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WHY TRADITIONAL EQUITY PORTFOLIO RISK MEASUREMENT FAILS LONG-TERM INVESTORS

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The global financial crisis highlighted the flaw in modern portfolio theory (MPT) which has dominated the industry's approach to portfolio risk for decades. MPT, as developed by Markowitz (1952, 1959), Sharpe (1964), Litner (1965) and Mossin (1966), has used short-term return volatility (absolute and relative to a benchmark) as the key focus in risk analysis. There has been general industry acceptance that the volatility of daily or monthly returns is central to assessing portfolio risk thus portfolio risk reduction must focus on historical correlation based diversification and index based portfolio constructs.

The purpose of this paper is to examine whether MPT captures the core elements of equity portfolio risk. It makes the case that portfolio risk is much broader than simply return volatility and that the industry's reliance on short-term volatility measures leads to incorrect assessments of portfolio risk.

INTRODUCTION

Modern portfolio theory (MPT) as developed by Markowitz (1952, 1959), Sharpe (1964), Lintner (1965) and Mossin (1966) has dominated the industry's approach to portfolio risk for decades. MPT measures the risk of a portfolio as the standard deviation (or variance) of portfolio returns. MPT states that risk and return follow a linear relation (captured by the Capital Asset Pricing Model (CAPM)) and investors are compensated only for holding non-diversifiable (systematic) risk (the slope coefficient – beta). MPT relies on a series of assumptions about investor behaviour. These include:

i. investors consider each investment alternative as a probability distribution of expected returns over an investment horizon;
ii. the risk of a portfolio is measured as the variability of expected returns;
iii. the probability distribution of expected returns is normally distributed;
iv. investors' utility curves are a function of risk and return only; and
v. investors are rational.

Although MPT is lauded for its theoretical roots, the problem with the theory is that it has limited practical usefulness for fundamentally based investors and its underlying assumptions are unrealistic. Thus, for the last fifty years or so, academics and practitioners have attempted to refine various aspects of these concepts to explain real world financial markets. As such, the principles of MPT still form the basis of traditional finance theory which guides most academic thought and industry beliefs about both the definition of risk and its relationship with return.

This paper challenges some of the underlying concepts of portfolio risk as described by MPT and questions the model's practical application. MPT lacks depth in measuring portfolio risk because it does not seek to explain the underlying drivers of equity based portfolio returns. It simply examines the historical return volatilities and correlations between stocks to explain how to price assets and reduce portfolio return volatility through diversification. This paper posits that the distribution of returns for a portfolio will at least partially be explained

by the characteristics of the firms comprising the portfolio through time and their general level of business and financial risk.

MPT measures the risk of a portfolio as the variance of its returns. Variance is a symmetrical measure providing information about the spread of returns around the mean return (both upside and downside). This definition of risk does not capture the one-sided nature of risk, in that it relates to adverse outcomes.

MPT's approach to portfolio risk reduction has focused on historical correlation based diversification and index weight based portfolio construction approaches. One of the problems with this approach to diversification is that it is not fundamentally based and ignores the fact that stock correlations tend to move close to one during crises. As such, it is not effective in reducing crisis related downside risk. Also, index based portfolio construction approaches assume that the index represents the "market" portfolio. It is further implicitly assumed that the index, as a proxy for the market, is properly diversified, is reflective of the underlying economy, is not over exposed to poor quality/speculative businesses and is not overpriced. The fact that indices are constructed based on the relative liquidity and size of listed stocks, with no direct reference to the type and quality of the underlying businesses and their pricing relative to intrinsic value, would indicate there is a real risk these assumptions will not always be correct.

In measuring risk, it is also apparent that the investment horizon is a key consideration. Industry application of MPT has focused on short-term return volatility (absolute and relative to a benchmark) as the key focus in risk analysis. There has been general industry acceptance that the volatility of monthly returns is central to assessing portfolio risk. Research indicates that market returns are more volatile (uncertain) when measured over short periods of time than when measured over more extended windows (Shiller, 1981). It is likely that the industry's reliance on short-term volatility measures leads to incorrect assessments of portfolio risk for equity based portfolios. Moreover, it is argued that the portfolio risk measure must be matched to the appropriate investment horizon in order to correctly assess the risk and return profile of a portfolio.

These concepts are further developed in the paper to show that portfolio risk relates to adverse future outcomes and this risk can only be understood and adjusted by examining the underlying structural causes of future adverse outcomes over the appropriate investment horizon.

The issues addressed in this paper are: the definition of portfolio risk and the distribution of returns, the relevance of beta, portfolio diversification, the investment horizon, volatility and business risk.

