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An intrinsic approach to performance measurement of portfolio manager skill

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Any errors in this paper remain my sole responsibility.

The views expressed in this paper are those of the author and not necessarily those of the company with which he is associated. This paper should not be considered as financial advice.

Abstract

This paper investigates the use of fundamentally based measures of portfolio manager skill rather than the traditional market value based measures.

Due to the volatility of market prices around the intrinsic value of a fund's investments, over short time periods, traditional market value based performance measures of active return may not be the best measures of portfolio management skill. Alternatively, measurement of the underlying alpha generation in the intrinsic value of the portfolio may provide a better measure of portfolio manager skill. This is expected to particularly be the case for deep value investors. This paper discusses these issues and looks at possible alternative measures for calculating the underlying alpha generation of an investment portfolio.

Keywords: active return, intrinsic value, skill, luck, volatility, portfolio management

1. Introduction

The standard measure of the relative performance of an investment portfolio is the total return of the portfolio less the return of the appropriate accumulation based benchmark. Performance in excess of the index is typically known as ‘alpha’. Generating positive ‘alpha’ is the life blood of the active funds management industry.

However, as ASIC’s Executive Director of Consumer Protection, Mr Greg Tanzer has commented *“Past performance is not a reliable indicator of future performance. An undue emphasis on past returns can lead to consumers having unrealistic expectations and making poor investment decisions”*. In 2003, ASIC commissioned the Funds Management Research Centre to report into the usefulness of past performance information when consumers (or their advisers) are selecting an Australian managed fund. The report concluded that “good past performance seems to be, at best, a weak and unreliable predictor of future good performance over the medium to long term”. The report said a plausible explanation for the conclusion about the low persistence of past performance was that “the future return on investments is extremely hard to predict, so a significant part of a fund’s performance (compared to its peers) may be random luck”.

A fundamental tenet of active funds management is that investment markets are not fully efficient and that there exist opportunities to invest in a manner that generates ‘alpha’ for a client. This implies it is possible to identify securities with market prices that are not trading at their underlying intrinsic fair value and, within the client’s time horizon, the market price will return sufficiently to this intrinsic value. Active funds management through research or alternative methods (such as quant models) aims to identify these mis-priced securities and to then take advantage of that mis-pricing.

Given active funds management is based on the premise that securities can be mis-priced (sometimes for long periods) it is therefore somewhat incongruous that the standard measure for assessing the performance of the active funds management industry is based on the change in market value of the portfolio from start of period to end of period.

In Warren Buffett’s 1997 letter to shareholders he advised “If you expect to be a net saver during the next five years, should you hope for a higher or lower stock market during that period? Many investors get this one wrong. Even though they are going to be net buyers of stocks for many years to come, they are elated when stock prices rise and depressed when they fall. This reaction makes no sense. Only those who will be sellers of equities in the near future should be happy at seeing stocks rise. Prospective purchasers should much prefer sinking prices”.

If a share price has fallen the key thing to determine is if the fundamentals of the business have deteriorated or if the company has become cheaper. Assuming the market is not fully efficient, the share price move on its own will not tell you which of these is true.

Benjamin Graham observed that “In the short run, the market is a voting machine, but in the long run it is a weighing machine”. This paper looks at alternatives to the voting machine (ie. traditional performance measurement using changes in share prices) to measure how much ‘weight’ (i.e. measures based on changes in intrinsic value) is being added to portfolios.

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Over the long-term, the 'voting machine' should be roughly equivalent to the 'weighing machine', but in the short-term alternative measures are needed to assess if positive relative performance has been generated through skill or good luck, or for negative relative performance if it has been generated through a lack of skill or bad luck.

2. Market Efficiency

An efficient market is one where the market price is an unbiased estimate of the true value of the investment. This does not require that the market price be equal to true value at every point in time. All it requires is that errors in the market price be unbiased, i.e., that prices can be greater than or less than true value, as long as these deviations are random. The fact that the deviations from true value are random implies, in a rough sense, that there is an equal chance that stocks are under or over valued at any point in time, and that these deviations are uncorrelated with any observable variable. For instance, in an efficient market, stocks with lower PE ratios should be no more or less likely to be undervalued than stocks with high PE ratios. If the deviations of market price from true value are random, it follows that no group of investors should be able to consistently find under or over valued stocks using any investment strategy. [Source: <http://pages.stern.nyu.edu>]

Under the Efficient Market Hypothesis an 'efficient' market is defined by Fama as "a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value.....Although uncertainty concerning intrinsic values will remain, actual prices of securities will wander randomly about their intrinsic values" [Source: Eugene Fama, *Random Walks in Stock Market Prices*].

This paper does not attempt to debate the degree of market efficiency in investment markets. The active fund management industry relies upon identifying inefficiencies in markets, and this paper is focused on measuring the success, or otherwise, of active management through the use of fundamental intrinsic value measures.

The success of active managers will depend upon a number of factors, including the sophistication of other participants in the market in which they operate. Active fund managers also need to create sufficient value to offset their generally higher management fees, transaction costs (including the market impact of demanding liquidity and brokerage costs) and taxation costs. Some historically successful active strategies, particularly quantitative strategies, can be replicated by others, thereby negating prospective value creation. That said, there is international research that shows long-term persistency in performance from some strategies such as value and small cap investing. It is most likely that behavioural finance provides the greatest insights as to why, despite the research, this seems to remain the case. One component may be that there is evidence that investment managers are prone to 'herding'. [Source: <http://wwdocs.fce.unsw.edu.au>]. However, as discussed later in this paper, in more recent periods, 'value' factors and 'small cap' have not proved to be successful quantitative factors for the Australian market. This may reflect that the prior systematic

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discrepancies have been identified and neutralised by market participants utilising those factors in their investment strategies.

Whether the market is efficient, or not, there appears to be a lack of measurement, analysis and reporting of any value created through active Portfolio Management by growing the intrinsic value of their portfolios. This paper looks to address some of these issues.

3. Portfolio Management

The term ‘portfolio management’ is widely used, but it is not often clear what it actually means.

Typically it is defined as something similar to “The process of managing the assets of a mutual fund, including choosing and monitoring appropriate investments and allocating funds accordingly”. [Source: <http://www.investorwords.com/>]

A Portfolio Manager is responsible for the security selection in a portfolio, but often it is not well defined how the portfolio is actually ‘managed’, other than the Portfolio Manager is accountable for the ultimate performance that results from the stock selection. As Portfolio Managers can’t control individual security prices, they are, as such, unable to ‘manage’ investment performance, at least over the short-term.

Portfolio Managers are, however, able to ‘manage’ the purchase and sale of securities in a way to purchase an initially undervalued portfolio and then grow the underlying intrinsic value of their fund. Subject to the holding period, those that do this well will create value for their investors and those that do this badly will destroy value for their investors.

Over the long-term, quality Portfolio Managers are those that are able to grow the intrinsic value of their portfolios at a rate significantly in excess of the broader market, in conjunction with not overpaying for the initial portfolio investment.

The key data points for a Portfolio Manager to ‘manage’ are therefore:

- the discount of market value to intrinsic valuation for the portfolio at the time of initial investment
- the rate of change in intrinsic value of the portfolio in periods following the initial investment; and

Over the long-term the first point should become less important and the success of the Portfolio Manager should be determined by the second point. As such, over the long-term, the performance of the Portfolio Manager should be determined by the rate of change in the intrinsic value of the portfolio. This should therefore be the primary focus of the Portfolio Manager – and if this is to be ‘managed’ then it should be advantageous for it to be measured.

