Academic Research Monitor
Value Investing

Equities

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Quantitative

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Aspects of value investing

We started 2015 by focusing on recent academic advances on momentum investing. We conclude 2015 by focusing on the other side of momentum investing, which amounts to long-term reversals to firm intrinsic value. In particular, value investing relates to the empirical finding that "cheap" securities outperform "expensive" securities. We review three recent academic papers that elaborate on various aspects of value investing.

Stating the facts and refuting the fictions

How to measure value? Is value a passive strategy? Is value a redundant factor? Does value constitute compensation for some systematic type of risk or it is behaviourally-driven? Is value an equity-only concept or it can be extended to other asset classes? How does value perform across large caps? These are some of a list of important questions about value investing that the first paper that we review tries to answer.

An attempt to explain the value premium as compensation for systematic risk

In the typical debate regarding the source of the value premium (is it risk or mispricing?), the second paper that we review takes the side of a risk-based explanation. Based on a country-level analysis, the evidence shows high B/P countries outperform low B/P countries, because they seem to bear a higher level of risk of subsequent earnings growth, especially during periods of low global earnings growth.

Combining value with momentum on a cost-efficient long-only basis

The last paper that we review suggests and compares two approaches in order to combine value and momentum in a single long-only portfolio. Apart from the improvement in the performance, the focus is on the effect of transaction costs and therefore on the turnover reduction that the different approaches can offer. Intrigued by the findings of the paper, we replicate the analysis and confirm the findings in a more investible universe (S&P500 constituents).

Introduction

2015 has been a year of focus on factor investing

Over the course of 2015, the Academic Research Monitor has featured papers on **Momentum** investing (see the January 2015 ARM), on **Quality** and **Size** investing (see the May 2015 ARM) and more broadly on the general concept of Smart Beta and Factor Investing (see the February 2015 ARM). The current issue, the last for 2015, focuses on one of the longest living equity style factors; **Value**. We review three recent papers (see Figure 1).

The principle of value investing

The principle behind value investing is one of the oldest principles in the history of investing and relates solely to the fact that undervalued securities (i.e. securities with a high fundamental-to-price ratio) outperform overvalued securities. The idea dates back to the 1930's and 1940's and the books by Benjamin Graham (see Graham and Dodd, 1934 and Graham, 1949), even though academic research followed much later (among many others, see Rosenberg, Reid and Lanstein, 1985, Fama and French, 1992, and Lakonishok, Shleifer and Vishny, 1994). Value has historically been an equities-only concept; however it has been recently shown that systematic value patterns exist across various asset classes (see Asness, Moskowitz and Pedersen, 2013).[1]

The first paper that we review focuses briefly on a broad list of facts and prejudices about value investing and tries to provide further insight. How to measure value? Is value a passive strategy? Is value a redundant factor? Does value constitute compensation for some systematic type of risk or it is behaviourally-driven? These are just a few of the nine in total questions that this first paper tries to answer.

The second paper that we review constitutes an effort to justify the existence of the value premium as compensation for bearing systemic risk regarding future earnings growth. Using an empirical analysis across 30 countries, the main finding is that high B/P countries suffer from a decline in earnings and profitability during the year before they are identified as high B/P, but subsequently recover; however, this recovery appears to be risky, because these countries are characterised by larger downside sensitivity to contemporaneous global earnings growth.

Finally, the last paper constitutes an effort to improve the combination of value and momentum patterns in a single long-only portfolio after taking into account turnover implications and therefore transaction costs. Intrigued by the findings of the paper, we replicate the methodology in a more investable universe (S&P500 constituents) and confirm the findings.

Figure 1: Papers on Value

"Fact, Fiction and Value Investing" *Clifford Asness, Andrea Frazzini, Ronen Israel and Tobias Moskowitz*	*Journal of Portfolio Management, Volume 42, Number 1, 2015*
"Risky Value" *Atif Ellahie, Michael Katz and Scott Richardson*	SSRN working paper, August 2015
"Combining Value and Momentum" *Gregg Fisher, Ronnie Shah and Sheridan Titman*	Forthcoming at *Journal of Investment Management*

Source: UBS

[1] To find out about our views on value investing across multiple asset classes, see our Quantitative Monograph *"Harvesting Cross-Asset Value"* (11 December 2014).

"Fact, Fiction and Value Investing"

by Clifford Asness, Andrea Frazzini, Ronen Israel & Tobias Moskowitz

Back in January 2015, we reviewed a manifesto in favour of momentum investing by Clifford Asness, Andrea Frazzini, Ronen Israel and Tobias Moskowitz entitled "*Fact, Fiction and Momentum Investing*" (see pages 3-6 in the Momentum Investing ARM). The very same authors return in order to shed light on various facets of value investing; to establish the facts and refute any fictions.

We structure our review, by stating one by one the four fictions and the five facts that are mentioned by the authors and we briefly comment on them. Whenever necessary, the authors support their arguments using data from Kenneth French's online data library.

Fiction 1: Value investing is an idiosyncratic skill that can only be successfully implemented within a concentrated portfolio.

The authors start their discussion by refuting a general claim that value investing relates only to a concentrated idiosyncratic stock-picking portfolio of a few value firms. The authors argue – and we agree – that value investing can, of course, take the form of a concentrated portfolio that is constructed using discretionary calls; Warren Buffett is the first value investor to come to everybody's mind. However, and most importantly so, the performance of one (or more) value managers cannot disqualify the performance of a systematic value strategy. Broad and diversified portfolios of cheap securities have been shown by both academics and practitioners to outperform equally broad portfolios of expensive securities.

The authors, of course, recognise that both forms of value investing (concentrated portfolio and systematic strategy) are viable and can be successful, but they stress the fact that a systematic and diversified strategy should naturally come with lower risk and therefore at a lower fee. This is because a concentrated portfolio is typically riskier than a broad diversified portfolio and its performance is largely dependent on the conviction of the manager value calls. Due to the larger upside and downside potential, a concentrated value portfolio should come at a higher fee for an investor, compared to a broad diversified and systematic value portfolio.

The authors conclude by claiming that value investing is attainable is various forms, which are neither mutually exclusive, nor competing with each other. For the rest of their paper (and our review), their focus resides primarily on the systematic variant of value.

Fiction 2: Value is a passive strategy, because it is rules-based and has low turnover.

Passive or active?