1. PORTFOLIO RISK, FIRM QUALITY AND THE DISTRIBUTION OF PORTFOLIO RETURNS

As mentioned previously, MPT measures the risk of a portfolio as the variance of its returns. One problem with this measure is that it captures both the upside and downside volatility of returns. In other words, a portfolio with a high variance of returns has a greater potential for large negative returns as well as large positive returns than a portfolio with a lower variance. If a portfolio manager's objective is to reduce the overall variance of the portfolio then the manager is minimising the range over which the return of the portfolio falls. However, in order to maximise overall returns to the portfolio, there is an incentive for managers to maximise volatility on the upside but minimise it on the downside.

Short-term tracking error is used by the industry to assess a portfolio's risk relative to an index. Tracking error is normally calculated as the standard deviation of a portfolio's monthly active returns. This risk measure assumes that risk is symmetrical. It also implicitly assumes that the index is properly diversified and has eliminated non-systematic risk. However, tracking error calculations may relate to indices that are unbalanced and over-exposed to particular stocks, industry sectors and macro risk factors.

An alternative view of risk focuses on just the potential downside of returns measured over an appropriate investment horizon. This view defines risk as a component of the uncertainty of future events relating specifically to the probability of an adverse outcome (Sortino and van der Meer, 1991). To an investor, an adverse outcome is the probability and quantum of a return short-fall over their investment horizon. The return short-fall is the likelihood that the actual return underperforms the minimal acceptable return (MAR) (Sortino and van der Meer, 1991). At the portfolio level, this would be the risk that the returns generated by a portfolio over an appropriate investment horizon fail to exceed the MAR.

In considering the distribution of returns, MPT assumes that returns are normally distributed. However, there is substantial evidence that market returns are not normally distributed and at times market returns are negatively skewed, kurtosed or leptokurtic.[1]

Lower quality/highly geared firms tend to produce low returns on equity, lower free cash flows, have wider return distributions and produce abnormally low returns (Fama and French, 2008; Campbell et. al., 2008). These lower quality/highly geared firms generally have a higher probability of a -100% return (i.e. going bankrupt) than higher quality firms with low financial gearing (Beaver, 1966; Altman, 1968; Campbell et. al., 2008). Extremely speculative firms with very low levels of predictability tend to have long-term return probability distributions that are dominated by a return outcome of -100% and a long narrow tail to the right indicating a small probability of a large positive return (extreme positive skewness). In these situations, the mean would overstate the expected return, as it would be distorted by the very low probability large return outcomes. Thus, for a low quality/speculative stock the mean is not representative of the midpoint (most probable) return and thus effectively mis-represents its expected return profile.

As the quality of the firm increases, the shape of the long-term return distribution curve changes and the -100% long-term return outcome becomes less likely and the mean outcome starts to become more representative of the expected return.

[1] Fama (1965), Kon (1984), Berglund and Liljeblom (1990), Campbell and Hentschel (1992), Frennberg and Hansson (1993) have all found evidence of leptokurtically distributed stock returns. An explanation of a leptokurtic distribution is provided by Roll (1988) who argues that stock market returns are interspersed with outliers that reflect news, events or information released by firms, thereby increasing the kurtosis of the return distribution.

2. THE IRRELEVANCE OF BETA

MPT argues that investors are compensated only for holding systematic risk. Stock diversification should be undertaken to minimise non-systematic (firm-specific) risk. CAPM states that the expected return of a stock is a function of the expected market return, a risk free rate and the stock's beta. Beta is the slope coefficient of a regression of a stock return against the index return. As such beta represents systematic risk. There are a number of problems with beta as a measure of risk.

The first problem relates to the measurement of beta. CAPM is based on expected measures of return. However, since these are unobservable, measures of beta rely on historical associations and assume that these associations will transfer across time. Beta is generally measured using an ordinary least squares regression of historical stock and market returns using four to five years of monthly data (Gray et.al., 2009). Such measures of beta are unreliable. Gray et. al. (2009) show that lengthening the measurement window to all available returns, results in a beta estimation, that although improved in predictability, is insignificantly different from an expectation that all stocks have a beta of one. Further, other studies show that beta varies through time. Instability in beta may be due to changes in firm-specific characteristics, changes in the index composition, economic factor changes or alternatively measurement error. Firm-specific factors related to changes in systematic risk over time include: firm maturity and growth (Turnbull,1977); news about future cash flows, real interest rates and excess returns (Campbell and Mei, 1993); and firm leverage (Callahan and Mohr, 1989).