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Berkshire Hathaway's 'An Owner's Manual' sets out Warren Buffet's owner-related business principles for the information of Class A and Class B shareholders. Within this document, his long-term economic goal (subject to some qualifications) is defined as "to maximise Berkshire's average annual rate of gain in intrinsic value on a per-share basis". This is one example where intrinsic value is being measured and managed, if not directly reported.

4. Intrinsic Value

Some definitions of intrinsic value include:

- The actual value of a security, as opposed to its market price or book value. The intrinsic value includes other variables such as brand name, trademarks, and copyrights that are often difficult to calculate and sometimes not accurately reflected in the market price. One way to look at it is that the market capitalization is the price (i.e. what investors are willing to pay for the company) and intrinsic value is the value (i.e. what the company is really worth). Different investors use different techniques to calculate intrinsic value. [Source: <http://www.investorwords.com/>]
- The value of a security, justified by factors such as assets, dividends, earnings, and management quality. Intrinsic value is at the core of fundamental analysis since it is used in an attempt to calculate the value for an individual stock and then compare it with the market price. Because analysts view facts differently, there is often a wide disparity in estimates of a particular stock's intrinsic value. [Source: <http://financial-dictionary.thefreedictionary.com/Intrinsic+Value>]

Berkshire Hathaway's 'An Owner's Manual' says "Intrinsic value is an all-important concept that offers the only logical approach to evaluating the relative attractiveness of investments and businesses. Intrinsic value can be defined simply: It is the discounted value of the cash that can be taken out of a business during its remaining life".

Warren Buffett adds "The calculation of intrinsic value, though is not simple. As our definition suggests, intrinsic value is an estimate rather than a precise figure, and it is additionally an estimate that must be changed if interest rates move or forecasts of future cash flows are revised. Two people looking at the same set of facts, moreover – and this would apply even to Charlie and me – will almost inevitably come up with at least slightly different intrinsic value figures. That is one reason we never give you our estimates of intrinsic value. What our annual reports do supply, though, are the facts that we ourselves use to calculate this value".

Essentially intrinsic value is the underlying value of the income streams of an investment as it will benefit the investor. If a company's free cashflows are not paid to investors in terms of dividends, the intrinsic value will be heavily dependent on how those cashflows are reinvested by the company.

Berkshire Hathaway has never paid a dividend to its shareholders. Part of its success has been Warren Buffett's ability to reinvest retained earnings (and the insurance float) at high rates of return.

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Investors will make their own estimates of intrinsic value using either explicit or implicit forecasts of free cashflows and discount rate assumptions. Intrinsic value will, however, only become evident over time as the cashflows are paid to shareholders. As such, ex ante, intrinsic value can only be estimated – but clearly companies with strong free cashflows and the ability to reinvest some or all of their cashflows at high marginal return on capital will have significantly more intrinsic value than those with poor free cashflows which are reinvested at low marginal return on capital.

5. Decomposing investment performance into its components

Relative investment performance = $[PM_t / PM_0] - [BM_t / BM_0]$

where PM_t is the portfolio's market price at time t; and
 BM_t is the benchmark's market price at time t

In log space, for n periods, this relative outperformance can be expressed as:

$$\alpha = \ln [PM_n / PM_0] - \ln [BM_n / BM_0]$$

This relative investment performance can be broken into three components:

- (1) The relative growth of the portfolio's intrinsic value versus the benchmark's growth in intrinsic value
- (2) The relative initial cheapness of the portfolio versus the benchmark's initial cheapness
- (3) The relative degree of convergence between the market value of the portfolio and benchmark to the respective intrinsic value of the portfolio and benchmark.

These three components represent: i) the excess growth in the portfolio's intrinsic value above the benchmark growth in intrinsic value, plus; ii) a component for the relative cheapness of the portfolio when it was acquired, plus; iii) a component to adjust for end of period prices not having aligned fully with the intrinsic values of the portfolio and benchmark.

The first component, the growth of the portfolio's intrinsic value relative to the growth of the benchmark's intrinsic value, will be the ratio of $[PIV_t / PIV_0]$ to $[BIV_t / BIV_0]$.

where PIV_t is the portfolio's intrinsic value after t periods; and
 BIV_t is the benchmark's intrinsic value after t periods

In log space, for n periods, this can be expressed as:

$$\begin{aligned}\alpha_{I_g} &= \ln \left[\frac{PIV_n}{PIV_0} \right] - \ln \left[\frac{BIV_n}{BIV_0} \right] \\ &= \ln \left[\left(\frac{PIV_n}{PIV_0} \right) \div \left(\frac{BIV_n}{BIV_0} \right) \right]\end{aligned}$$

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$$= \ln \left[\left(\frac{\text{PIV}_n}{\text{PIV}_0} \right) \times \left(\frac{\text{BIV}_0}{\text{BIV}_n} \right) \right]$$

Provided that the intrinsic value of the portfolio continues to grow at a rate in excess of that of the growth in intrinsic value of the benchmark, this term, when annualised by dividing by n , will not tend to zero as n becomes large.

The second component, the relative initial cheapness of the portfolio versus the benchmark's initial cheapness, will be driven by the ratio of $\text{PIV}_0 / \text{PM}_0$ to $\text{BIV}_0 / \text{BM}_0$.

In log space, this can be expressed as:

$$\begin{aligned} \alpha_{10} &= \ln \left[\frac{\text{PIV}_0}{\text{PM}_0} \right] - \ln \left[\frac{\text{BIV}_0}{\text{BM}_0} \right] \\ &= \ln \left[\left(\frac{\text{PIV}_0}{\text{PM}_0} \right) \div \left(\frac{\text{BIV}_0}{\text{BM}_0} \right) \right] \\ &= \ln \left[\left(\frac{\text{PIV}_0}{\text{PM}_0} \right) \times \left(\frac{\text{BM}_0}{\text{BIV}_0} \right) \right] \end{aligned}$$

This term, when annualised by dividing by n , tends to zero as n increases, but may still be important, even over medium term time horizons, where the relative initial cheapness of the portfolio is sufficiently large.

The third component, the relative degree of convergence between the market value of the benchmark and portfolio, to the respective intrinsic value of the benchmark and portfolio will be driven by the ratio of $\text{BIV}_n / \text{BM}_n$ to $\text{PIV}_n / \text{PM}_n$. Relative investment performance will be depressed if PM_n has not sufficiently converged to PIV_n relative to the degree of convergence of BM_n to BIV_n . This component is out of the control of the Portfolio Manager. As such, this component has some of the characteristics of an error term in assessing Portfolio Manager performance.

In log space, this can be expressed as:

$$\begin{aligned} \varepsilon_{1n} &= \ln \left[\frac{\text{BIV}_n}{\text{BM}_n} \right] - \ln \left[\frac{\text{PIV}_n}{\text{PM}_n} \right] \\ &= \ln \left[\left(\frac{\text{BIV}_n}{\text{BM}_n} \right) \div \left(\frac{\text{PIV}_n}{\text{PM}_n} \right) \right] \\ &= \ln \left[\left(\frac{\text{BIV}_n}{\text{BM}_n} \right) \times \left(\frac{\text{PM}_n}{\text{PIV}_n} \right) \right] \end{aligned}$$

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This term, when annualised by dividing by n , tends to zero as n increases, but again may be important depending on the relative degree of convergence of the portfolio and benchmark to intrinsic value.