This point goes beyond value investing and relates largely to the broader debate within the investment community as to whether systematic equity styles (typically referred to as "smart beta" factors) constitute active or passive investments (or anything in-between!).

The authors of the current paper argue that systematic value investing (and other systematic equity strategies, like momentum, profitability, low-volatility) is clearly a form of active management. They claim that *any* strategy that employs a weighting

scheme that is different from a market-cap weighting scheme constitutes an active strategy. Their argument is that such a strategy requires one part of the investor population to take the other side of the trade; hence, as long as the entire population cannot hold the same portfolio at the same time (which is only the case for the market portfolio), then we are talking about an active investment.

Finally, the authors argue that the fact that value investing is a rules-based and low-turnover strategy is definitely not enough to characterise the strategy as passive. If this was the case, then someone like Warren Buffet (low-turnover value investor) and high-frequency traders (who clearly follow rules-based strategies) would qualify as passive investors; and this is indeed inaccurate, to say the least.

Fiction 3: Value is "redundant"

The fact that value is a "redundant" factor is the artefact of a recent paper by Fama and French (2015), which introduces a new five-factor model by augmenting the standard Fama and French (1993) three-factor model (market, size – SMB, value – HML) with a profitability factor (RMW) and an investment factor (CMA).[2] The introduction of these two factors led to a relatively surprising result; regressing the value factor, HML, to the remaining four factors results in an economically small and statistically insignificant alpha. In other words, the profitability and investment factors render value (or, strictly speaking, whatever HML captures as a factor) redundant.

The authors of the paper under review refute this claim by focusing on two important omissions of Fama and French (2015) in their new five-factor model.

First, the original construction of the HML factor by Fama and French (1993) assumes annual rebalancing at the end of every June, using book-to-price estimates that are available at the end of the December prior to every June. This results in portfolio ranks that use market prices which are six to eighteen months old, instead of using the most recent market prices. Using lagged book value is typically fine, as it does not change very quickly and are also not always readily available (see also Gerakos and Linnainmaa, 2015 and our review of the paper in the February 2014 ARM). However, as Asness and Frazzini (2013) show, using past month's price to scale book value gives rise to a purer value factor, HML-DEV.

Second, Fama and French (2015) completely ignore the momentum factor and do not include it in their model. Momentum was not part of the original Fama and French (1993) three-factor model either and it is only due to Carhart (1997) that momentum was added in a typical equity factor structure.[3]

The authors of the paper under review show that (a) substituting HML by the more timely value factor, HML-DEV and (b) adding in the momentum factor (UMD) results in a more reasonable equity factor model. Most importantly, regressing HML-DEV on the remaining four + momentum factors generates a strong and statistically significant alpha. Value is not redundant. And we agree.

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[2] As early as February 2014, the (at the time) working paper by Fama and French (2015) caught our attention and we wrote an extensive review in that month's Academic Research Monitor (see pages 3-5).

[3] Jegadeesh and Titman (1993) were of course the first to document momentum patterns within equities, but Carhart (1997) was the first to suggest adding momentum in a factor structure to explain stock returns.

Fiction 4: Value's efficacy is the result of a risk premium, not a behavioural anomaly, and is therefore in no danger of ebbing going forward.

Generally speaking, there are two potential explanations as to why a trading strategy exhibits positive average excess returns over a long period of time. Either the strategy returns constitute compensation for bearing some type of systematic risk or there exist behavioural biases that give rise to such empirical patterns.

It value compensation for risk or behaviourally-driven?

When it comes to value, the authors of the current paper argue that it is more likely to be the result of a combination of risk-based and behavioural-based causes. From a risk perspective, the most compelling story describes the value premium as compensation for bearing distress risk (Fama and French 1992, 1993). From a behavioural perspective, the value premium is regarded as the artefact of investor overreaction that causes naive irrational excess demand for high growth stocks and equivalently irrational neglect for value stocks (Lakonishok, Shleifer and Vishny, 1994 and Daniel, Hirshleifer and Subrahmanyam, 1998). What the authors argue is that the academic and investment community are yet to agree on a well-grounded explanation for value. It appears more plausible that value is just a combination of both.

Can value disappear?

Be it risk or behaviour (and the authors of the paper argue that it is both, as we also did in an older research report back in 2005: see *Understanding Value*), the value premium cannot just disappear, not at least before some fundamental changes in human behaviour take place. If value constitutes compensation for some type of risk (and therefore it can qualify as a "risk" premium), then for this to disappear, investor risk preferences have to change. Conversely, if value is the result of irrational behaviour, then for this to disappear, either human beings have to alleviate their behavioural biases or enough capital should be made available to the investors that are at the "other side" of value in order to arbitrage it away. Neither of the above is highly likely to happen. Put differently, as long as risk preferences, human biases and limits to arbitrage remain stable, the value premium is relatively unlikely to go away.

Importantly enough, the authors show that even in a scenario where value had zero expected returns, it would still constitute an important investment vehicle, bearing a positive weight in a multi-factor optimisation, due to its great diversification nature against momentum and profitability/quality factors.

Fact 1: "Fundamental Indexing" is, and only is, systematic value investing.

The investment principle of fundamental indexing (FI, henceforth) is to overweight/underweight the constituents of a broad and diversified market-capitalisation weighted index based on the relative value of some (one of more) fundamental value(s), such as book value, earnings, dividends, sales etc.

The authors argue that there generally exists a misconception that FI is completely different to value investing. Their view is completely opposite to this. They argue that FI is (just) one form of value investing and that the fundamentally-driven reweighting of the market-cap weighted index *is* "*literally a simple value tilt*".

To illustrate their argument, they use the FTSE RAFI US 1000 Total Return Index as a proxy of FI, and conduct a series of time-series regressions and show that this index is heavily exposed to a value proxy (e.g. the HML value factor). Whether this (and any other FI product) outperforms some value factor is a completely different

discussion, and merely relates to the underlying design of the FI product. What the authors want to make clear is the concept of FI is no different to value investing; FI might be a "better" value strategy, but certainly not a completely different entity.

Fact 2: Profitability, or quality measures, can be used to improve value investing and still be consistent with a risk-based explanation for value.

Value and quality

The fact that profitability/quality measures can improve value investing was recently highlighted in the works of Novy-Marx (2013, 2014), which we have already reviewed in our January 2014 ARM. The authors of the paper under review show that investing in cheap and quality / high-growth stocks is generally a more profitable strategy than investing merely in cheap stocks, which can be contaminated by companies with poor prospects.