The second problem with beta is that a number of other factors have been identified as explaining individual stock returns. CAPM anomalies include: small firms have high returns (Banz, 1981), high book to market firms have high returns (Fama and French, 1992), profitable firms have high returns (Haugen and Baker, 1996), firms that invest more have low returns (Fairfield et. al., 2003), high accrual firms have low returns (Sloan, 1996), firms with high past returns tend to have high future returns (Jegadeesh and Titman, 1993), firms with high stock issues have low returns (Loughran and Ritter, 1995), financially distressed firms have low returns (Dichev, 1989; Campbell, et. al., 2008). Many of aforementioned factors would suggest the need to consider fundamental aspects of the firm and its' stock price relative to expected free cash flows in the assessment of risk and return (Fama and French, 2008).

Finally, beta ignores both the fundamentals of the underlying businesses in a portfolio and the relationship between price and intrinsic value. Firms with strong business fundamentals and low financial gearing tend to produce higher, more robust, reliable and sustained free cash flows and have a lower probability of experiencing financial distress in the future (Fama and French, 2008; Campbell et al, 2008). Beta is normally calculated based on short-term share price movements and thus tends to reflect the short-term cyclicality of a firm's business rather than the long-term quality of the business franchise and the robustness and sustainability of its free cash flows. In emphasising the short-term cyclical return characteristics of stocks it could be argued that CAPM has encouraged a short-term mindset in the industry.

3. PORTFOLIO DIVERSIFICATION

MPT argues that investors should only be compensated for holding non-diversifiable (systematic) risk as diversifiable (non-systematic) risk can be removed by adding stocks to a portfolio. The return required by investors for holding systematic risk is a combination of the risk free rate and a risk premium. CAPM based diversification theory says idiosyncratic stock risk is removed by buying the market portfolio.

MPT focuses on non-fundamentally based diversification to reduce portfolio return volatility. Non-fundamental diversification is the process of adding stocks to a portfolio without reference to the business quality, macro factors and price to value differentials of those stocks. Achieving a diversified portfolio by selecting stocks by virtue of their historical return correlations is likely to require a large number of stocks (Domian et. al., 2007; Campbell et. al., 2000).

On the other hand, it would seem reasonable to expect that fundamentally based diversification requires significantly lower numbers of stocks because the exposure to macro based structural risks can be spread more efficiently.

The industry has used the relevant market index as a proxy for the market portfolio and assumed the index is fully diversified and has no non-systematic risk. A liquidity/market capitalisation based equity index does not necessarily eliminate individual stock shortfall risk or overall market pricing risk. This is because these indices are not based on the fundamental relationship between the prices of the stocks in the index, the estimated quantum and timing of future free cash flows of those stocks and the associated shortfall risk. If the stocks comprising a large percentage of the index are of poor quality and/or significantly overvalued then buying the index does not reduce long-term shortfall risk. In fact a liquidity/market capitalisation based index actually overweights stocks that are overvalued and under-weights stocks that are undervalued.

There are many indices globally that are or have at different times in the past been unbalanced in terms of industry/sector exposures. For example, the S&P/ASX 300 index has around a third of its weight in the resources sector and a quarter of its weight in banks.

Diversification is a portfolio construction tool that can be used to reduce shortfall risk. It is used to reduce a portfolio's exposure to an adverse return outcome from a particular stock or macro-economic factor. Diversification is symmetrical in that it not only reduces a portfolio's downside exposure, it also dilutes its upside exposure in equal measure.

The fact that the future outcomes are not known with certainty means that some stock diversification is sensible to reduce the risk of a portfolio return not achieving the MAR and to also reduce the quantum of any return shortfall below the MAR.

There are several problems with focusing purely on random or index based diversification as a risk reduction tool in portfolio management:

1) Stock correlations tend to increase during crisis, reducing the expected volatility reduction benefits;
2) Non fundamental diversification will not provide much long-term downside protection if you enter the market at or near the top of a stock market bubble;
3) Non fundamental diversification ignores the fact that the main driver of long-term portfolio returns and short-fall risk is the economic performance of the businesses comprising the portfolio through time.

