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A fundamental view of risk in small cap portfolios

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Assessing and managing portfolio risk in small caps has traditionally been done by applying quantitative analysis to recent historic share price volatility and correlation data using an index based model in order to provide a 'best guess' estimate of future risk. The premise behind this method is that the recent past is the best estimate of future events and as such, portfolio risk measurement has become defined by this ex-post approach. This research paper discusses an alternative way of approaching the diverse small cap universe using a combination of qualitative stock level risk analysis combined with traditional quantitative methods to estimate ex-ante portfolio risk.

"Not everything that counts can be measured. Not everything that can be measured counts"

Albert Einstein

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Introduction

The primary risk objective for any investor in constructing a portfolio is to maximise return with the least amount of risk. From a risk perspective this means aiming to diversify away as much stock specific (idiosyncratic) risk as possible without sacrificing portfolio return. However, in deciding how best to mitigate risk in the portfolio construction process we must first have an understanding of exactly what risk is in that context. As some investors would have discovered to their detriment in the last year, understanding the risks being taken to achieve the level of returns generated is critically important (c.f. CDO's, LPT's, Infrastructure Trusts).

Typically, our industry calculates risk as a function of the expected volatility of the portfolio relative to the index. This would make some sense if we had a liability that was in someway related to the index or we were otherwise implicitly comfortable with the index volatility (and return).

However, assuming few of us really have a liability represented by the index, as time horizons lengthen, absolute risk and return taken on significantly greater importance than relative risk and return. In particular as index constituents change or, as was evidently the case with LPTs, the nature of the companies that make up the index change, then it is our view that it is important to have a sense of the real absolute risks (particularly the downside risks) embedded in a portfolio. Consoling one-self with the notion that your portfolio is low risk relative to an index that disappears off a cliff is likely to provide cold comfort.

This paper explores, particularly with respect to investors in Australian Smaller Companies:

1. How a broader framework is required to assess risk, particularly one that takes into account absolute risk, and (contd.)
2. Why a qualitative overlay is required in obtaining a more accurate assessment of this risk.

More specifically the analysis concludes that regardless of the measurement method used, small company investors should care about the risk adjusted returns in the performance of their small cap equity portfolios. Whilst the focus can often be primarily on the return objective or achievement, the risk assumed to generate this return should not be ignored. The conclusions from our analysis in this paper are that there is an opportunity for a qualitative approach to determining risk to improve the risk characteristics of a small cap equity portfolio in conjunction with traditional quantitative risk models. The greater variability of factor concentration observed within the S&P / ASX Small Ordinaries Index relative to the S&P / ASX 100 Index, due to the greater ease with which stocks and sectors can enter and exit the universe, can result in periods where investors can achieve a portfolio with lower levels of absolute risk by assuming greater levels of relative risk.

Objective of risk controls in portfolio construction

As noted the primary risk objective in constructing a portfolio is to diversify away as much stock specific (idiosyncratic) risk as possible without sacrificing portfolio return. Ever since Markowitz's (1952) pioneering work on diversification, much analysis has been undertaken looking for an optimal approach to risk control through portfolio diversification. An interesting observation from their studies is that over time the minimum number of stocks required to provide risk close to that of the market portfolio (in the US) has been increasing. Evans and Archer (1968) suggested 10 firms Elton and Gruber (1997) 30 firms and Poon et al (1992) and more recently Campbell et al (2001) concluded 50-100 firms were required to minimise relative portfolio volatility.

The principle reason for the increasing number of securities to be held in order to diversify away idiosyncratic risk is a result of the trend towards increasing firm level volatility and decreasing correlation between securities observed overtime. This is despite the overall market and industry level volatility showing no significant trend over the same period. At the fundamental level, two of the primary reasons offered for this change in firm level volatility are increasing firm specialization (a decline in conglomerates or diversification within each security) and increasing reliance on external sources of financing. Many investors will be able to relate to this latter point.