Using data for the Fama and French (1993, 2015) factors, the authors show that the Sharpe ratio of the value factor (HML) increases from 0.46 to 0.58 when this is combined on a 60-40 basis with the profitability factor (RMW) for the period between 1963 and 2014. Needless to say that adding the Carhart (1997) momentum factor (UMD) can improve the performance even further; the equally weighted portfolio between HML, RMW and UMD reaches 0.84.

The authors claim that the fact that profitability (and momentum) can improve the performance of a value strategy does not disqualify a risk-based explanation for value. In fact, if we accept such a risk-based explanation for value, then the rational expectation would be that profitability should come at a cost (i.e. negative premium), as long as it constitutes a hedge. However, the empirical evidence shows that high profitability/quality firms earn a statistically positive premium. This is definitely a more challenging finding to reconcile, as the authors argue.

Fact 3: Value investing is applicable to more than just choosing what stocks to own or avoid.

Even though value is generally associated with equity investing, the authors of the current paper argue that the concept of mean-reversion to a fair value is more generic and can find application to other asset classes.

Value across multiple asset classes

Measuring "value" in equities is clearly easier, given the breadth of accounting - fundamental data that are available. However, following from Asness, Moskowitz and Pedersen (2013), a long-term reversal return signal is sufficient to proxy for a value metric across different asset classes and therefore used to identify undervalued (worst long-term returns in the cross-section) and overvalued (best long-term returns in the cross-section) assets. Along these lines, Asness *et al.* (2013) document statistically significant cross-asset value patterns.

Even though we generally agree with the empirical evidence, we recently focused in detail in such cross-asset dynamics and documented a significantly lacklustre performance for cross-asset value over the most recent decade.[4] However, we do agree completely with the authors of the paper in that cross-asset value constitutes a very good diversifying instrument for a cross-asset momentum strategy.

[4] See our views on value investing across different asset classes, in our Quantitative Monograph *"Harvesting Cross-Asset Value"* (11 December 2014).

Fact 4: Value can be measured in many ways, and is best measured by a composite of variables.

How to measure value?

Measuring "value" amounts to being able to identify undervalued assets within a cross-section. Academics and practitioners have historically used a multitude of value metrics, all of which take the form of a ratio between a fundamental – accounting parameter and the current market price of the firm. For instance, book-to-price (B/P), earnings-to-price (E/P), dividend yield (D/P), cash flow-to-price (CF/P), even a long-term (typically five-year) negative return, which effectively compares the price five years ago to the current price. So, which is the best metric of value?

The authors of the paper argue that any fundamental-to-price ratio can generally capture the value dynamics and along these lines, there is no single definition of value that outperforms all the other candidates. Instead, the authors speak in favour of a simple equally-weighted composite score across the various different screens. Using value screens based on various definitions of value (B/P, E/P, D/P, CF/P, negative five-year return), they show that the resulting strategy returns are largely correlated to each other and no single definition consistently outperforms the rest over a long period of time. Interestingly, they find that over the last four decades, a different value metric generated the largest Sharpe ratio each time. A composite score can intuitively smooth out measurement errors and other idiosyncrasies of the single metrics and therefore appears to generate more stable returns with lower volatility.

In line with the above, our regular monthly publication, entitled Global Style Watch (see the most recent issue; published on December 1st, 2015) captures value in eight different ways: seven single-metric screens and a composite.

Fact 5: Value standalone is surprisingly weak among large cap stocks.

As with most equity strategies, value appears to be significantly stronger across small cap stocks. The authors use data from Kenneth French's website on the small cap and large cap definitions of the HML factor. Across all sub-periods tested (1926-2014, 1926-1962, 1963-1981, 1982-2014) the small cap HML factor generates larger returns than the large cap HML factor. In fact, other than the period 1963-1981, which was the period that the value premium was initially documented in academic studies, HML across large caps did not generate any statistically significant average returns.

The HML factor, as a whole, is in fact defined as the simple average between small cap and large cap HML factors, which clearly gives a relatively larger weight on small caps, compared to a market-cap weighted average. This small-cap tilt is the main reason why the HML factor generates strong returns across most historical sub-periods.

In an effort to resurrect value investing across large cap stocks, the authors, once again, highlight the great diversifying nature of value when combined with momentum. A 60-40 combination between value and momentum across large caps increases the Sharpe ratio from 0.25 (HML large cap) to 0.65 for the period between January 1927 and July 2014.

"Risky Value"

by Atif Ellahie, Michael Katz & Scott Richardson

As already highlighted in the previous paper that we reviewed (see Fiction 4 in page 5), there is lack of a broad consensus as to whether the value premium constitutes compensation for bearing some type of systematic risk, as for example the distress risk story by Fama and French (1992, 1993) or, instead, it constitutes the outcome of behaviourally-driven mispricing, as for example due to overreaction caused by growth extrapolation as explained by Lakonishok, Shleifer and Vishny (1994) and Daniel, Hirshleifer and Subrahmanyam (1998).

In the current paper, Atif Ellahie, Michael Katz and Scott Richardson attempt to provide further support to a risk-based story by exploring value investing across 30 (21 developed and 9 emerging) countries. In order to do so, the authors start their analysis by stating an accounting identity and therefore forming hypotheses as to what drives expected returns. They then go on and empirically test their hypotheses using a broad global country dataset.

Explaining the time variation of expected equity returns

In particular, the authors start by the clean surplus relationship, which states that the book value of a company changes as a result of earnings and the payment of dividends (net of equity issuance). Basic algebraic manipulation of this identity gives rise to the following expression of conditional expected equity total returns:

$$\mathbf{E}_t[R_{t+1}] = \frac{\mathbf{E}_t[P_{t+1} + d_{t+1} - P_t]}{P_t} = \underbrace{\frac{\mathbf{E}_t[E_{t+1}]}{P_t}}_{\substack{Expected \\ Earnings \\ Yield}} + \underbrace{\frac{\mathbf{E}_t[P_{t+1} - B_{t+1}] - (P_t - B_t)}{P_t}}_{\substack{Expected\ change\ in\ the\ Premium \\ of\ price\ over\ book \\ (expectation\ of\ earnings\ growth)}} \qquad (1)$$

where:

- $\mathbf{E}_t[\cdot]$ is the time-t conditional expectation operator
- R denotes the rate of total return (i.e. including dividends)
- P denotes the asset price
- d denotes the annual dividend, net of equity issuance
- E denotes the annual earnings
- B denotes the book value

The above expression basically says that the expected equity returns are the sum of (a) the expected earnings yield and (b) the expected *change* in the premium of price over book, which effectively relates to the expected earnings growth. Along these lines, the expected equity returns should be related to both (forward) Earnings-to-Price (E/P) and Book-to-Price (B/P) ratios; put differently, these ratios are both necessary to capture/explain the time variation in expected returns.