4. THE INVESTMENT HORIZON AND SHORT-TERM RETURN VOLATILITY

To correctly assess the risk adjusted return profile of a portfolio, the period over which portfolio risk is measured must be matched to the investor's investment horizon. Applying a short-term volatility or short-fall risk measure

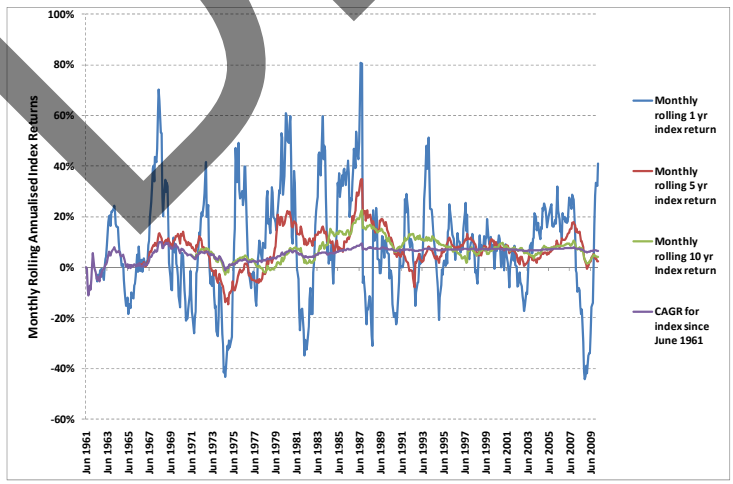
to an investor with a long-term investment horizon is likely to lead to incorrect assessments of the true level of portfolio risk for that investor. Given the very high level of return volatility normally associated with the share market over the short-term, the investment horizon over which the shortfall risk is assessed is particularly important.

Much of the risk analysis undertaken by the investment industry focuses on absolute and relative volatility of portfolio returns based on monthly data and measured over a short horizon window. However, a large proportion of the money invested in the stock market is held by investors with much longer investment horizons such as members of superannuation funds. The industry focus on short-term volatility and tracking error seems to relate to the need to maximise the number of data points (statistical robustness) and get the data sooner (immediacy). The fact that the short-term nature of the data makes it irrelevant to the vast majority of clients appears to be forgotten.

Short-term volatility in returns is unlikely to be driven by changes in fundamentals, as changes in expectations about fundamentals are likely to be relatively stable in the very short-term. This view is supported by empirical evidence that short-term share price movements relate to factors other than intrinsic value (Shiller, 1981; West, 1988). Using U.S. stock market data from 1871 to 1979, Shiller (1981) shows that prices have been significantly more volatile than would be expected based purely on future dividends and real bond yields. This extreme volatility is inconsistent with the efficient market hypothesis and suggests that much of the volatility is due to mispricing and "noise".

Using the rolling monthly returns of the All Ordinaries Index from 1961 to 2009, Figure 1 shows the index returns are much more volatile over the short-term (one-year historical index returns) than the long-term (5 or 10 year index returns). Further, returns can be seen to be negative more frequently when measured over one-year indicating that short-term returns have greater downside risk than returns measured over longer horizons.

Figure 1
All Ordinaries Index Return Volatility

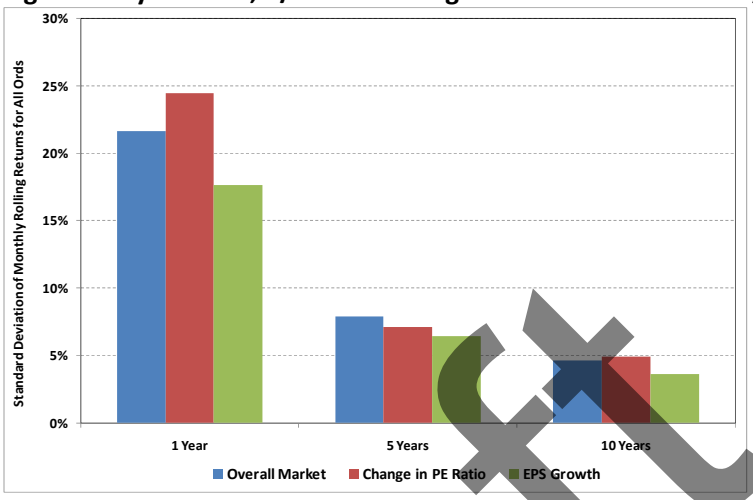


Source: Credit Suisse, Goldman Sachs, DataStream, Hyperion Asset Management

Figure 2 illustrates that the vast majority of the All Ordinaries Index's return volatility relates to short-term share price movements. Overall market volatility is dissected into change in P/E ratio and growth in EPS over the three time horizons in Figure 2. The chart shows the volatility of all three measures decreases as the time horizon over

which they are measured extends and the standard deviation of returns moves more in line with long-term fundamentals.