Managing absolute and relative risk in the Australian smaller companies

Investing in Australian small companies most often requires a manager to compare their portfolio with a market portfolio to determine the relative risk exposures, which in this market is the S&P / ASX Small Ordinaries Index. Whilst many quantitative risk tools exist to compare the manager portfolio to the benchmark

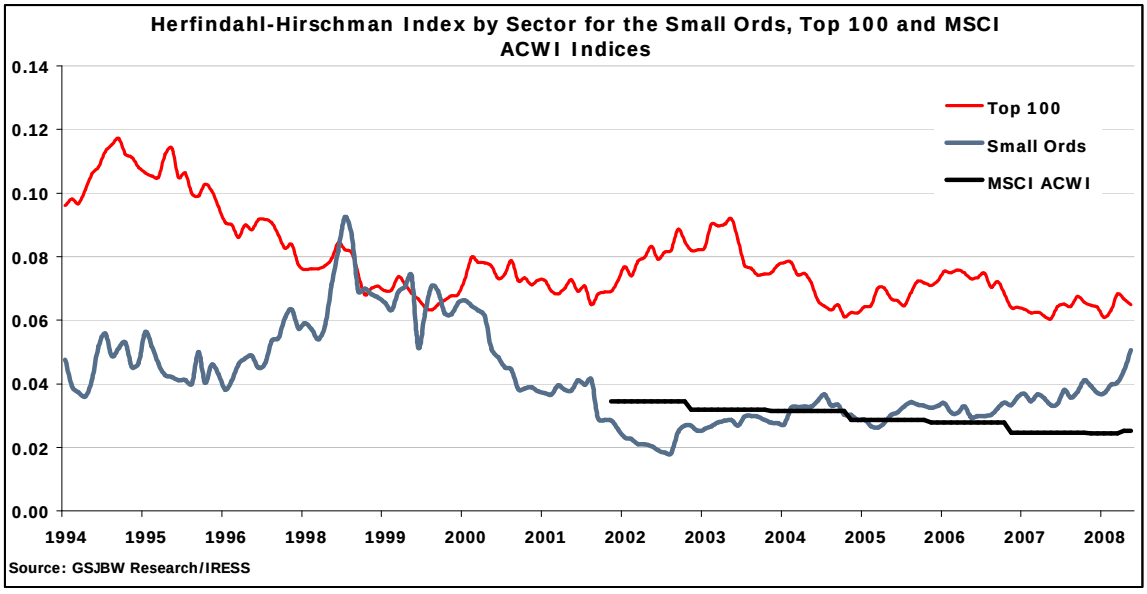
portfolio across multiple risk factors, particularly tracking error, this tells us little about the diversification of the index itself. In some ways this is a circular argument when the benchmark is considered the market portfolio against which all portfolios are measured. However there are other tools that can provide insight into the level of diversification of a given portfolio or index that are not constrained to the benchmark.

One approach, which is presented in this paper, is the use of the normalized Herfindahl-Hirschman Index[1] (HHI) as a measure of concentration as it relates to sector exposures within the S&P / ASX Small Ordinaries Index to highlight the range of diversification outcomes that are present in the index over time. The higher the normalized HHI score, the more concentrated the index. This analysis focuses on sector exposures as single factor proxy to illustrate the variability of the small cap index character. However there are various other factor concentrations that can be equally as important to diversify, such as momentum, value, size, financial leverage, foreign currency exposure and interest rates upon which HHI concentration studies are outside the scope of this paper. The crux of diversification however is to understand for a portfolio or index how diversified the individual securities are against as many factors as possible – both the obvious (such as the factors described above) and the less obvious but none the less equally important, which may be addressed by improvements in the use of qualitative analysis.

One reason the S&P / ASX Small Ordinaries Index is an interesting index upon which to perform this analysis is that unlike the larger capitalisation market indices, such as the S&P / ASX 100 Index, the S&P / ASX Small Ordinaries Index has mechanisms for firms to enter and exit the universe at both ends of the market cap spectrum, as well as being the primary market into which new industries initially present in the form of initial public offerings. These characteristics should result in a much less static concentration across sectors, industries and firms than presents in the larger cap dominated indices, and as a result factor concentration can (and does) change dramatically over time.