The relative importance of E/P and B/P is not fixed; it depends on the conservatism of the financial reporting system

However, as the authors point out, the relative importance of the two ratios, E/P and B/P, is not clear cut and has to be empirically assessed. This is because earnings can be in practice largely influenced by the conservatism that is inherent in the financial reporting system. The authors list a number of critical issues, like the expensing of R&D and advertising costs, which can cause the earnings estimate to become uninformative of future earnings growth. To elaborate on this, when companies take on a particular risky investment, its cost is typically instantly incurred, but any benefits (that potentially give rise to earnings growth) are deferred into future periods. In such cases, the role of the second term of equation (1), which captures the expected change in the premium of price over book (and is therefore related to the B/P ratio), becomes progressively more important, exactly because it reflects the expectation about the risky future earnings growth.

Forming hypotheses: B/P should only be important in the presence of expected earnings growth

To summarise the above, when the earnings estimates are expected to be significantly impacted by conservative accounting choices, the information content of the B/P ratio about future earnings growth should become significantly more important and relevant. At the firm level, these dynamics are established by Penman, Richardson, Reggiani and Tuna (2013). The current paper investigates the dynamics for a multi-country universe.

In order to test for the above hypothesis, the authors first conduct a series of panel regressions at the country level (more details on the dataset follow in the next paragraph), which follow from equation (1). In particular, the next 12-month country excess returns of all countries are regressed against the current country forward-looking E/P ratios, the country B/P ratios as well as other explanatory variables (denoted by X) that could be potentially related to future earnings growth (country characteristics, real annual GDP growth forecasts as well as inflation forecasts are used):

$$R_{t+1} = \alpha + \beta_1 \cdot \frac{\mathbf{E}_t[E_{t+1}]}{P_t} + \beta_2 \cdot \frac{B_t}{P_t} + \sum_i \gamma_i \cdot X_{i,t} + \epsilon_{t+1} \qquad (2)$$

Dataset

The authors use data for 30 countries over the period between March 1993 and June 2011. They collect data (price, fundamental, earnings forecasts) for all stocks of each country and then aggregate the data at the country level by value-weighting returns and summing up fundamental values. In particular, they collect (a) stock returns data from CRSP and Compustat Global, (b) fundamental data (book value, earnings, and dividends) are Compustat North America, Compustat Global and Factset Fundamentals and (c) earnings forecasts data from I/B/E/S. The analysis is done at the local currency and for the construction of excess country index returns a local short-term risk free rate is used. Finally, data on macroeconomic forecasts for GDP growth and inflation are collected from Consensus Economics. Overall, the authors end up with 6,600 country-month returns observations that are fed into the panel regression setup.

E/P and B/P are both important in order to explain future country excess returns…

…but D/P isn't, if we account for both E/P and B/P

Starting from univariate panel regressions, the authors regress 12-month buy-and-hold country returns on forward E/P, on B/P and for additional robustness, on country dividend-price ratio (D/P). All three valuation ratios are statistically significant and therefore explain the cross-section of future country excess returns. They, all bear a positive coefficient, which effectively shows that undervalued countries (high fundamental-to-price ratios) exhibit higher future returns, which is indeed the "value" pattern. However, putting all three ratios together in a multivariate panel regression renders D/P redundant. On the contrary, E/P and B/P remain statistically strong and in fact appear to have complimentary forecasting power than each one individually; just to give some statistics, the adjusted R^2 of the regression is 0.042 for E/P, 0.082 for B/P and 0.092 when both are used. This comes in complete agreement to the accounting identity of equation (1), in that E/P and B/P ratios are predominantly related to future excess returns, but not D/P. This is quite an interesting finding, especially given that the D/P ratio is heavily used as a screening variable for value investing.

The only other important variable is price momentum

The authors try a number of different model specifications (including variables such as country size, country price momentum, country beta against MSCI All Country Worlds index, GDP growth forecast and inflation forecast; these are denoted by X in equation (2)) and different methodologies (country fixed effects, time fixed effects, and both) and their main finding remains robust. Independent of the specification, E/P and B/P are strongly related to future country excess returns. Other than these ratios, the only other variable that has statistically strong

forecasting power for the cross-section of country returns is price momentum. The variable bears, as expected, a positive coefficient, which means that past performance positively predicts future returns.

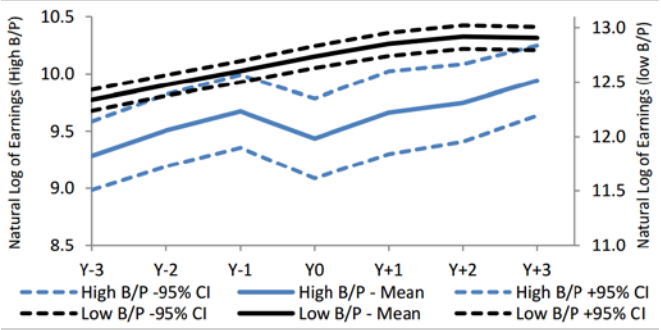
What is the relative importance of E/P and B/P?

Given these results, the authors then go on and investigate the relative importance of E/P and B/P, especially when the earnings variable becomes more significantly impacted by conservative accounting and therefore rendered less informative about future country returns. To do so, the authors conduct an event study. In particular, they sort the 30 countries based on their B/P ratios at the end of every month in their sample period and focus their attention on how various fundamental metrics of the top and bottom quintiles fluctuate between three years prior to B/P sorting ("Y-3") up to three years after the B/P sorting ("Y+3").