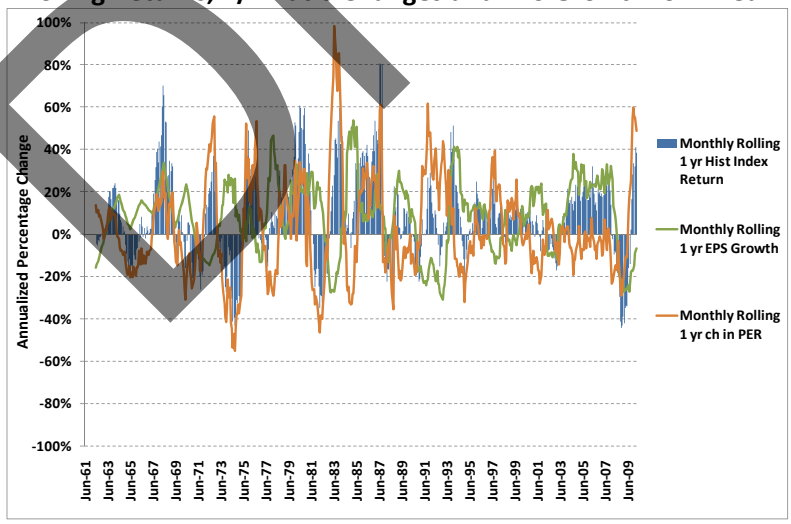
Figure 2
Volatility of Rolling Monthly Returns, P/E Ratio Changes and EPS Growth for 1, 5 and 10 years



Source: Credit Suisse, Goldman Sachs, DataStream, Hyperion Asset Management

Figure 3, below, illustrates that a large contributor to short-term return volatility in the All Ordinaries Index since 1961 has been changes in the P/E ratio for the Index. Increases (decreases) in the P/E ratio have been a feature of most bull (bear) markets with the exception of the bull market from 2003 to 2007.

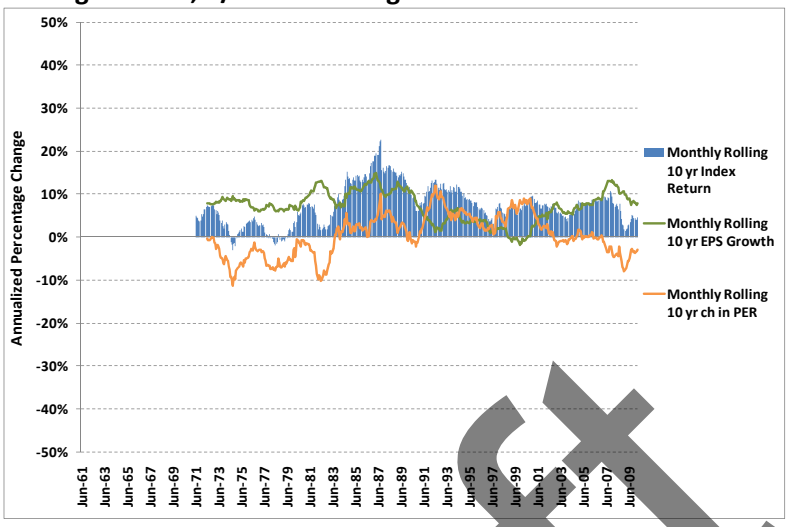
Figure 3
Rolling Returns, P/E Ratio Changes and EPS Growth for 1 Year



Source: Credit Suisse, Goldman Sachs, DataStream, Hyperion Asset Management

Figure 4, below shows the dramatic reduction in the influence of the change in P/E ratios on the 10 year index return and the increased positive impact of EPS growth over the index return. Change in EPS increases its influence over the index return over longer periods because of its bias towards positive growth. Whereas, the P/E ratios are range bound and therefore their influence reduces as the time horizon extends.

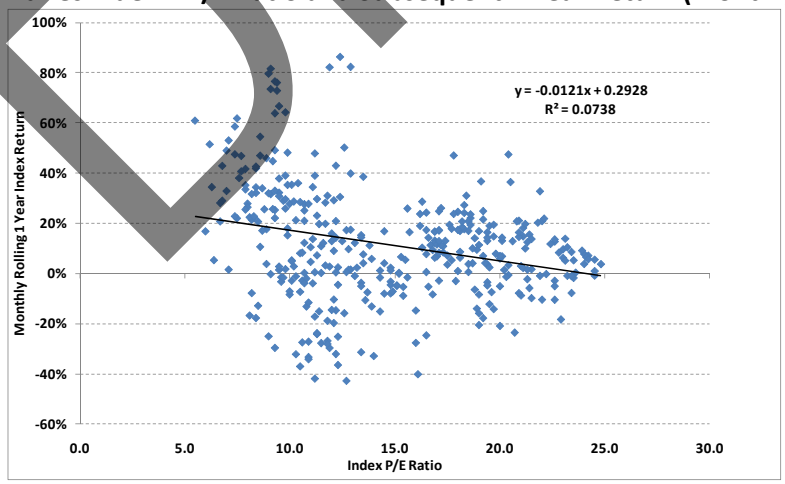
Figure 4
Rolling Returns, P/E Ratio Changes and EPS Growth for 10 Years