The chart below (Chart 1) highlights that over the past fourteen years (from July 1994 to June 2008), the sector concentration of the small cap benchmark has fluctuated significantly from being modestly more concentrated than the 100 to currently being more diversified by sector representation. A lower HHI score means less concentration. The analysis finds that the small cap benchmark is somewhat more volatile in its concentration than the 100, with a range of concentration of 0.074 vs 0.057 for the 100. As a comparison to both of the Australian indices, the sector concentration for the MSCI All Countries World Index - consisting of 48 country indices comprising 23 developed and 25 emerging market country indices – is also shown. Compared to the MSCI ACWI, both Australian indices appear both less diversified and more volatile in their level of concentration, as the MSCI ACWI has an HHI range of only 0.01 over the period from December 2001 to June 2008.

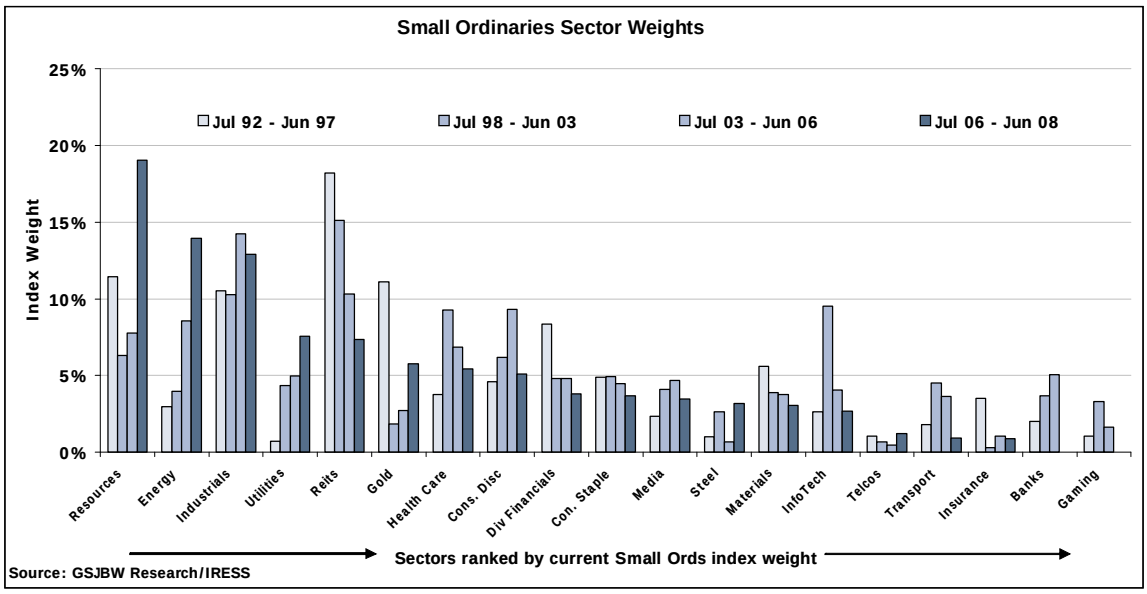
Chart 1: Normalised Herfindahl-Hirschman Index measure of concentration analysis



[1] Detail of HHI formula applied in this analysis contained in Reference on page [8]

Research by Tabner (2003) concluded that for the FTSE100 index from 1984 to 2003 high levels of index concentration at the firm level did not always suggest increasing prospective absolute risk. Intuitively this makes sense, as concentration per se may not increase risk, depending upon what is the concentrated exposure. A concentration to a large globally diversified firm, or concentration to a sector that has a lower level of volatility may indeed result in a reduction in index volatility – although because the market itself is the benchmark, the larger the stock or sector, the more the index will reflect the volatility of its largest constituents. If portfolio concentration is accumulated in specific firms, sectors or factors which are significantly greater in volatility than the market, index investors may end up with a riskier portfolio due to increasing concentration. Chart 2 shows the sector weights in the small cap benchmark over the past 15 years, and where the current increase in concentration has focused.