High B/P countries suffer for a decline in earnings during the sorting period

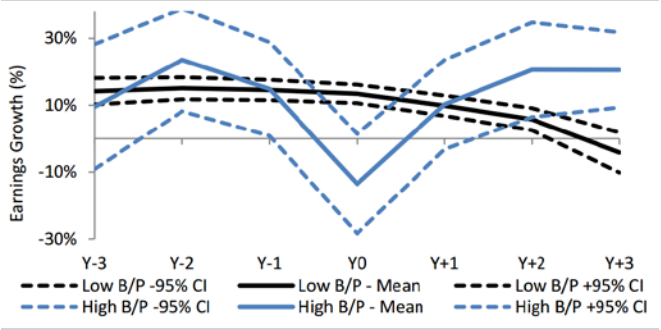
Figure 2 presents the average portfolio earnings, as well as a 95% confidence interval, for the two extreme B/P quintile portfolios. Unlike low B/P countries, high B/P countries suffer from a significant fall in their earnings around the sorting period (Y-1 to Y0). First-order differencing of the (log of) country earnings produces year-on-year realised earnings growth estimates, presented in Figure 3. It is clear that high B/P countries suffer from an earnings growth slowdown before the sorting period and from negative earnings growth during the sorting period. These countries subsequently recover; however, the wider confidence interval bands (compared to low B/P countries) show that the recovery is more uncertain and potentially riskier in relative terms.

Figure 2: Portfolio Earnings for high and low B/P quintiles



Source: "*Risky Value*" by A. Ellahie, M. Katz & S. Richardson; Panel A of Figure 1, reproduced with permission. The figure presents the evolution of earnings for top and bottom B/P-sorted quintile portfolios across 30 countries over the period March 1993 to August 2010. Y0 denotes the portfolio formation month and the plot spans the period between three years before (Y-3) and three years after (Y+3) portfolio formation. The dashed lines indicate 95% confidence intervals.

Figure 3: Avg. Realised Earnings Growth for B/P quintiles



Source: "*Risky Value*" by A. Ellahie, M. Katz & S. Richardson; Panel B of Figure 1, reproduced with permission. The figure presents the evolution of year-on-year earnings growth for top and bottom B/P-sorted quintile portfolios across 30 countries over the period March 1993 to August 2010. Y0 denotes the portfolio formation month and the plot spans the period between three years before (Y-3) and three years after (Y+3) portfolio formation. The dashed lines indicate 95% confidence intervals.

The authors additionally document that high B/P countries have lower levels of dividends with wider confidence intervals relative to low B/P countries. Finally, they find that high B/P experience lower and decreasing levels of profitability (as captured by ROE) in the years leading to the sorting period, but experience a recovery following portfolio formation.

Summarising the above findings, it becomes obvious that sorting countries based on their B/P ratios is equivalent to a systematic sort on earnings and earnings growth. A decline in earnings and profitability around the sorting period for the high B/P countries, followed by a subsequent recovery, which is more uncertain and potentially more risky (compared to low B/P countries) can constitute evidence in favour of a risk-based explanation of the value premium across countries.

Are high B/P stocks more risky?

In order to test specifically whether the earnings growth recovery for the high B/P portfolio indeed comes with greater amount of systematic risk (and therefore the value premium can be interpreted as compensation for bearing this type of risk), the authors investigate whether there exists co-movement between the earnings growth of the various B/P-sorted quintile portfolios and a global estimate of earnings growth. This co-movement (if it exists) can capture the systematic nature of risk that characterises the high B/P quintile portfolio. The authors find that there exists a significantly strong positive correlation (and therefore a higher fundamental beta) between country level earnings growth and global earnings growth for high B/P countries, especially in bad states of the world, which are defined as periods with global earnings growth one standard deviation below the average global earnings growth over the entire sample period. This shows that high B/P countries are more likely to exhibit negative future earnings growth in down states, which therefore renders these countries more risky. Put differently, the B/P ratio appears to capture expectations of risky subsequent earnings growth.

Having documented the link between the country value premium and the risk of future earnings growth, the authors finally go on and formally test their initial hypothesis following from equation (1). Given that B/P captures the expectations about risky future earnings growth, the authors investigate the relative importance of E/P and B/P in explaining country excess returns. To reiterate their hypothesis, following from equation (1), B/P should only be important in the presence of expected earnings growth. To test for this, the authors split the countries of their universe in different buckets based on proxies on the riskiness of subsequent earnings growth and run the panel regression of equation (2) separately within each of these buckets. In particular, they split the universe between (i) small and high countries by market capitalisation, (ii) developed and emerging countries and (iii) countries with lower and larger dispersion of beliefs about real GDP growth.

B/P is relatively more important to explain country returns in:

- **Small countries**
- **Emerging markets**
- **Countries with high GDP forecast dispersion**

The empirical evidence is completely in line with the authors' hypothesis; B/P is more important in explaining country excess returns for countries with more risky subsequent earnings growth (small countries, emerging markets and countries with larger dispersion of beliefs about real GDP growth). Instead, E/P becomes more relevant for large countries, developed markets and countries with lower GDP forecast dispersion.

Overall, the paper documents a new interesting link between the value premium and the higher level of risk of subsequent earnings growth of high B/P countries. These countries suffer from a decline in earnings and profitability during the sorting year, but subsequently recover (hence giving rise to the positive value premium); however, this recovery is risky, because these countries are characterised by larger downside sensitivity to contemporaneous global earnings growth.

"Combining Value and Momentum"

by Gregg Fisher, Ronnie Shah & Sheridan Titman

It is well-documented that both momentum and value strategies can, on an individual basis, generate positive excess returns. Momentum investing exploits the phenomenon that past winners, for a lookback period that is typically 12 months, tend to outperform past losers over the subsequent month (Jegadeesh and Titman, 1993, 2001). The value effect, as already explained in this ARM issue, refers to the return differential between high book-to-price and low book-to-price securities.

Value and momentum are negatively correlated

Momentum and value factors typically exhibit negative correlation, and therefore a combination of the two results in a portfolio of higher risk-adjusted performance relative to the "pure-play" individual portfolios. Asness (1997) and Daniel and Titman (1999) identify profitable strategies containing high value stocks amongst low momentum securities and high momentum securities from a pool of low value securities. Asness, Moskowitz and Pedersen (2013) explore these dynamics across multiple asset classes, but only focus on the combination of long-short factors and do not incorporate transaction costs in their analysis.

Contrary to the above studies, in the current paper, Gregg Fisher, Ronnie Shah and Sheridan Titman pay special attention to the implications of trading costs for long-only portfolios that are constructed using information from both value and momentum factors simultaneously. In particular, they suggest two approaches for combining value and momentum signals and evaluate their performance in terms of turnover reduction and therefore in terms of transaction-cost-adjusted basis.

