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Executive summary

This paper explores the fundamental basis of stock pricing and returns. It makes the case that certain characteristics of stocks are key to understanding, and therefore forecasting, their long-term returns relative to other stocks. The paper recalls academic research that has isolated these key factors and provides evidence that stocks with a preferable mix of factors will provide persistent excess-return over time. It also identifies factors that provide excess-returns, but not on a persistent basis. The paper discusses the underlying source of persistent excess-return phenomena, such as premia for bearing risk.

What drives equity returns?

Equities provide a return to investors for bearing economic risk over the long-term. This well-known characteristic is observed in markets around the world, and through a diverse range of economic environments, and is built into the market by the behaviour of investors. Investors generally price equities based on an expectation of return with an added margin for risk - in fact - stock analysts' pricing models often include risk explicitly by adjusting for risk in the cost of capital used for discounted cash flow valuations. Due to this long-established behaviour, in all equity markets, the return to stocks will reflect how they have been priced based on the market's expectations for their prospects.

However, performance is rarely as linear as forecasts imply. For instance, returns are not earned evenly through time, and the realised financial performance of companies dominates changes in valuations. A departure of realised earnings from market expectations greatly impacts the actual realised return. Also complicating matters for a forecast are changes, through time, of the market pricing of risk, and influences such as short-term trading and liquidity impacts. Nonetheless, through history, a broad underlying rational pricing of risk has provided a long-term return premium to risky assets.

For an individual stock, the company's execution of its business plan and its subsequent financial performance dominate the value of the stock. An investor's correct anticipation of this, for a given stock, can reap rewards significantly in excess of the base equity risk premium. For a large group of stocks, much of this individual performance is effectively diversified away, as some stocks execute above expectation and others below. The average return across the group, therefore, more closely reflects the pricing of investors' expectations.

"In the short run, the market is a voting machine. But in the long run, it is a weighing machine."

Benjamin Graham¹

Meet the factors

It has become clear over time that certain characteristics of stocks give information about how they are priced by the market. These characteristics help explain why different types of stock achieve different rates of return over the long term, and crucially, it is evident that the information from these characteristics persists over time.

An early academic milestone in identifying factors which persistently explain performance was Graham and Dodd's 1934 *Security Analysis*. Since then, academic research has steadily added to the list of factors. And industry practitioners have amassed an enormous body of evidence supporting both the additive value of each factor in relation to the others, and their persistence over time.

Figure 1: Milestones in the understanding of market behaviour

Factor	Signals	Year
Value	Graham & Dodd show that low Price to Earnings/Book/Cash Flow ratio stocks tend to outperform.	1934
Volatility	Haugen and Heinz find that low volatility stocks realise extra risk-adjusted returns.	1972
Momentum	Carhart finds that a 4-factor model including momentum improves performance.	1997
Size	Banz finds that small cap stocks outperform large caps.	1981
Quality	Sloan shows that stocks with higher earnings quality or lower accruals outperform.	1996

“There are many ways to harvest a return from the equity market...
...but not all demonstrate persistent out-performance.”

So, what constitutes a factor? In principle; any characteristic of a stock, that can be quantified and compared across stocks, can be used as a factor - in a strictly mathematical sense. With the rise of “Factor Investing” and “Smart Beta” investment vehicles, the emphasis on factors has increasingly been on return generation. But for a long time, factors have been used in equity risk modelling, and other contexts, by practitioners and academics.

What really distinguishes a meaningful market factor is its ability to explain return or risk differences across stocks. The term factor is used in a variety of ways in different contexts, however a useful way to categorise them is as follows;

■ Persistent Return Factors

Factors which explain long-term return differences between stocks, in multiple markets, over long periods.

These may be tailored for particular markets and refined to improve their efficacy, but are broadly associated with phenomena that stand-up to academic and peer review. Simple implementations of these may be used as the basis for Factor Investing products; Earnings yield and cash flow yield measures, for example, have long dominated security valuation.

■ Transient Return Factors

Factors which explain return differences between stocks in certain market environments but do not reflect long term market behaviour.

An example of this would be a macro theme such as economic linkage to emerging markets, which explained a great deal of return dispersion in developed market stocks during periods of rapid emerging market growth.

■ Risk Factors

Factors which are useful to measure, analyse and predict stock and portfolio volatility.

These can overlap significantly with return factors, but are tuned to explain volatility, not return drift. They may, in fact, describe substantially less about long term returns than apparently similar persistent return factors.

Short term market behaviour

Short Term Market Behaviours such as, investor sentiment, liquidity and trading impacts, and the impact of the economic environment on valuation, can have significant influence over the short term.