Chart 2: Trends in sector weightings within the S&P / ASX Small Ordinaries Index

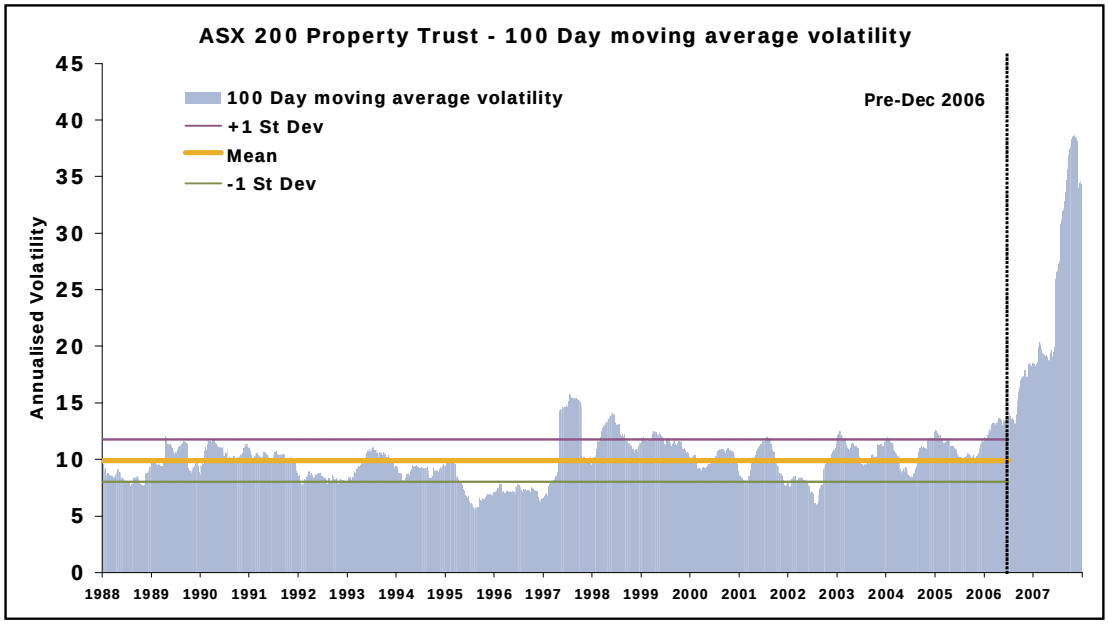


Indeed, recent market observations would suggest that an assumption of stability for given sector volatility can be extremely misleading, particularly if there has been a change in the fundamental risk character of that sector. An example of this would be the S&P / ASX 200 A-REIT Index (XPJ), where the characteristics of the securities or factors within the index changed dramatically over time as it related to both the activity undertaken and the financial leverage applied to equity.

In the early 1990's the index was characterized by entities that derived 99% of their income from the passive ownership of domestic Australian income producing property in an ungeared unit trust vehicle. By the end of 2006, the index was characterized by entities that derived income from passive ownership of income producing property, funds management activities and property development, operating in global markets through highly financially leveraged and complex stapled structures.

That the historical sector volatility showed only a modest increase in 2006 relative to the early 1990's may be statistically correct, but none the less seemed at odds with the observable character of the securities in the index and the difference in prospective risk that they carried from a qualitative standpoint. Relative to 18 years of data, what occurred in 2007/08 as the market priced the significantly increased risk was a 15 standard deviation event as shown in Chart 3.

Chart 3: S&P / ASX 200 Property Trust Index Volatility: 1 Jul, 1988 – 30 Jun, 2008



Source: Goldman Sachs JB Were

Improving risk estimates through qualitative analysis

As per these examples, in conjunction with a qualitative approach to risk, the information contained in an analysis of index diversity or concentration can be useful in helping determine when higher tracking error (deviation from the benchmark portfolio) may result in lower absolute portfolio risk. Normally tracking error is intended risk that results from a return expectation an active manager may hold relative to the benchmark. This framework of factor concentration and qualitative risk can provide the manager another vector upon which to create intended tracking error that is not purely return related. Indeed, both risk and return models used in conjunction should better explain the portfolio tracking error relative to the benchmark at a particular point in time.

Table 1 below illustrates how the market currently applies quantitative and qualitative methods to determine the risk and return opportunities in the market. Much of the return innovation in the past few years has been focused on using quantitative methods to improve upon the identification of alpha opportunities. Qualitative (or fundamental) active management tends to focus almost exclusively on the return side of the ledger, leaving risk estimation almost entirely in the realm of quantitative methods.