Approach 1: Take the average of value and momentum ranks and estimate a score for each stock as the proportional market-cap of all stocks with lower ranks.

The first approach requires ranking stocks on momentum (past 12-month return, excluding most recent month) and value (book-to-price ratio) separately on a cross-sectional basis at the end of every month; let $rank_k^V$ and $rank_k^M$ denote the value (V) and momentum (M) ranks of stock k at the end of some month. Based on these ranks, the average rank for each stock is calculated:

$$rank_k^{VM} = \frac{1}{2}(rank_k^V + rank_k^M) \qquad (3)$$

The final value-momentum score for each stock k is estimated as the percentage of total market capitalization of stocks whose value-momentum rank is equal or lower than $rank_k^{VM}$:

$$\text{Avg. V/M Score}_k = \frac{\sum_j Cap_j}{\sum_{i=1}^N Cap_i}, \forall j \text{ where } rank_k^{VM} \geq rank_j^{VM} \qquad (4)$$

This score determines which stocks enter and exit the value-momentum portfolio based on pre-specified buy and sell thresholds as it will become clearer later on in Figure 4. Basically, for a stock to be bought, its score has to be above the buy threshold and for an existing stock of the portfolio to be sold, its score has to fall below the sell threshold.

Approach 2: Start from the value portfolio and only rebalance if both value and momentum characteristics are favourable (buy) or unfavourable (sell)

The second approach attempts to reduce the turnover. For this purpose, rather than using the combined signal above, the authors suggest starting from a basic value portfolio and only rebalance when both value and momentum signals are favourable or unfavourable; buy stocks in the former case, sell in the latter. Whether a trade is triggered depends on both the slow-moving value score and fast-moving momentum score and it is this mechanism which reduces turnover and results, as we will see shortly, in higher transaction-cost-adjusted performance.

Data

For the empirical analysis, the authors use a universe that consists of stocks from NYSE, AMEX and NASDAQ as reported in the CRSP database. Accounting data are collected from Compustat and factor data are collected from Kenneth French's website. The sample period of the analysis is January 1975 – December 2013. Value-momentum portfolios are constructed separately on a large-cap (top 1000 stocks by market capitalisation) and small-cap (all but top 1000) universe as the authors want to separate the effect of transaction costs across size buckets. Following an analysis on bid/ask spreads and trading commissions, the authors use two scenarios of round-trip trading costs: TC_{High}: 2.94% and 1.06% for small and large capitalization stocks, respectively; TC_{Low}: 0.82% and 0.41% for small and large capitalization stocks, respectively.

Empirical Analysis

Figure 4 (Panel A for small-cap, Panel B for large-cap) reports various performance statistics for the two approaches (denoted by "Avg. V/M" and "Value I > 50% M" respectively) as well as for a simple benchmark 70% value and 30% momentum portfolio (".7V+.3M"). The table contains additionally exposure to value (HML) and momentum (MOM) factors from a Carhart (1997) four-factor regression analysis. For each value-momentum portfolio, two sets of buy/sell thresholds are presented. Just to explain the methodology, take as example the buy 90 and sell 70 setting:

- The Avg. V/M portfolio buys stocks whose combined value and momentum score is above 90, and sells stocks whose combined score falls below 70.
- The Value I > 50%M portfolio buys stocks whose value score is above 90 and momentum score is above 50 and sells stocks whose value score falls below 70 and momentum score falls below 50.
- The .7V+.3M portfolio uses the thresholds for the construction of single-factor portfolios, based on the single-score equivalent of equation (4).

Figure 4: Value and Momentum Portfolios

Panel A: Small Capitalisation Stocks

Style	Buy	Sell	Compound Return	Standard Deviation	Sharpe Ratio	Turnover	Sharpe after TC_{High}	Sharpe after TC_{Low}	# stocks	HML	MOM
Small Market	-	-	15.0%	21.4%	0.53				2,514	0.15	-0.12
Avg. V/M	90	70	22.0%	19.6%	0.87	89%	0.74	0.84	847	0.61	0.13
Avg. V/M	95	65	21.4%	19.7%	0.84	62%	0.75	0.82	685	0.64	0.11
Value|> 50%M	90	70	20.4%	20.5%	0.77	20%	0.74	0.76	881	0.73	-0.06
Value|> 50%M	95	65	20.3%	20.9%	0.76	16%	0.74	0.75	638	0.76	-0.06
.7V + .3M	90	70	19.0%	20.7%	0.71	57%	0.63	0.69	989	0.42	-0.01
.7V + .3M	95	65	18.5%	21.2%	0.68	48%	0.61	0.66	763	0.41	0.00

Panel B: Large Capitalisation Stocks

Style	Buy	Sell	Compound Return	Standard Deviation	Sharpe Ratio	Turnover	Sharpe after TC_{High}	Sharpe after TC_{Low}	# stocks	HML	MOM
Large Market	-	-	12.4%	15.9%	0.51				1,000	-0.03	0.00
Avg. V/M	90	70	16.4%	17.3%	0.68	103%	0.62	0.66	234	0.36	0.18
Avg. V/M	95	65	16.1%	17.6%	0.66	75%	0.62	0.65	191	0.37	0.17
Value | > 50%M	90	70	14.8%	18.1%	0.58	17%	0.57	0.58	247	0.45	-0.01
Value | > 50%M	95	65	14.6%	17.8%	0.58	12%	0.57	0.58	192	0.44	-0.02
.7V + .3M	90	70	15.1%	17.8%	0.60	65%	0.57	0.59	273	0.32	0.02
.7V + .3M	95	65	15.3%	18.3%	0.60	54%	0.57	0.59	221	0.30	0.04