Source: Credit Suisse, Goldman Sachs, DataStream, Hyperion Asset Management

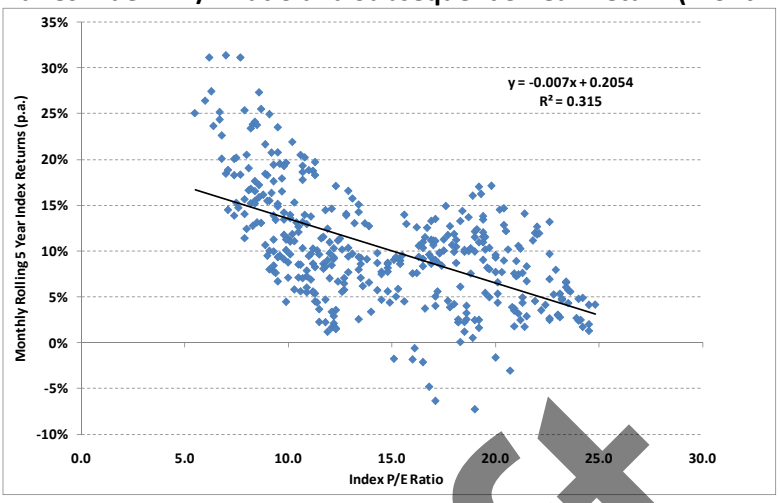
Figure 5 illustrates that value, as measured by historical P/E ratios, is not on average, a good predictor of short-term future returns. However, as the investment horizon extends it becomes a much better predictor of returns. This is evidenced by the charts in Figures 6 and 7 which illustrate that the fit of the regression line becomes much tighter as the period over which returns are measured increases (the R^2 of the model goes from 0.0738 to 0.6251 for 1-year returns and 10-year returns respectively). Further, as previously mentioned, fewer negative returns are observed as the return horizon increases.

Figure 5
All Ordinaries Index – P/E Ratio and Subsequent 1 Year Return (Monthly Data)



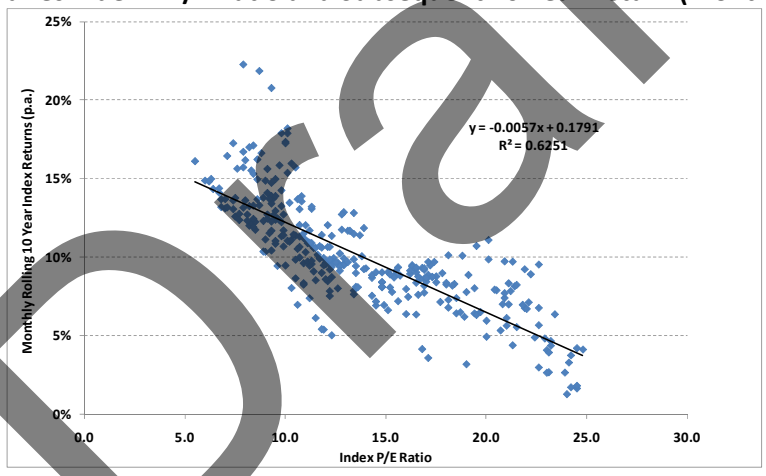
Source: Credit Suisse, Goldman Sachs, DataStream, Hyperion Asset Management

Figure 6
All Ordinaries Index – P/E Ratio and Subsequent 5 Year Return (Monthly Data)



Source: Credit Suisse, Goldman Sachs, DataStream, Hyperion Asset Management

Figure 7
All Ordinaries Index – P/E Ratio and Subsequent 10 Year Return (Monthly Data)



Source: Credit Suisse, Goldman Sachs, DataStream, Hyperion Asset Management

Overall, prior research (largely U.S.) and an analysis of Australian data (over the period 1961 to 2009) indicate that volatility of returns is greater in the short-term than the long-term. Much of this short-term volatility appears to be unrelated to underlying fundamentals. Downside risk appears greater for investment decisions based on an analysis of short-term returns. This is because growth in fundamental value only occurs gradually through time (normally in line with overall growth in the economy). Earnings tend to increase, on average, in-line with GDP growth but with much higher levels of short-term pro-cyclical volatility. As mentioned previously, P/E ratios have even more extreme short-term volatility. However, unlike earnings they cannot provide long-term growth because they are range-bound. The volatility impact of changes in P/E ratios gets reduced through amortisation over longer time periods and the volatility associated with short-term EPS growth reduces over the long-term due to cyclical mean-reversion effects.