Table 1: Traditional risk and return separation of qualitative and quantitative analysis

Analysis	Return	Risk	Source of Data
Quantitative	Quantitative multi-factor models focusing on valuation (p/e, yield, pbv, p/sales etc) and momentum (share price, EPS revision) factors	Commercial multi-factor risk models focusing on tracking error, Value at Risk (VaR) , Style exposures (value, growth, portfolio p/e etc)	Standardised Publically available Non-proprietary
Qualitative	Industry and business quality analysis, Sustainable earnings analysis, Long term value drivers relative to short term earnings drivers	?	Proprietary Not publically available User defined

Many of the arguments used to support the value of qualitative fundamental active management to improve the returns to a portfolio primarily revolve around the use of proprietary, non-publically available analysis of qualitative factors. These methods could also be applied to improve the risk of a portfolio by targeting the objectives discussed previously as they relate to factor concentration, diversification and ex-ante risk estimation.

As an example, some of the factors qualitative analysis targets to improve return estimates include:

- Industry analysis,
- Analysis of firm competitive advantage,
- Understanding of drivers of company return on capital,
- Differentiating between current and sustainable levels of profitability and returns,
- Details behind key value drivers such as contractual terms, contingent liabilities, off-balance sheet liabilities, hedging policy, sensitivity to changes in primary business drivers, market values vs book values of assets and liabilities, re-statement of accounting earnings to reflect economic earnings,
- Assessment of management ability and strategic direction of the firm,
- Determining the appropriateness of a given capital structure,

These are all factors which ultimately result in the reported and estimated accounting items that most multi factor quantitative models use to derive alpha expectations, and in theory the qualitative manager is attempting to use their research effort to determine what the likely outcome is before it is captured in the publically available data most quantitative processes use.

As a result of the qualitative manager looking at the source of value add as being through improved returns rather than controlling risk, active manager processes tend to focus almost exclusively on using their research effort to improve returns, with very little qualitative research effort used to improve the risk profile of the portfolio for a given level of return.

Some examples of where qualitative research can improve the understanding of stock risk include:

- **Corporate Governance:** details behind management incentives and shareholder alignment, related party transactions, board structure,
- **Transparency:** how transparent both the economics and accounting information provided for the business are to outside investors,
- **Quality of earnings:** Cash vs accrual analysis to assess earnings quality across companies, which can be quantitatively measured,
- **Equity leverage:** measurement of operating and financial leverage of a business. Financial leverage can be measured in a quantitative manner, but operating leverage requires a qualitative view,
- **Management Capability:** A subjective view of how likely management are to deliver upon the financial outcomes embedded in the valuation. Track record, previous experience, etc.
- **Analyst confidence**: a measure of how much an analyst believes they have a competitive advantage relative to the market in understanding the risks and return opportunities for a given business. This is subjective, but recognizes that despite all the best intentions, analysts do not always have the same level of understanding or conviction across all stocks within their coverage universally,
- **Structural shifts relative to historic experience**: Multi factor risk models tend to rely on historic share price series to describe the range of possible outcomes, which can lead to significant estimation error when the future does not resemble the recent (or entire) past, not to mention model risk if there is dependence between periods, skewed distribution or fat tail events. In some circumstances, history is not a good guide and a fundamental analysis of causal links may provide a better view of risk, as per our property trust example earlier and
- **Sources and magnitude of fundamental factor risk**: analysts can detail for each security which factor risks apply to a specific security and the direction and magnitude of exposure that security contains as it related to the free cash flow of the business – as opposed to a statistical analysis of the factor correlations, allowing for increased understanding of fundamental factor diversity within a portfolio.

Unlike return analysis which conclude in expected return scores (alpha) via the conversion of qualitative analysis into financial forecasts, the qualitative risk analysis is not as easy to standardize and quantify into a direct numerical output. For example how does a portfolio that is overweight poor corporate governance translate into a variability of returns estimate? This issue is at the heart of the quote at the beginning of this

paper – how can investors methodically use information that they know has significant value but is difficult to measure?