An investor can harvest long term returns in a number of ways; via the total market equity risk premium, via persistent factor returns, or from individual stock fundamentals. Alternatively, securities can be traded to benefit from short term price fluctuations. Some short-term traders provide liquidity to the market hoping to earn a premium from short-term price reversals, while others attempt to be first-to-market in trading news that impacts stock valuations. Many of these activities are largely independent of the long-term return process of the equity market. They produce very different investment characteristics, especially in terms of turn-over, transaction costs, tax realisation and fund capacity.

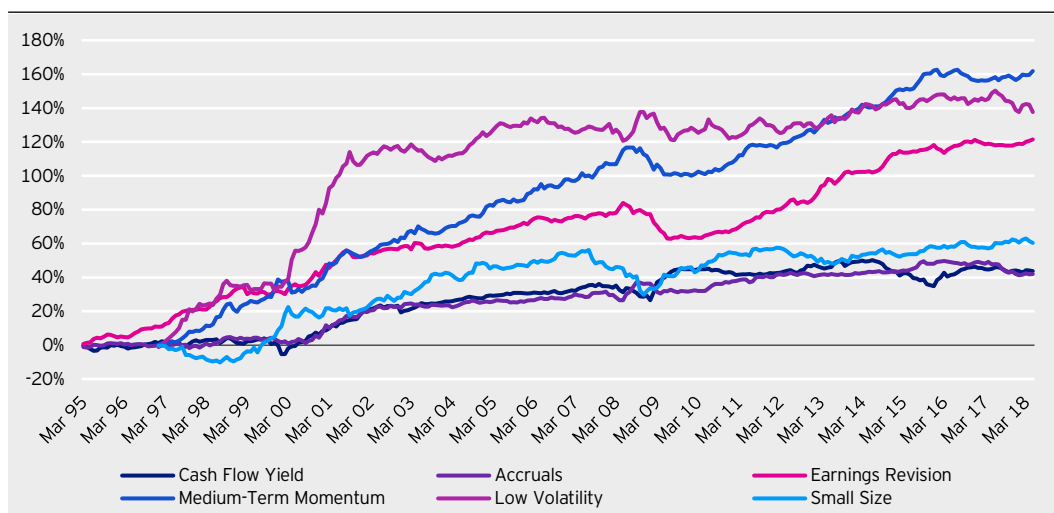
As many of these techniques require trading ahead of other market participants, they are also prone to being superseded by the evolution of the market and may decline in efficacy over time. These approaches require constant update and improvement to remain effective. Thus, proponents of these styles of investment may find themselves in an ongoing arms race with other traders as their current investment techniques are "arbed out". Current success of such an investment technique does not imply that it will provide positive returns over the long term.

Meet the persistent factors

Although the findings on persistent return factors, whose principal milestones are listed in Figure 1, date back decades - their publication has not resulted in eliminating their effectiveness. The effects persist.

We see in Figure 2 the return profiles of some well-known stock characteristics for the Australian equity market. Here the power of each factor in explaining stock returns is demonstrated via a cross sectional regression of stock returns against the factor scores at each point in time. It is evident that these characteristics continue to be important determinants of stock pricing to this day.

Figure 2: The return profiles of some well-known stock characteristics for the Australian equity market



Source: Invesco. For illustrative purposes only.

Why do they persist?

There is significant empirical evidence that factor premia, like the equity risk premium itself, are an enduring component of market behaviour. Returns to these factors may fluctuate over the short term, in the same way that the equity risk premium return does, but positive premia are earned over the long term.

Investigation of the causes of this persistence has indicated several possible reasons. These are often grouped loosely into **Risk Premia**, **Behavioural Rationales** and **Market Structure**.

Risk premia

A risk premium is broadly interpreted as a reward for bearing a systematic risk, in the same manner that equity investors expect to earn a premium over less risky assets. This means that the return premium associated with that factor can only be accessed by bearing the risk of that factor.

Value is seen by some as an example of a factor rewarded for bearing risk. It has been hypothesised, for example, that the value factor return premium is a compensation for the higher default risk in companies with lower valuations.

More broadly, many return generating factors are also known to be useful explanators of the risk of stocks. Most commercial equity market risk models use a set of factors to model systematic risk that include well known return-explaining factors. In this sense exposure to these factors can be seen as incorporating non-diversified risk which is priced to provide a long-term return premium.

Behavioural rationales

Behavioural rationales for factor performance draw from Behavioural Finance as espoused by Kahneman², Shiller, and others, to explain market features which appear to imply irrational behaviour by market participants. Human cognitive traits such as heuristics (use of rules of thumb for mental shortcuts), or framing (anecdotes or stereotypes which act as mental filters on human understanding) are used to explain apparently irrational market participant behaviours.