Behavioural factors provide an explanation for excessive short-term return volatility (Olsen, 1998). Traditionally, divergence in investor beliefs is thought to explain price volatility and trading volume. Olsen argues factors such as the complexity of the decision, the emotional state of the decision maker, the time available to make the decision, the reversibility of the decision and the format in which the information is presented to the market are determinants of short-term return volatility. These common human traits lead to predictable errors in decision making by market participants. A growing body of literature has investigated a number of cognitive biases including overconfidence (Daniel et. al., 2001), representative bias (Hibbert et. al., 2008) and under and over-reaction (DeBondt and Thaler, 1985 and 1987; Brown and Harlow, 1988; Campbell, 1990; Barberis et.al., 1998).

It appears that return volatility and short-fall risk of the stock market tend to be inversely related to the relevant time horizon. The longer the time period the more likely that average positive EPS and DPS growth dominate total returns and the influence of changes in P/E ratios is reduced. This gradual long-term growth in the fundamental value of the market is a function of the long-term growth in free cash flows for the businesses underlying the stock market. Each firm held within the portfolio will have an intrinsic or economic value range at the beginning of the stock holding period and at the end. The increase (decrease) in the intrinsic value range during the relevant holding period plus any dividends received will be the key drivers of portfolio returns over time where stocks are held for the longer term.

The other key driver of portfolio returns is the price to value differential. If the price of a stock and its economic/intrinsic value were always the same then there would be no pricing component of portfolio risk. The behavioural impact on short-term pricing volatility assists in the creation of gaps between long-term intrinsic value and the market price.

Thus, a fundamentally based investor attempts to buy stocks that will produce attractive returns based on two factors:

1) Expected increases in the intrinsic value of the stock (including distributions) during the holding period;
2) Expected stock price increases that are not related to increases in the intrinsic value but rather based on mis-pricing anomalies either on purchase or sale.

This approach is consistent with a long-term investment horizon as it takes time for a business' forecast free cash flows to increase and be reflected in higher intrinsic value. Buying a stock based on a discount to estimated intrinsic value also requires a longer term view because it is likely to take an extended period of time for the price/value differential to close. This long-term view is also supported by the risk reduction benefit of time diversification. Setting an investment horizon that is measured in decades rather than years has the effect of reducing the average volatility of returns. This is because stock markets tend to follow a cyclical or mean-reverting pattern, that is, bull markets tend to be followed by bear markets and over time tend to reduce the volatility of the annualised returns over the total period.

5. IS THE VOLATILITY/RETURN RELATIONSHIP LINEAR?

CAPM assumes that the relationship between portfolio volatility and return is linear.
Markowitz's mean-variance model assumes there is a positive linear relationship between holding period returns and return volatility. The higher the expected holding period return volatility, the higher the expected return. This over-simplifies the relation between risk and return which is more complicated, particularly at higher levels of risk.

Empirical studies show that there is no positive relationship between historical short-term share price volatility and future returns (Ang et al, 2006). Stocks that have more volatile short-term share prices and therefore more volatile short-term return profiles do not produce higher returns. In fact, stocks with high levels of volatility have very low returns (Ang et al, 2006; Campbell, 2008).

At high levels of fundamental business risk there is also evidence of an inverse relationship between risk and return (Campbell, 2008). When looking at fundamental business risk, once the level of default risk reaches a critical point, further increases in business risk result in lower future returns. This is because many of these types of businesses end up failing and the end equity investor's terminal value is nil, resulting in poor returns. Extreme share price volatility is normally a sign that the future free cash flows of the firm are highly uncertain and it is difficult for the market to set a stable equilibrium price. Here too, high volatility risk normally results in low returns.

Thus, the risk/return relationship is positive sloping between the risk-free rate, corporate bonds and equities. However, within the equities asset class, the empirical evidence would suggest that at above average levels of risk the line is steep and negative sloping.

6. BUSINESS RISK - THE CORE OF PORTFOLIO RISK

Shortfall risk is a function of the actual versus the expected economic performance of the underlying businesses contained within the portfolio.