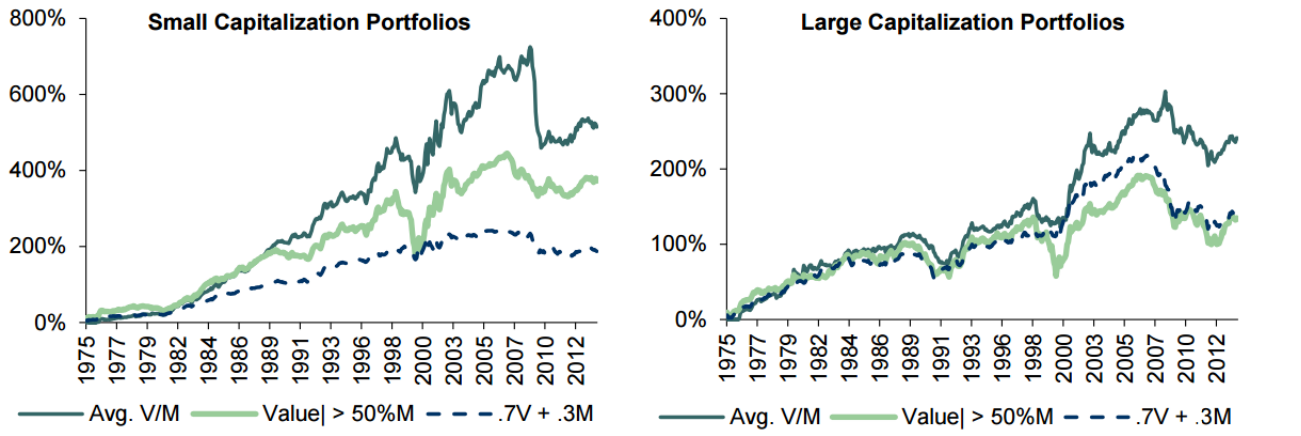
Source: "*Combining Value and Momentum*" by Fisher, Shah and Titman; Table 3 reproduced with permission. The table shows performance statistics for various value-momentum portfolios with different buy/sell triggers where the underlying universe is concentrated on small capitalization stocks (Panel A) and large capitalisation stocks (Panel B). The data period is from January 1975 to December 2013.

The evidence shows that forming portfolios via the first approach ("Avg. V/M") results in the highest risk-adjusted returns albeit with the highest turnover. This is true both for small and large cap universes. However, the second approach to construct a value-momentum long-only portfolio ("Value I > 50%M") generates significantly lower turnover, with a comparable (if not better) Sharpe ratio to the naive ".7V+.3M" portfolio, either before or after transaction costs.

The second approach generates decent risk-adjusted performance with significantly lower turnover

Cumulative excess returns for combined value-momentum portfolios amongst small and large cap stocks are presented in Figure 5. These portfolios are based on the buy 90, sell 70 rebalance trigger.

Figure 5: Cumulative Market-Excess Returns for Value-Momentum Portfolios (thresholds: Buy 90, Sell 70)



Source: "*Combining Value and Momentum*" by G. Fisher, R. Shah and S. Titman; Figure 2 reproduced with permission. The figures show the cumulative market-excess returns of value-momentum portfolios based on three different methodologies presented in Figure 4. The left panel is for a small-cap universe and the right panel is for a large-cap universe. The sample period of the analysis is January 1975 – December 2013.

For robustness purposes, the authors carry out the same analysis for the post-2000 period; the results remain unchanged. Despite the consistent outperformance of the first approach to combining value and momentum, the turnover is very high. This is primarily due to the momentum signal outweighing value, which is exactly what the second approach tries to alleviate.

Our Empirical Analysis

Motivated by the findings of the paper, we replicate the suggested methodologies on a more investible universe. We use S&P 500 as our underlying index and apply the rules of each methodology to the stocks in the index on a monthly basis.[5] The period under analysis is April 1997 – September 2015. We present results using both equal weights and market-cap weights (the paper presents only market-cap weighted strategies).

Our back-test dataset:

- **S&P 500**
- **April 1997 – September 2015**

The objective is to investigate whether we realise the same relative benefits from each approach as reported in the paper. To supplement this study we explore another method for combining factors. This approach, which we explain in due course, is used for constructing FTSE's Global Factor Index Series[6]. In all cases, it is

[5] The S&P 500 index is by construction a large-cap universe and we therefore refrain from splitting it into small and large subsets. If anything, an investor is more likely to consider the S&P 500 universe as a proxy for a large-cap universe in its entirety. To put things in perspective, the paper that we have just reviewed defines a large-cap universe as the 1,000 stocks from NYSE/AMEX/NASDAQ with the largest market capitalisation.

[6] http://www.ftse.com/products/indices/factor/

important that each portfolio exhibits both factor characteristics whilst improving on the single-factor equivalents in terms of risk-adjusted returns and turnover.

We first present results for single-factor value and momentum portfolios, then describe briefly the three combination approaches that we use and then present results in Figure 7.

Single-Factor Portfolios

How do value and momentum portfolios compare on an individual basis?

To facilitate comparisons, we start our analysis by simulating value and momentum portfolios on a single-factor basis and calculate their performance over the sample period. Essentially, on each rebalance date, the universe is split into buckets based on factor scores. Stocks are then either equally-weighted or cap-weighted in each basket. Performance statistics are reported in Figure 6.

Figure 6: Single Factor High Value and Momentum Portfolios.

Panel A: Equally weighted portfolios

	High Momentum	High Value
Annualized Return	10.45%	10.39%
Annualized Volatility	15.34%	19.47%
Annualized Sharpe (Rf=0%)	0.68	0.53
Turnover	33.7%	14.4%

Panel B: Market-cap weighted portfolios

	High Momentum	High Value
Annualized Return	7.43%	7.40%
Annualized Volatility	14.84%	17.40%
Annualized Sharpe (Rf=0%)	0.50	0.43
Turnover	32.2%	11.9%

Source: UBS Quantitative Research. The table reports performance statistics for high value and momentum portfolios based on equally weighted baskets (Panel A) and market-cap weighted baskets (Panel B) where stocks are selected on a monthly basis from the S&P 500 Index over the period April 1997 – September 2015.

Evidently, high momentum portfolios outperform high value portfolios on an absolute and risk-adjusted basis regardless of which weighting scheme is employed. Consulting turnover numbers, however, it is clear that momentum gains come at a higher cost, as expected.

Value-Momentum Approach 1: Using the average rank ("Avg. V/M")

For the first combined Value-Momentum approach, as in the paper, we calculate for each stock the average rank between univariate and independent value and momentum ranks, as in equation (3). These average ranks are then adjusted by market capitalisation, as in equation (4) and a buy threshold of 90 and a sell threshold of 70 are used to determine which stocks enter and which stocks leave the portfolio at the end of each month.