In a sense, like the qualitative analysis which results in stock valuation, there is no getting away from individual analyst judgment, and this has to be accepted. However, it is possible to crudely score each of the risk factors investors are trying to assess with the objective of being approximately right rather that precisely wrong. Simply concluding from the analysis that exposure to each risk factor is low (1), moderate (2) or high (3) or exists in a range from -10 (strong negative causal link) to +10 (strong positive causal link) may appear to be simplistic in a world of 99% confidence intervals and Z-Scores, however that is not to say that the process does not impart valuable information as it relates to a qualitative view of risk that was otherwise either ignored or being assessed in an ad-hoc, not methodical fashion.

Being able to score each of the individual risks or factor exposures enables a crude risk score to be compiled for each security, and then allows for a degree of comparison across a universe on a consistent basis. Using such a crude score would still provide a wide variance of risk estimation between one security that has low transparency, poor corporate governance, low quality earnings, high financial leverage and weak management and a second security that has high transparency, good corporate governance, high quality earnings, low financial leverage and strong management.

Capturing risk consistently using traditional valuation models

Security valuation at its most simple is driven by two factors – the forecast of free cash flows generated by a business and the discount rate used to estimate the current value of this future cash flow stream.

There is a valid argument that many of the areas of qualitative analysis this paper targets to improve our understanding of risk at the stock level, and use to improve the diversification of the portfolio, should be embedded within a valuation framework and reflect either lower (higher) terminal return on capital through our cash flow forecast or result in a higher (lower) discount rate. As mentioned above however, quantifying the impact upon value in a dollars and cents fashion can be problematic and is compounded by behavioural biases within analyst valuations.

One example of where our proposed risk methodology may result in double counting of risk is in capturing financial leverage as a risk factor, given that under CAPM the financial leverage of a firm should be reflected in the discount rate used. Although this is theoretically correct, there are practical examples in very recent times, such as in the property trust sector, where the magnitude of discount rate adjustment applied to market valuations significantly underestimated the risk to equity of a given level of financial leverage, and in some cases ignored it completely.

In 2006 and 2007 financial leverage risk to equity has arguably been understated in share prices and valuations as the market was in a period of significant corporate activity where enterprise values were focused on due to potential capital structure changes. The market has had to simultaneously try and price equity on a going concern, current capital structure public market basis, and on an enterprise value, change in control, private market basis – giving a very broad scope for the treatment of financial leverage in valuation considerations. In the case of financial sponsors, their own satellites and other entities seen as targets, this has consequently seen enormous volatility in market valuation of the equity.

Qualitative risk analysis allows an extra dimension upon which to construct portfolios. If investors have the detailed risk analysis, crude outputs and proprietary qualitative risk scores available for all stocks within our universe they can achieve the following:

- Increased granularity of stock factors and an ability to increase portfolio factor diversification,
- An alternative, proprietary measure of relative stock specific risk for each security within our universe. In a crude sense, this allows optimization of a portfolio using a fundamental measure of risk against a fundamental measure of return,
- An ability to compare proprietary qualitative risk measures against standard quantitative risk models to determine where significant differences occur and hence opportunity for a qualitative process to add value at both the stock, sector and market index level,

Although it is beyond the scope of this paper to demonstrate the statistical validity of a qualitative risk approach due to the lack of historic data upon which to perform such an analysis, the opportunity to incorporate risk based qualitative research is appealing simply because it is an area that currently appears to

be far less competitively pursued and as such the rewards for effort should be significant. Due to the more variable index characteristics within the small company universe, and as a result the changing risk characteristics of the benchmark, the conclusion of our analysis is that increased awareness of how concentration and risk characteristics of the index are changing are likely to be important considerations in the construction of small company portfolios. In addition, by directing qualitative research efforts to better understand fundamental risks as well as continuing to look for alpha opportunities investors can develop a basis for introducing greater benchmark tracking error to a portfolio that is likely to result in improvements, through greater diversification of the portfolio, in absolute risk adjusted return relative to that of the benchmark.

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Herfindahl-Hirschman Index as applied in this paper:
Base HHI Calculation

$$H = \sum_{i=1}^{n} s_i^2$$

where s_i is the index weight of sector i in the index, and n is the number of sectors.
Normalised HHI applied in this analysis

$$H* = \frac{(H - 1/N)}{1 - 1/N}$$

where N is the number of sectors in the market and H is the base HHI calculation.

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