Momentum factor performance is sometimes described as a behavioural phenomenon, manifested when investors underreact to news events.

It can be difficult to establish a definitive link between factor performance and behavioural phenomenon, and there is a temptation to use this as a catch-all rationalisation where evidence of risk premia or structural influences have not been demonstrated. Even when investor behaviour does appear, on the surface, to be irrational - this may reflect some other unobserved but rational motivation for the behaviour. For this reason, it cannot be assumed that the market will overcome apparent behavioural anomalies by investors learning to trade more rationally.

Exploitation of these anomalies can impact the premium earned, but while simple formulations of factor implementation can lose some efficacy through overuse, empirical persistence of long-term factor returns despite published advances in behavioural analysis seems to indicate that the underlying phenomena are not about to disappear.

Market structure

Market Structure rationales imply the factor premium results from the structure of an industry, or from market constraints. This can produce anomalous returns for certain classes of investors or return strategies, but are not generally associated with the traditional return factors such as Value, Size and Quality seen worldwide.

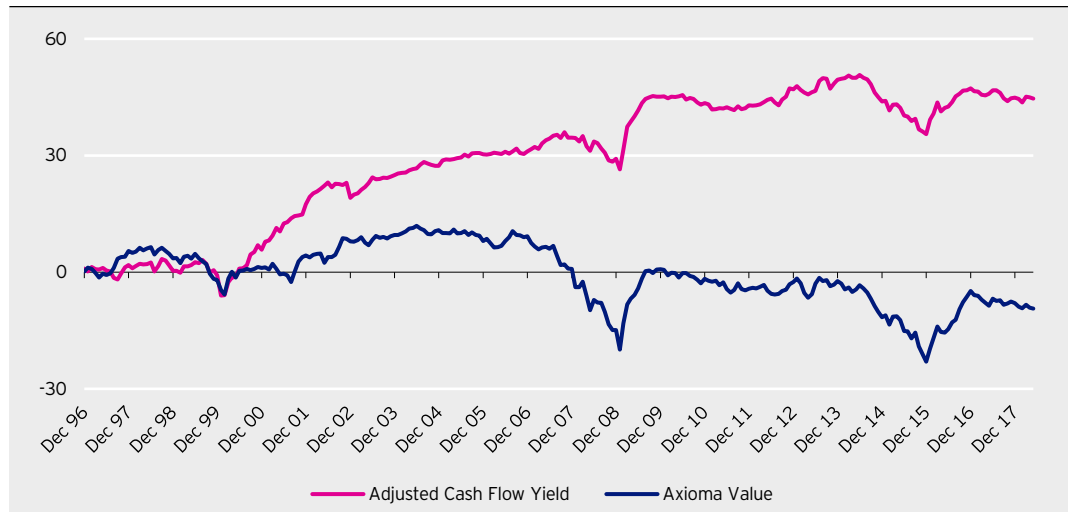
An example of a market structure premium in the Australian market is the imputation tax credit provided to Australian tax payers that is not available to foreign investors.

Refining the factors

A crucial aspect of harnessing persistent factor returns is finding effective formulations to quantify the exposures; formulations that can be used to differentiate between stocks, and form portfolios with desirable factor exposures. Some measures are better than others at capturing the true underlying pricing mechanism, and the significance of returns drivers can differ across industries and countries. Additionally, the appropriate formulation of these measures may differ according to accounting standards and industry practice.

This chart shows the significant performance difference between a value factor formulated to explain risk and one that is used to target returns. The factor from the commercial risk model (Axioma Value) has significant short-term correlation with the cash generation based value measure (Adjusted Cash Flow Yield), successfully capturing the risk characteristics of value exposure. However, the cash flow measure is far superior in identifying the value return premium.

Figure 3: The significant performance difference between a value factor formulated to explain risk and one that is used to target returns