Equities have the potential to provide attractive long-term returns because the businesses that comprise the market tend to grow their earnings, free cash flows and dividends over the long-term. Future free cash flows are the key determinant of the economic/intrinsic value of a business (Fama and French, 2008) and earnings are a normalised estimate of the sustainable/recurring free cash flows. At the aggregate stock market level earnings tend to growth at rates that are broadly in line with overall levels of economic growth over the long-term. In a stable mature economy, such as Australia, nominal GDP growth tends to increase at approximately 6% per annum (3.5% real and 2.5% inflation) over the long-term.

The economic performance of a business depends, inter alia, on: the competitive advantages of the business, strength of the value proposition to customers, competitive intensity, government regulation, organic growth opportunities, sustainable returns on capital, industry stability, economic conditions and financial gearing levels. If a business has a weak competitive advantage, operates in a structurally poor industry or economic environment with low returns on capital and/or high levels of financial gearing then it will have high levels of fundamental risk. A problem with low quality stocks is that the probability distribution of intrinsic value is wide. This means that there is a high probability of future free cash flows falling significantly below mean expectations.

Portfolios comprised of low quality/high risk businesses primarily rely on the price to valuation differential adding alpha. Firms with low quality businesses and/or high levels of financial gearing are more likely to suffer bankruptcy or significant dilution through forced equity raisings during economic downturns. There is empirical evidence that the long-term returns from low quality/high risk stocks are significantly smaller than the long-term returns from high quality/low risk stocks (Campbell, 2008).

For many businesses the future economic performance over the very long-term is difficult to predict with any real precision. However, some businesses have characteristics that make it easier to predict the long-term economics

and thus cash flows. The types of businesses that are easier to predict are those that have strong sustainable competitive advantage, stable customer and supplier bases, low levels of invested capital, wide profit margins, high returns on equity, good organic growth opportunities and low levels of financial gearing. These types of businesses have lower forecasting error and less shortfall risk.

Investors face the same risks irrespective of whether they buy an index or create an "active" portfolio that is different from the relevant index. Buying an index fund exposes an investor to a portfolio constructed purely on the basis of size and liquidity. Depending on the index underlying the fund, this may result in material exposure to lower quality businesses and/or firms with high gearing levels. There is also the risk that the index portfolio is overpriced relative to the long-term intrinsic value of the underlying stocks.

Given that a stock's index weight indicates very little about its long-term return outlook or fundamental risk, the use of an index as the core part of an "active" portfolio construction process seems logically inconsistent. The most logical approach to portfolio construction should be to select the stocks with the most attractive risk adjusted return profiles regardless of their weight in the index.

In a practical sense stock specific risk cannot be eliminated through stock diversification. This is because adding stocks may spread the portfolio's exposures to individual businesses but individual business exposures still comprise the portfolio. Adding more stocks beyond a certain number just adds noise and complexity to the portfolio and makes the portfolio more difficult to manage. However, stock specific risk can be minimised by investing in firms with low fundamental business risk and low pricing risk. Investing in sound businesses with low/no debt and predictable cash flows over the relevant holding period will minimise fundamental risk. Buying businesses within or below their intrinsic value range will reduce pricing risk.

SUMMARY

For all its simple theoretical elegance, MPT and CAPM fail to explain the actual relationship between return and risk at an equity portfolio level. Industry has assumed that any general market index is a suitable proxy for the market portfolio and therefore has no non-systematic risk. Short-term volatility and tracking error measures appear to be a key area of focus when it appears a long-term focus would be more appropriate for many investors. Tracking error relates back to indices that may be unbalanced and over exposed to particular stocks, industry sectors and macro risk factors. A stock portfolio is effectively the same as owning a portfolio of businesses without the associated management control. Therefore, the economic performance of the underlying businesses within the portfolio when combined with the average price value gap, will determine the returns and the shortfall risk of the portfolio over the long-term.

MPT ignores long-term fundamentals and focuses on stock correlations, short-term volatility and beta. CAPM's emphasis on beta, which is largely measured as a short-term cyclical factor, has encouraged a short-term mindset in the measurement of portfolio risk. Markets are not always efficient and consequently fundamental business and pricing risks are relevant to portfolio risk. Buying an index when the market is significantly overvalued or the index has a material exposure to businesses with poor economic fundamentals is unlikely to produce attractive long-term returns for investors. The industry's focus on short-term volatility and returns rather than on the underlying long-term fundamentals of the businesses comprising the portfolio is likely to result in incorrect risk assessments and sub-optimal long-term returns for investors.

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