Value-Momentum Approach 2: Tilting a value portfolio ("Value | > 50%M")

As already explained in the review of the paper, the second approach is similar to a single-factor value portfolio, but for a stock to enter or leave the portfolio both value and momentum thresholds have to be crossed towards the same direction:

- a new stock enters the portfolio if its value increases beyond 90 and its momentum score increases beyond 50;
- an existing stock is sold if its value score falls below 70 and its momentum score falls below 50.

The univariate value and momentum scores are generated at the end of each month by first ranking all stocks on a univariate basis based on value (book-to-market) and momentum characteristics (past 12-month returns, excluding the most recent month), and then by market-cap adjusting the univariate ranks in the spirit of equation (4).

Value-Momentum Approach 3: Z-score

The last approach we investigate is used for constructing FTSE's multi-factor indices. This method of combining factor signals is not discussed in the paper but is interesting to consider nonetheless simply as another approach to compare. On each rebalance date and for each factor, we calculate the cumulative normal of each z-score of each factor value:

$$S_i = CN(Z_i) = \int_{-\infty}^{Z_i} \frac{e^{-x^2/2}}{\sqrt{2\pi}} dx \qquad (5)$$

where $Z_i = (f_i - \mu(f))/\sigma(f)$ and $CN(.)$ is the cumulative distribution of a standard normal random variable. To avoid overweighting extreme z-scores, which tend to be associated with stocks whose factor values are unreliable or volatile, extreme values outside of the range [-3,3] are capped at -3 and 3, respectively. On a single-factor basis, the general formulation for constituent weights is given by:

$$W_i^f = \frac{W_i^* * S_i}{\sum_{i=1}^{N} W_i^* * S_i} \qquad (6)$$

where W_i^* refers to any reference underlying weight. On a pure factor basis, where $W_i^* = 1 \; \forall \; i$, weights are simply rescaled to unity. Alternatively, weights W_i^* can represent any weighting scheme in which case this then becomes a factor tilt portfolio. On a multi-factor basis, multiplying scores, S_i, for each factor then yields a combined factor portfolio:

$$S_i^* = \prod_{f=1}^{F} S_i^f \qquad (7)$$

To construct a multi-factor index in the style of FTSE's Global Factor indices requires replacing S_i in equation (6) by S_i^*. Compared to the first combined factor approach above, which involves ranking stocks and estimating the average rank, the z-score approach takes account of the magnitude. In addition, the order in which factors are incorporated does not make a difference as a stock's combined factor score is simply the product of the individual factor scores:

$$S = CN(Z_1, Z_2) = \int_{-\infty}^{Z_1}\int_{-\infty}^{Z_2} \frac{e^{-(x^2+y^2)/2}}{2\pi} dxdy = \left(\int_{-\infty}^{Z_1} \frac{e^{-x^2/2}}{\sqrt{2\pi}} dx\right)\left(\int_{-\infty}^{Z_2} \frac{e^{-y^2/2}}{\sqrt{2\pi}} dy\right) \qquad (8)$$

An obvious pitfall with this approach, however, is the assumption that factors can be modelled by the normal distribution or at least be transformed into a variable which is normal-like.

Value-Momentum Portfolios

Using the three combination approaches outlined above, we construct equally weighted and market-cap weighted portfolios of value and momentum and report performance statistics in Figure 7.

Figure 7: Combined Value-Momentum Portfolios: Performance Statistics

Panel A: Equally weighted portfolios

	Approach 1: Avg. V/M	Approach 2: Value | >50%M	Approach 3: Z-score
Annualized Return	11.12%	9.01%	6.46%
Annualized Volatility	18.22%	15.61%	17.49%
Annualized Sharpe (Rf=0%)	0.61	0.58	0.37
Turnover	56.39%	27.08%	23.23%
Correlation with High Value	83.35%	88.46%	64.84%
Correlation with High Momentum	94.29%	97.74%	74.19%

Panel B: Market-cap weighted portfolios

	Approach 1: Avg. V/M	Approach 2: Value | >50%M	Approach 3: Z-score
Annualized Return	9.15%	7.12%	5.40%
Annualized Volatility	18.37%	15.75%	17.80%
Annualized Sharpe (Rf=0%)	0.50	0.45	0.30
Turnover	59.16%	23.42%	15.88%
Correlation with High Value	81.90%	87.73%	68.36%
Correlation with High Momentum	87.69%	98.11%	80.93%

Source: UBS Quantitative Research. The table reports performance statistics for high performing portfolios based on the three approaches described above for constructing combined value-momentum portfolios. Panel A represents equally-weighted baskets and Panel B refers to cap-weighted baskets. The bottom two rows in each panel tabulate return correlations with each single factor portfolio; high value portfolio returns and high momentum portfolio returns. The period under analysis is April 1997 – September 2015

The second approach offers the best balance between return and turnover

In line with the findings of the paper, the second approach to combining value and momentum yields portfolios whose turnover is less than half that of the first approach whilst only slightly underperforming. We do find that the third approach that uses the Z-scores results in the lowest turnover, however this comes with much lower performance. In further support of the second approach, the returns associated with these portfolios correlate the highest with the single factor value and momentum portfolios, as documented in the last two rows of each panel of Figure 7. Given these findings, the second approach is indeed the most favourable, in complete agreement with the paper.

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Neutral	FSR is between -6% and 6% of the MRA.	40%	26%
Sell	FSR is > 6% below the MRA.	12%	18%
Short-Term Rating	**Definition**	**Coverage[3]**	**IB Services[4]**
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	less than 1%	less than 1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	less than 1%	less than 1%

Source: UBS. Rating allocations are as of 30 September 2015.
1:Percentage of companies under coverage globally within the 12-month rating category. 2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
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KEY DEFINITIONS: Forecast Stock Return (FSR) is defined as expected percentage price appreciation plus gross dividend yield over the next 12 months. **Market Return Assumption (MRA)** is defined as the one-year local market interest rate plus 5% (a proxy for, and not a forecast of, the equity risk premium). **Under Review (UR)** Stocks may be flagged as UR by the analyst, indicating that the stock's price target and/or rating are subject to possible change in the near term, usually in response to an event that may affect the investment case or valuation. **Short-Term Ratings** reflect the expected near-term (up to three months) performance of the stock and do not reflect any change in the fundamental view or investment case. **Equity Price Targets** have an investment horizon of 12 months.

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Unless otherwise indicated, please refer to the Valuation and Risk sections within the body of this report.

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