The addition of the above three components can be shown to equal the market value based alpha, or relative investment performance of the portfolio.

$$\begin{aligned}
 \alpha_{I_g} + \alpha_{I_0} + \varepsilon_{In} &= \ln \left[\left(\frac{PIV_n}{PIV_0} \right) \times \left(\frac{BIV_0}{BIV_n} \right) \right] + \ln \left[\left(\frac{PIV_0}{PM_0} \right) \times \left(\frac{BM_0}{BIV_0} \right) \right] + \ln \left[\left(\frac{BIV_n}{BM_n} \right) \times \left(\frac{PM_n}{PIV_n} \right) \right] \\
 &= \ln \left[\left(\frac{PIV_n}{PIV_0} \right) \times \left(\frac{BIV_0}{BIV_n} \right) \times \left(\frac{PIV_0}{PM_0} \right) \times \left(\frac{BM_0}{BIV_0} \right) \times \left(\frac{BIV_n}{BM_n} \right) \times \left(\frac{PM_n}{PIV_n} \right) \right] \\
 &= \ln \left[\left(\frac{PM_n}{PM_0} \right) \times \left(\frac{BM_0}{BM_n} \right) \right] \\
 &= \ln \left[\left(\frac{PM_n}{PM_0} \right) \div \left(\frac{BM_n}{BM_0} \right) \right] \\
 &= \ln \left(\frac{PM_n}{PM_0} \right) - \ln \left(\frac{BM_n}{BM_0} \right) \\
 &= \alpha
 \end{aligned}$$

The conclusion is that, over long time periods, the key driver of portfolio management alpha generation is the ability to grow the intrinsic value of a portfolio at a rate in excess of the growth in intrinsic value of the broader market. Over long periods this is the main component of portfolio manager ‘skill’. Long-term outperformance will be driven by ‘managing’ the rate of change in a portfolio’s intrinsic value in excess of that for the broader market and the level of this component of ‘alpha’ will be determined by the level of growth in excess of that of the broader market.

There is also a component of ‘skill’ in acquiring the initial portfolio at relatively cheap prices, although this component becomes less important over longer periods of time.

Finally, there is a component of performance out of the control of the Portfolio Manager. This is the component of performance driven by the degree of convergence between BM_n to BIV_n and PM_n to PIV_n . This component becomes less important over longer periods of time.

6. Measurement of Intrinsic Value

PIV and BIV need to be measured in order to assess portfolio management ‘skill’. They should be calculated on an accumulation basis (ie. including dividends) and be adjusted for cashflows (ie. time weighted).

A Portfolio Manager wishing to manage a portfolio’s intrinsic value at a rate above the market will have either an explicit or implicit view on PIV and BIV. Explicit views may well

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be in the form of a proxy measure of intrinsic value. This section discusses the suitability of some proxies of intrinsic value.

Analyst valuations as a proxy measure of intrinsic value

Stock analysts typically calculate company valuations as part of their stock research and analysis. These valuations can be based on a variety of measures. Common methods include: DCF based valuations; PE based valuations; EBIT, EBITA or EBITDA based valuations; dividend yield based valuations; and price to book value based valuations. For resource stocks, project based NPVs are commonly used. Consensus data is generally available for a range of valuation variables including:

- EPS per share (up to 2 years forward)
- DPS per share (up to 2 years forward)
- NAV per share
- NTA per share
- EBIT, EBITDA and net debt

Analyst valuations could be used as a proxy for the estimated underlying intrinsic value of an investment.

Analyst valuations are generally not captured by data vendors, so data would need to be sourced directly from the relevant fund manager or stockbrokers.

Stockbroking analysts typically also publish target share prices, although they are not generally available from data vendors. These are often set in relation to the analyst's valuation rolled forward 12 months, but may also capture other factors in the share prices such as takeover premiums and optionality (eg. new projects, upside from acquisitions, ability to reinvest at high marginal return on capital etc) not captured in the base valuation.

An estimate of intrinsic value could be derived from the 12-month forward target share price by dividing this figure by the equity cost of capital and adding the net present value of dividends expected to be paid over the 12 month period. The lack of consistency of assumptions between broker analysts is likely to be the main disadvantage of this indicator of intrinsic value.

EPS times a multiple as a proxy measure of intrinsic value

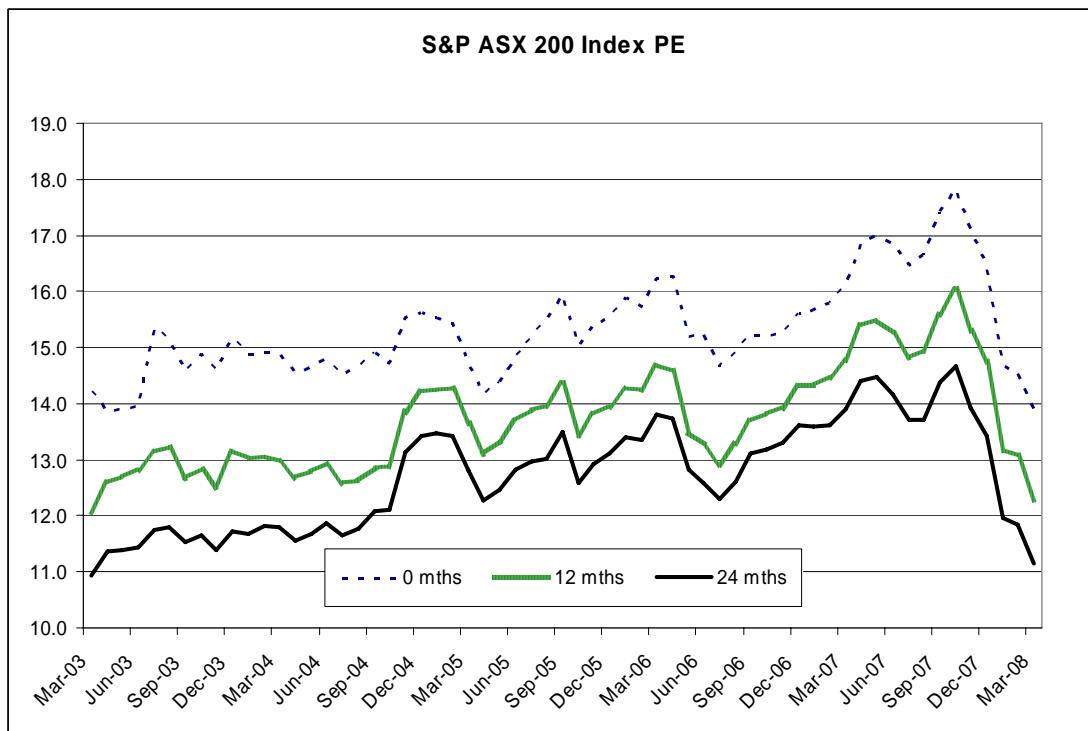
Earnings per share (EPS) multiples (ie. PE multiples) are a crude but common valuation method. The multiple essentially captures the discount rate and perpetuity earnings growth rate into one figure. To avoid capitalisation of cyclically low / high earnings, the EPS multiple should be applied as close as possible to mid cycle earnings.

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Consensus earnings per share forecasts are generally only available on at most a 2 year forward basis, so some cyclical component in EPS is unavoidable.

The multiple is essentially $1 / [r-g]$ where r is the discount rate and g is the growth rate (with the earnings growth rate 'g' based on the assumption of a 100% payout ratio, to exclude the double counting of earnings growth from retained earnings).