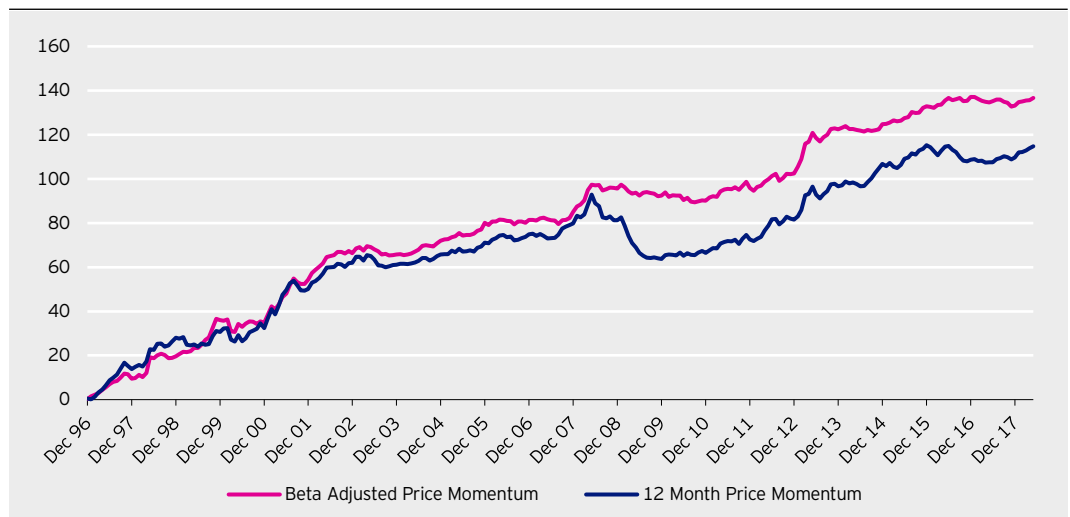
Source: Invesco. For illustrative purposes only.

Factor exposure measures can also be subject to extraneous influences; from other style, or transient market effects, that introduce volatility and risk of performance drawdown. These degrade the performance of the factor exposure. Refinements specific to a particular indicator can ameliorate this additional uncompensated risk.

Momentum is a factor which can be subject to the influence of transient macro themes, causing increased risk concentration and performance drawdowns when the macro conditions change. It is possible to reduce this sensitivity by explicitly adjusting momentum factor exposures for macro level effects.

Figure 4: The benefit of adjusting a 12-month price momentum factor for stock beta effects

This chart shows the reduction in performance drawdown provided by reducing the systematic market exposure of a price momentum signal. The performance is particularly enhanced during episodes of significant market level volatility in 2008 (GFC) and 2016 (Hedge fund deleveraging).



Source: Invesco. For illustrative purposes only.

Another important consideration in the application of factor based investing, is the way factors interact with each other. Much of the theory and structure around the analysis and application of factors assumes a linear structure for the influence of factor exposures on stock returns. In practice, the returns of stocks are not linearly related to factors scores, and certain combinations of factors are more effective than a mere linear averaging of their properties would imply.

Figure 5: The impact of modifying a momentum factor by conditioning it on the scores of a value factor

Market neutral factor portfolios	Momentum	Momentum with no value exposure	Momentum with no value beta
Annualised returns %	11.15	11.34	12.09
Standard deviation %	10.02	9.98	7
Information Ratio	1.11	1.14	1.73
T-stat	4.98	5.09	7.74
Maximum drawdown %	34	34	14
Turnover	700%	674%	665%

<p>Performance statistics for the momentum factor exposure (based on Invesco IQS factor definitions for global equities over the period 12/1996 - 12/2016).</p> <p>This factor is known to exhibit a negative exposure to value, which is itself a return generating factor.</p>	<p>The impact of neutralising the value bias in the momentum factor, with respect to the value factor scores. This demonstrates a very modest improvement.</p>	<p>The momentum exposure has been adjusted to remove any beta to the value factor - a slightly different method of neutralising the value bias. This provides a much more significant benefit, illustrating the importance of understanding how factors interact and tuning the specific implementation of the factors used.</p>
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“The persistence of the excess returns these factors deliver is so pervasive that even a rudimentary tilt toward them is effective...”

Conclusion

A stock can be ranked against its peers in a multitude of quantifiable ways. But as we've explored, only a discrete subset of these ways, recognised as return 'factors', unlock persistent excess returns. The factors driving persistent returns have been evidenced in academic papers by high-profile researchers - indeed several Nobel prize winners - and have withstood decades of academic challenge. Furthermore, hard-nosed practitioners with no interest in academic protocol have harnessed the phenomena of persistence for decades, and back-tested rigorously. Persistence has held.

The persistence of the excess returns these factors deliver is so pervasive that even a rudimentary tilt toward them is effective. But more effective still is a sophisticated approach which looks to improve the return capture incrementally and adjust to market evolution through continuous research.

References

- 1 [Graham](#), Benjamin. *'The Intelligent Investor'*, 1949. p477.
- 2 The following paper by Werner F. M. [De Bondt](#) and Richard [Thaler](#), also explores the contemporaneous findings of Robert [Shiller](#), Daniel [Kahneman](#) and Amos [Tversky](#).
Does the Stock Market Overreact? The Journal of Finance, Vol. 40, No. 3, Papers and Proceedings of the Forty-Third Annual Meeting American Finance Association, Dallas, Texas, December 28-30, 1984. (Jul., 1985), pp. 793-805.

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