in the value rally that started in March 2009. More importantly we find that RIM and ROM based portfolios are less affected by sector-bias, suggesting that these measures are able to correctly identify stock-specific value and more efficiently incorporate sector-wide risk in their valuations. Overall, we find that within an investment strategy sophisticated models such as RIM and ROM have some merit over their simple peers.

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Appendix

Cost of Equity Calculation

We calculate the cost of equity following Fama and French (1997) who derive cost of equity forecasts through the equation:

$$E(R_i) - R_F = b_i [E(R_M) - R_F] + s_i E(SMB) + h_i E(HML)$$

where b_i , s_i , and h_i are obtained from the regression:

$$R_i - R_F = a_i + b_i (R_M - R_F) + s_i SMB + h_i HML + e_i$$

In this regression R_i is the return on industry i . We estimate this regression on the basis of a 5-year rolling window of monthly returns. Fama and French (1997) highlight that OLS estimates of the regression coefficients can in some cases be imprecise thus delivering unreasonable estimates of an industry's cost of equity. They advocate that a Bayesian shrinkage method can mitigate such problems. To deal with this issue we use robust linear regression methods which are control for biases and inefficiencies that may arise due to outliers and generally inconsistencies of the theoretical and the empirical distribution of the data. As estimates of $(R_M - R_F)$, SMB , and HML we use their average monthly values. To calculate averages we use an expanding window.

One other issue that arises when the analysis is carried out cross-country is what the relevant risk free rate should be. We used an 'industry-specific' risk free rate. This is computed by market capitalisation weighting the risk free rates of a country in line with what the contribution of each firm (that comes from a certain country) is to the industry's total market cap.

Fair PE Model

The theoretical P/E is estimated by a cross-sectional model, using expected earnings growth and market capitalization (risk and liquidity proxy) as inputs. The form of the model is:

$$\ln(PE) = \alpha + \beta_1 \ln(1 + EG) + \beta_2 (MC)$$

where PE denotes the price-earnings ratio, EG is the annualized two-year forward I/B/E/S EPS growth rate, and MC is the standardised market capitalization, capped at 3.

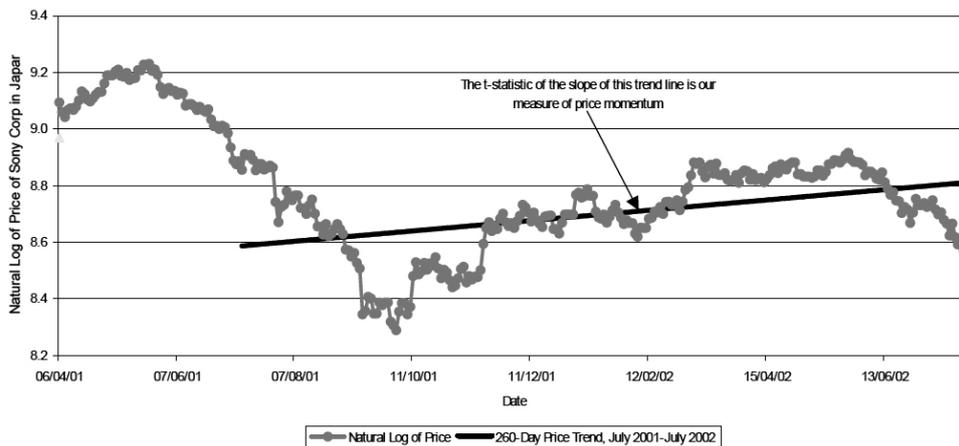
In addition to the above factors we also include country dummy variables (i.e. 1 if it belongs to a particular sector, 0 otherwise) to capture the differences in P/E ratios within each European country. Every month we re-estimate the model using the previous month's data. We then use this model to forecast the theoretical or fair PE for the next month.

Price Momentum (t-statistic methodology)

Our one-year price momentum measure looks at the underlying price trend adjusted for volatility. The specific measure is the t-statistic of a trend line slope fitted to logged stock prices, using 260 days of data. Figure 1 shows a price history of company "XYZ" and a price trend line.

Figure 1 Price momentum t-statistic methodology

This figure shows the price history of company "XYZ" and a line fitted for a period of 260 trading days.



For stocks with a trading history spanning fewer than 260 days, we employ the median price momentum of the universe as a substitute.