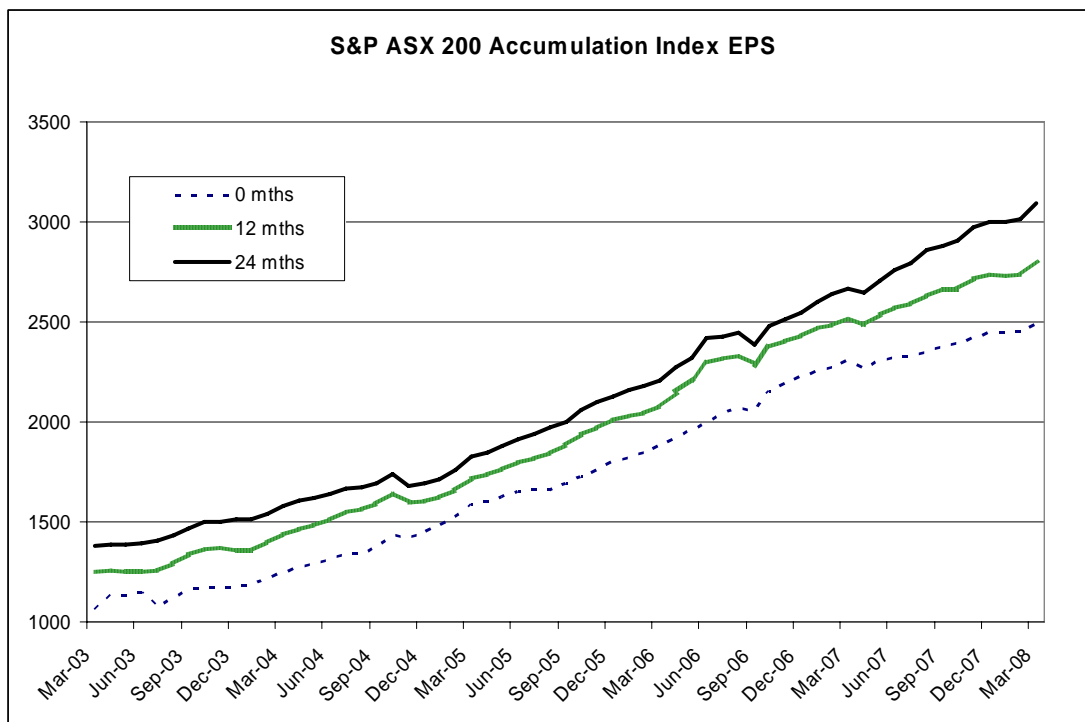
The following chart shows the T, T+1, and T+2 PE multiples for the Australian share market (S&P ASX 200 index) since March 2003.



Data Source: Credit Suisse

Using the above PE data and applying it to the S&P ASX 200 Accumulation index, enables estimates of T, T+1 and T+2 EPS (accumulated for dividends) to be calculated. This is shown in the chart below.

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Data source: Credit Suisse

By applying a multiple to T+2 EPS (accumulated for dividends) forecasts, we get an estimate of BIV. The multiple used should be consistent with the approach used to assess PIV.

Amongst other assumptions, the use of a constant multiple implies a constant discount rate and a constant terminal growth rate. This may not be reasonable, especially when T+2 EPS has an element of cyclicity.

As can be seen from the above chart, consensus analyst earnings forecasts tend to be anchored to current year EPS, but typically around 20% higher. As such, estimates of BIV using current year EPS may be as good as those using T+2 EPS.

T, T+1 or T+2 EPS times a multiple could provide an externally assessable, fundamentally based assessment of BIV and PIV where other more direct measures are not available.

Price to book value as a proxy measure of intrinsic value

Price to book valuations are most commonly used in industries which are capital intensive and commodity in nature. For example, analyst valuations of the US property & casualty sector rely heavily on price to book multiples.

Price to book valuations tend to be less reliable for companies that operate in industries that are non capital intensive and franchise or brand based.

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The variance of the price to book ratio between companies is significantly greater than that of the variance of price earnings multiples between companies. As such, price to book is less likely to form a good proxy for intrinsic value at an individual stock level.

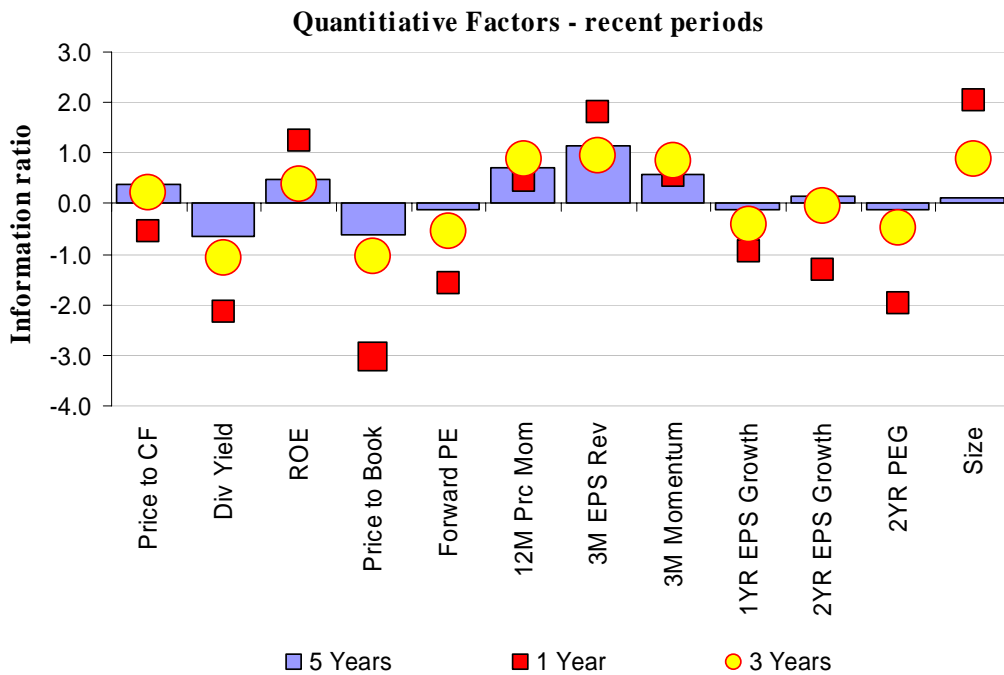
Enterprise valuations (using EBIT, EBITDA and net debt) as a proxy measure of intrinsic value

Enterprise valuations are similar in nature to EPS multiple based valuations. Consensus data from data vendors may be available for individual companies, however ensuring veracity of the calculations of enterprise value using the raw data may be difficult for an external party. In particular, the treatment of any value accruing to minority interests (which are included in enterprise value) and non-ordinary equity holders needs to be determined on a company by company basis when calculating the intrinsic value of a portfolio or the market benchmark.

Quantitative factors as a proxy measure of intrinsic value:

Quantitative factors that have long-term predictive power could also be used a proxy measures of intrinsic value.

The following chart shows the 1, 3 and 5 year information ratios for a range of common quantitative factors based on analysis performed by Credit Suisse. Most of the factors are self explanatory. Size relates to the performance of large companies (ie. a positive information ratio shows that large companies have been outperforming smaller companies).



Source: Credit Suisse

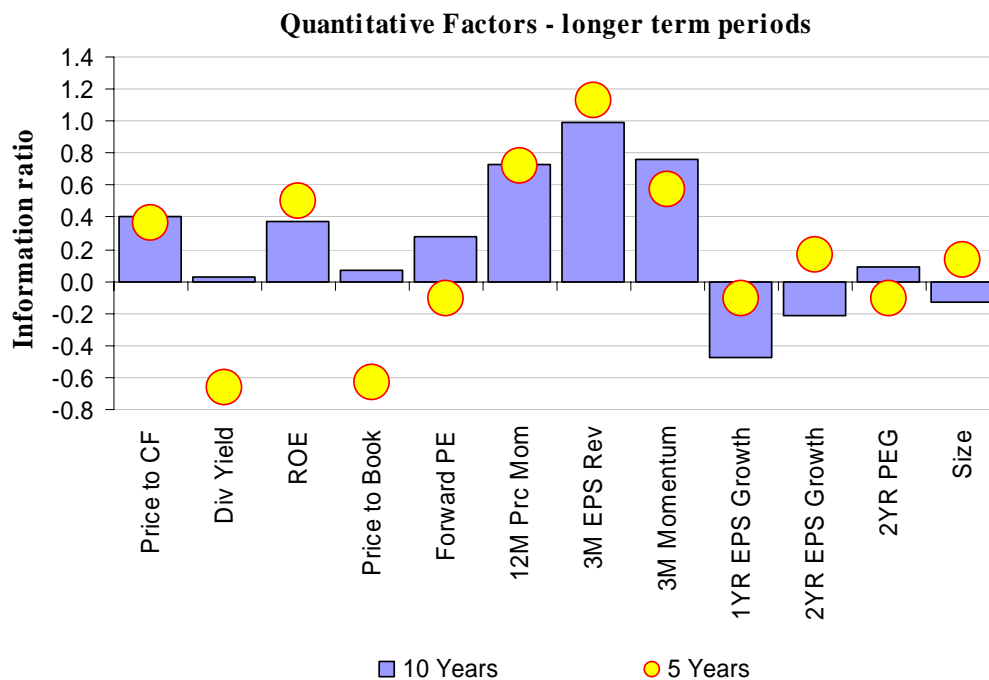
Basic measures of value such as cashflow yield [Price to CF], dividend yield [Div Yield], book yield [Price to Book], and earnings yield [Forward PE] seem to have not been successful

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quantitative factors over the past 1 and 3 years. This may reflect the stage of the current market cycle (eg. the ‘bull run’ in commodities and resources), and / or it may reflect the increased concentration of use of quantitative funds which have arbitrated away this ‘value’ component of historic excess returns. The poor performance of financials in the past year has negatively impacted many of the value based measures.

For quantitative factors with long-term predictive power, it could be argued that those factors are essentially identifying stocks that are trading above / below their intrinsic value. However, somewhat counter intuitively price momentum (over 3 months and 12 months) is one of the most positive quantitative factors over each period. This suggests that share prices continue to rise despite getting more expensive and continue to fall despite getting cheaper. There may be some element of fundamentals – for example share price falls from EPS downgrades tend to continue due to the persistent nature of EPS revisions. Investment analysts and companies tend to under estimate the persistence of EPS revisions. The success of momentum factors in recent years may have been exaggerated by the continued rise in commodity prices which has continued to boost profitability of resource companies. There may also be some element of herding that reinforces the share price momentum for periods of time. Share price momentum (outside that component related to improved fundamentals) may exaggerate movements away from intrinsic value, but over longer time periods the share price is likely to be attracted back to the intrinsic value of the company. An alternate view may be that the strength of the share price momentum factors may just reflect that share prices take a period of time to move towards intrinsic value.

The following chart shows how the quantitative factors have performed over the past 5 and 10 years. It shows that most of the value factors have performed well over this longer time horizon, although dividend yield and price to book factors have been poor performers over the past 5 years.



Source: Credit Suisse

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The intrinsic value of investment portfolios with a bias to long-term positive predictive quantitative factors would then need to be calculated allowing for these factors in some manner as the factors on their own do not provide a valuation of the portfolio.

Accuracy of estimating intrinsic value from external data sources

The degree of accuracy in estimating intrinsic value from external data sources is a key issue. If, for example, a portfolio manager changes his investment mix from lower growth to higher growth companies, then the short dated EPS of the fund would most likely fall significantly. Applying a constant valuation multiple to this would indicate that the Portfolio Manager had destroyed intrinsic value, however the increased earnings growth of the fund may have justified the decision and the intrinsic value of the fund may have actually increased.

It could be argued that consensus data is what is reflected in the market price of securities and therefore market prices are the best estimate of BIV. Applying consistent macro criteria (eg. bond yields, discount rates, economic outlook) between the calculations of PIV and BIV is also an important consideration.

7. Profile of a 'skilled' Portfolio Manager

As defined earlier, a skilled Portfolio Manager is essentially one who can grow PIV at a greater rate than the rate of growth in BIV.

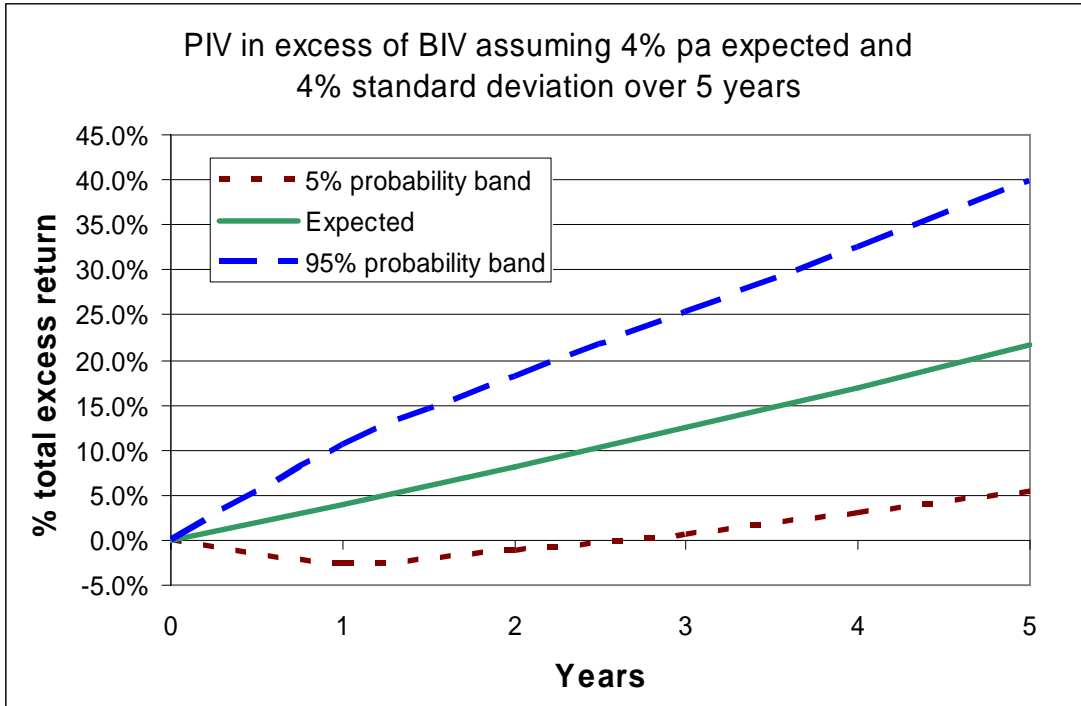
Let us say a skilled Portfolio Manager may be able to grow $PIV > BIV$ at around 4% per annum over a long period of time. However, over shorter periods the Portfolio Manager is in some years likely to add more than 4%, some years add modest amounts, but in other years grow PIV below that of BIV – as even a skilled Portfolio Manager will make some mistakes.

Effectively a skilled Portfolio Manager has an 'expected' ability to grow $PIV > BIV$, with a 'volatility' around its delivery.

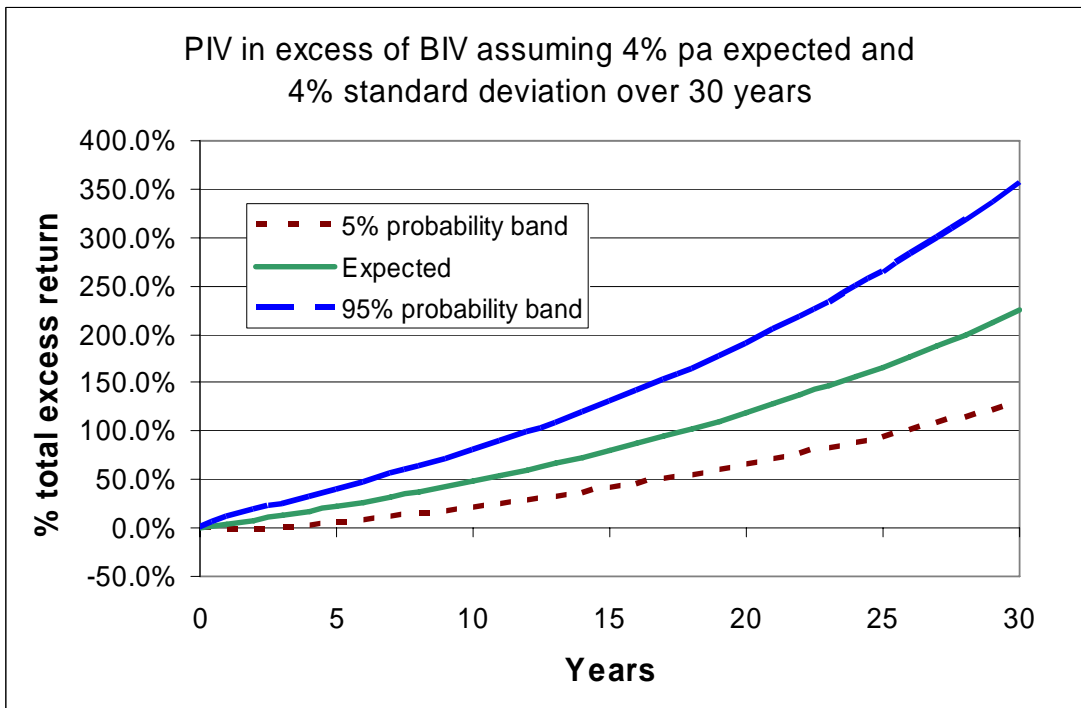
The charts below show the 5%-95% probability band (assuming a normal distribution) for the growth in a Portfolio Manager fund's intrinsic value over the growth in intrinsic value of a market benchmark assuming a 4% 'expected' growth of $PIV > BIV$ with a 4% standard deviation. This first chart shows the band over a 5 year period and the second chart shows the band over a 30 year period.

The chart below shows that using the above criteria, there is around a 5% probability that it may take at least 3 years for a 'skilled' Portfolio Manager to grow PIV in excess of BIV. After 5 years a 'skilled' Portfolio Manager should have grown PIV in excess of BIV by at least 5% (ie. around 1% pa) with a 95% confidence interval. There is also a 90% probability that after 5 years the Portfolio Manager has grown PIV in excess of BIV by between around 5% and around 40% (ie. between 1% and 7% pa).

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The 30 year chart shows that over long periods of time if a manager is 'skilled' it should be clearly evident.



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Share price volatility and the ‘skilled’ Portfolio Manager

A skilled Portfolio Manager may be growing PIV at a greater rate than the growth in BIV, but in the short-term to medium-term this may be ‘hidden’ to external parties due to the volatility and vagaries of share price movements that don’t relate to changes in PIV and BIV.

PM_t should be ‘attracted’ to PIV_t , but may be dislocated for a period of time. Similarly, BM_t should be ‘attracted’ to BIV_t , but again may be dislocated for a period of time.

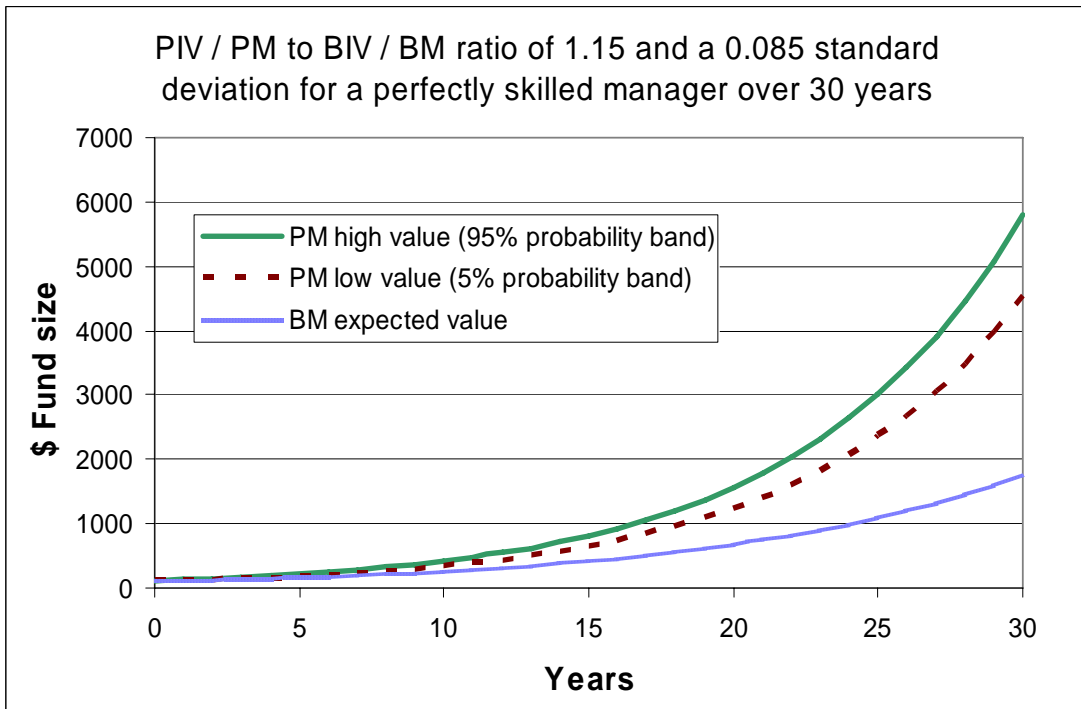
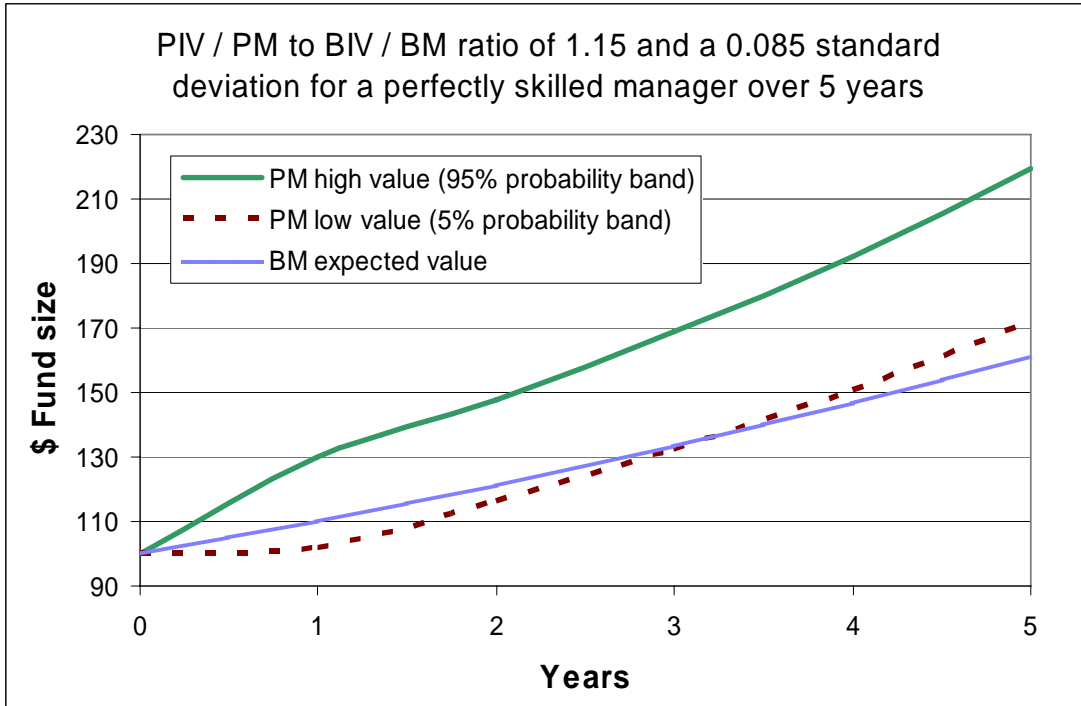
It could be expected that $PIV_t - PM_t$ (ie. the cheapness of the portfolio) would be correlated to $BIV_t - BM_t$ (ie. the cheapness of the benchmark) when broader market moves are driven more by sentiment than by fundamentals.

It is the ratio $[PIV_t - PM_t] / [BIV_t - BM_t]$ (ie. the relative cheapness of the portfolio versus the benchmark) which would create the main ‘noise’ in measuring relative performance based on market prices.

The amount of volatility in the ratio $[PIV_t - PM_t] / [BIV_t - BM_t]$ will likely depend on the market conditions and on the Portfolio Manager’s investment style. ‘Skilled’ Portfolio Managers who have a deep value style may tend to have longer periods in which the intrinsic value of their investments is not recognised by the broader investment community. This would most likely partly relate to the concentration of their portfolio to certain factors (eg. low PE, out of favour companies). ‘Skilled’ Portfolio Managers who have a broader based investment style may find that the intrinsic value of their investments is more quickly recognised by the broader investment community and they therefore are likely to have shorter periods in which the relative cheapness of their portfolio versus the benchmark is at extreme levels.

The following charts show the 5 and 30 year profiles of a ‘perfectly skilled’ Portfolio Manager (ie. one that can grow PIV at 4% pa above the growth in BIV with zero standard deviation) with 5% to 95% probability range of outcomes for PM compared to BM. The data assumes that the ratio of PIV / PM to BIV / BM has a mean of 1.15 and a standard deviation of 0.085. It is likely that the ratio would remain above 1.00 (ie. the Portfolio Manager would be expected to manage the portfolio so that the securities were relatively cheaper than the market). In this example the 5% probability is 1.01x and the 95% probability is 1.29x. Given an initial starting point it would take a period of time for this volatility to emerge. For simplicity of calculation it is assumed to apply for all periods after Year 1.

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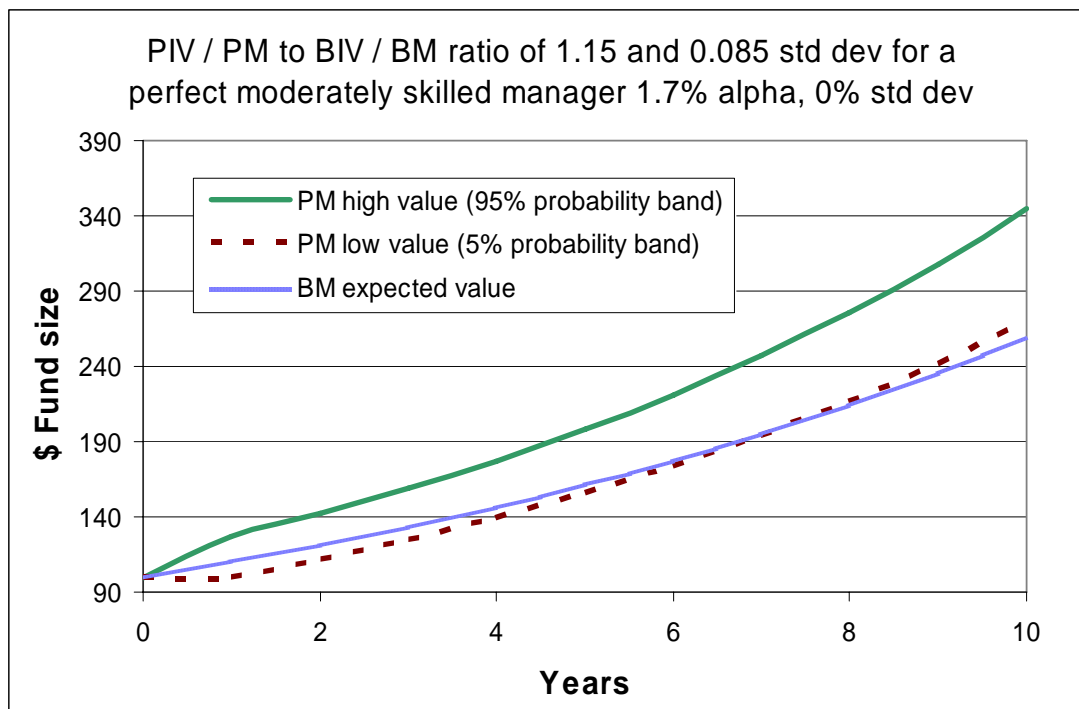


The charts suggest that it would take 3 to 4 years of market price based investment performance to identify a perfectly skilled manager at the 95% confidence level.

The charts, however, don't allow for the volatility of a non-perfect 'skilled' Portfolio Manager. In this case it would take longer for the skill of the Portfolio Manager to be identified by market price based investment performance at the 95% confidence level.

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As a 'skilled' Portfolio Manager (expected growth in PIV > BIV of 4% per annum with a 4% standard deviation) at the 95% confidence level will have grown PIV in excess of BIV by at least 1.7% pa after 8 years, we can approximate the combination of volatility in skill and volatility in PIV / PM to BIV / BM, by looking at the 10 year profile of a 'perfect moderately skilled' Portfolio Manager, using a 1.7% per annum 'skill' level with no volatility and the previous assumptions of PIV / PM to BIV / BM with a mean of 1.15 and a standard deviation of 0.085. This combination is shown in the chart below.



The charts suggest that it would take around 8 years of market price based investment performance to identify a skilled manager at the 95% confidence level.

Monte Carlo Simulations

Stan Beckers' paper *Manager Skill and Investment Performance: How Strong is the Link?*, performed 100 simulations using a Monte Carlo simulation of skilled fund managers with conceptually identical data with nothing but luck separating the best from the worst results. He performed the results for a long/short hedge fund manager (with a target annual standard deviation of 3.2%); a conservative long-only manager (with a target annual standard deviation of 13.0%); a moderately conservative long-only manager (with a target annual standard deviation of 14.5%); and an aggressive long-only manager (with a target annual standard deviation of 17.25%);

His analysis showed that skill will show through for a hedge fund investor and a conservative traditional manager, with even the most unlucky among them having positive information ratios after five years. Conversely for a long-only aggressive fund manager he said a five year period is not long enough to do justice, as 20% of them ended up with negative information ratios through bad luck only. The simulations suggested some aggressive long-only fund

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managers may still have negative information ratios after twenty years despite having underlying skill.

Beckers then ran the simulations assuming managers had no skill. On average, the managers had a zero information ratio, but after three years the luckiest managers ended up with an information ratio of 1.7 or higher. After 3 years at least 15% of managers had an information ratio of 0.7 or higher. After 5 years the simulation showed at least 10% of managers had an information ratio of 0.7 or higher.

Beckers concluded *‘We know that skilful managers may be forced out of business through bad luck. Even more worrisome is that a respectable proportion of managers without a clue could easily stay in business for five years or longer’*. He added *‘The natural conclusion therefore is that manager selection on the basis of returns data (and league rankings) is extremely hazardous.....This has very sobering consequences for the mutual fund industry, where typically the only information in the public domain in the returns data track record’*.

The analysis from this paper provides conclusions that are consistent with those arising from Becker’s simulations, in that they show performance figures over shorter periods of time can be poor indicators of underlying Portfolio Manager skill.

8. Fundamental indexes

Somewhat surprisingly fundamental indices are a relatively new concept. The 2004 paper *Fundamental Indexation* by Rob Arnott, Jason Hsu and Philip Moore introduced the concept of non-capitalisation weighted indices. The paper says “The genesis of our non-capitalization weighted market indexes stems from a concern that market capitalization is a *particularly* volatile way to measure a company’s size or its true fair value. If so, capitalization weighting may lead to sub-optimal portfolio return characteristics because prices are too noisy relative to fundamentals”.

The paper by Arnott, Hsu and Moore measures a firm’s ‘size’ by:

- Book value
- Trailing 5-year average cashflow
- Trailing 5-year average revenues
- Trailing 5-year average sales
- Trailing 5-year average gross dividend; and
- Total employment.

The analysis also included a composite measure, equally weighting book value, cashflow, sales and gross dividend. Non dividend payers were treated differently to low dividend payers.

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The following table shows that the annual returns of the fundamental indexes were on average 215 basis points higher than the equivalent capitalisation-weighted indexes. The results were over the 43 year period 1962 to 2004.

Return Characteristics of Alternative Indexing Metrics, 1962-2004

PORTFOLIO / INDEX	Ending Value of \$1	Geometric Return	Volatility	Sharpe Ratio	Excess Return vs. Reference	Tracking Error vs. Reference	Information Ratio	t-Statistic for Excess Return
S&P 500	\$ 73.98	10.53%	15.1%	0.315	0.18 pps	1.52%	0.12	0.76
Reference	68.95	10.35	15.2	0.301	—	—	—	—
Book	136.22	12.11	14.9	0.426	1.76	3.54	0.50	3.22
Income	165.21	12.61	14.9	0.459	2.26	3.94	0.57	3.72
Revenue	182.05	12.87	15.9	0.448	2.52	5.03	0.50	3.25
Sales	184.95	12.91	15.8	0.452	2.56	4.93	0.52	3.36
Dividends	131.37	12.01	13.6	0.458	1.66	5.33	0.31	2.02
Employment	156.83	12.48	15.9	0.423	2.13	4.64	0.46	2.98
Composite	156.54	12.47	14.7	0.455	2.12	4.21	0.50	3.26
Average (ex Composite)	\$159.44	12.50%	15.2%	0.444	2.15 pps	4.57%	0.47	3.09

Source: Arnott, Robert D., Jason Hsu, and Philip Moore. "Fundamental Indexation." 2005. *Financial Analysts Journal*, vol. 61, no.2 (March/April):86.

The following table shows the performance of the Fundamental indexes as at February 2008.

Performance Update[†]

TOTAL RETURN AS OF 2/29/08	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED 3 YEAR	ANNUALIZED 5 YEAR	ANNUALIZED 10 YEAR	ANNUALIZED 10 YEAR VOLATILITY
FTSE RAFI® 1000 Index ^A	FR10XTR	-8.09%	-5.85%	6.33%	14.51%	7.88%	14.02%
S&P 500 ^B	SPTR	-9.05%	-3.60%	5.37%	11.62%	4.06%	14.76%
Russell 1000 ^C	RU10INTR	-8.87%	-3.77%	5.86%	12.23%	4.41%	14.92%
FTSE RAFI® US 1500 Index ^D	FR15USTR	-8.31%	-10.57%	5.88%	18.95%	10.54%	18.17%
Russell 2000 ^E	RU20INTR	-10.27%	-12.44%	3.90%	15.08%	5.34%	19.90%
FTSE RAFI® Developed ex US 1000 Index ^F	FRX1XTR	-7.61%	3.64%	15.28%	24.11%	10.89%	14.69%
MSCI EAFE ^G	GDDUEAFE	-7.90%	1.28%	13.22%	21.65%	6.98%	14.71%
FTSE All World Series Developed ex US ^H	FTS5DXUS	-7.50%	4.00%	14.55%	22.53%	7.86%	14.84%

Source: Based on price data from Bloomberg

Source: <http://www.researchaffiliates.com/rafi/performance.htm>

It seems that the construction of fundamental indexes based on indicators of value may lead to out performance when measured against market capitalisation weighted indices. This may reflect the discipline of measuring and managing the fundamental index based on intrinsic value criteria. A component of this out performance may be a liquidity premium where stock prices are impacted by large buy or sell orders in the market which can be captured by approaches focused on value based measures rather than market capitalisation based measures.

The factors used in the construction of these fundamental indexes are relatively crude. For example, they don't explicitly take into account a company's competitive positioning or expected long-term profit margins. Solid investment analysis should allow an investor to

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improve on the assessment of 'true fair value' used in these fundamental indexes. If so, out performance should be even further enhanced by fundamental analysis and portfolio construction adopting the disciplines involved in the construction of fundamental indexes.

9. Conclusion

When an investor is faced with the results of an underperforming Portfolio Manager based on share price movements, the investor needs to decide if the underperformance relates to bad luck by a skilled Portfolio Manager, bad luck from an unskilled Portfolio Manager or just share price volatility which has created a 'buying' opportunity for a skilled Portfolio Manager. The investor should have a different reaction to each of these reasons for underperformance. If it is bad luck from a skilled Portfolio Manager then the investor should stick by the Portfolio Manager; if it is bad luck from an unskilled Portfolio Manager then the investor should exit (subject to caveats such as tax); and if it is due to share price volatility with a 'skilled' Portfolio Manager then the investor should add to their holding as the Portfolio Manager's fund is now cheaper.

Similarly, when an investor is faced with the results of an outperforming Portfolio Manager based on share price movements, the investor needs to decide if the outperformance relates to good performance by a skilled Portfolio Manager, good luck from an unskilled Portfolio Manager or just share price volatility which has boosted the performance of a skilled Portfolio Manager more than justified by their skill. Again, the investor should have a different reaction to each of these reasons for outperformance. The outperformance of an unskilled Portfolio Manager provides a great opportunity to exit (again subject to caveats such as tax). The reaction to the outperformance of the 'skilled' Portfolio Manager is more difficult and would depend upon the situation. If all 'skilled' Portfolio Managers were equally skilled then the investor should reallocate funds from the 'skilled' Portfolio Manager with the lowest ratio of PIV / PM to BIV / BM to the 'skilled' Portfolio Manager with the highest ratio of PIV / PM to BIV / BM. If the 'skilled' Portfolio Managers have different levels of skill that also needs to be taken into account.

For the investor to make these important decisions they will need to be able to differentiate the reasons for the under or outperformance. This requires an analysis of the Portfolio Manager's ability to grow PIV in excess of the growth in BIV. It may be possible to assess this qualitatively (eg. asking the Portfolio Manager to explain their investment decisions and assessing if the explanations are well founded and logical). In addition, as this paper has discussed, Portfolio Manager skill could be assessed quantitatively by measuring indicators of the growth in intrinsic value of a portfolio versus that of the benchmark.

Investors commonly measure the key fundamentals (ie. PE, dividend yield, ROE, price to book) of investment portfolios, but there seems to be a lack of fundamental analysis of Portfolio Manager's 'skill' as defined in this paper. This may partly be due to the relative invisibility and difficulty in calculating PIV and BIV - but that doesn't mean that it is not worthwhile trying to estimate these factors. This is especially the case for Portfolio Managers themselves, as it is their role to 'manage' the growth in PIV for their investors.

The disclosure of performance attribution into its three components would assist clients of Portfolio Managers in better understanding the level of skill of that portfolio manager. That said, Portfolio Managers may be reluctant to publicly disclose potentially competitive

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information such as the assessed intrinsic value of their investment holdings. Undue emphasis on public disclosure may also change investing behaviour and may lead to over estimations of intrinsic value by Portfolio Managers in attempts to justify poor investment decisions. That said, measuring is a first step in managing and I hope this paper is a step along that road of encouraging a greater focus on the key components of Portfolio Manager skill.

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