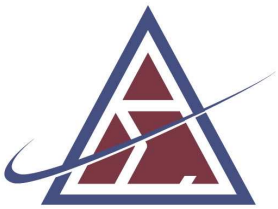

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Dealing with Excessive Concentration to Stocks in Small Markets

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Abstract

Countries with small equity markets will often experience times when one or more stocks dominate the local stock market index. Investors domiciled in such countries generally hold a disproportionate share of their wealth in local stocks and can suffer excessive single-company exposure. A range of solutions is suggested to ameliorate this concentration. The most effective are reducing home equity bias and using index-agnostic domestic equity managers. But these measures are typically unavailable as (a) there may be dominating issues driving home equity bias and (b) truly index-agnostic equity managers are rare. Other measures, such as imposing limits on manager mandates and total portfolio level overlays, were found to be difficult and often ineffective in resolving this issue. Perhaps the most effective measure is to adopt a capitalisation-capped index as the benchmark used to mandate managers, thereby eliminating unwanted business risk management by the manager. Of course, such an approach cannot avoid the likelihood that your portfolio will underperform peers when domestic large capitalisation stocks perform relatively strongly.

Keywords: concentrated stock market; equities; home country bias; cap-weighted index; fundamental indexation; index-agnostic investing; high conviction investing; multi-manager; BHP Billiton; Rio Tinto; Nortel; Nokia

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1 Introduction

From time to time a single company can grow to represent a large proportion of the capitalisation of its local stock market. This can raise issues for investors domiciled in countries with small stock markets. Such investors tend to have a disproportionately[1] large exposure to domestic shares. When such investors have significant allocations to equity investments and run an investment approach for such investments that tracks the local index, or is active relative to that index, they can find that their total wealth may become unacceptably over-exposed to just one company.

In the past these circumstances have occurred many times and in many places. For example, Canadian investors faced a weight of 27% to Nortel in the TSE300 in May 2000 and UK investors had to deal with the implications of Vodafone buying Mannesman, bringing the weight of the merged entity to over 12% of the FTSE100. Nokia is of course an extreme example, representing 73% of the Finnish index at the end of 1999 and single stock concentration has been a perennial issue for New Zealand investors, exacerbated by NZ Telecom dominance of that market.

Many Australian investors may soon be finding themselves facing a similar situation with BHP Billiton's strong relative price performance over the last few years, and its plans to acquire Rio Tinto. At the time of writing[2] the weight to each company in the S&P ASX 300 index was 12.6% and 3.4% respectively. With a typical allocation to Australian equities of 40% in a diversified portfolio, an index allocation to the merged entity would represent 6.4% of an investor's wealth. This could be much higher if the investor's Australian equity investment manager(s) overweighted their allocations to the company.

In this paper I assess what level of exposure to one company's stock represents an excessive concentration of risk to that company. I then consider the situation of an institutional investor using a multi-manager approach and explore options that such an investor could take to ameliorate this risk in the diversified funds that they make available to individuals. I also note that single-company concentration is just one of a range of exposures that should be managed at an investor's total wealth level. However this paper focuses on single-company risk and does not attempt to deal with other risk concentrations.

2 Literature survey

2.1 Concentrated markets

The Pension Investment Association of Canada (PIAC) together with William M. Mercer Limited published a report in 2000 discussing the practical issues around managing the stock concentration risks that Canadian investors were, at that time, experiencing as Nortel grew to 25% of the local equity index.

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[1] There may valid reasons (such as tax) for having a disproportionate share of your wealth exposed to the local stock market. Regardless, the adjective "disproportionate" is an accurate description when measured by objective capitalisation metrics.

[2] Index weights at 31 May 2008.

That report proposed four approaches to dealing with this issue:

- No change, on the basis that single stock exposure does not require special management.
- Cap single stock positions on the basis that doing so reduces an important component of risk and is worth the impact on returns.
- Make a separate allocation to Nortel on the basis that fund sponsors are in the best position to judge the extent of single stock exposure that their fund can bear.
- Go global on the basis that reducing the specific allocation to Canadian equities will reduce the exposure to Nortel at the total fund level.

The report provides a good, practical analysis of the advantages and disadvantages of each approach. It also discusses the issues that fund sponsors will face when applying each of the approaches. In short, it found none of the approaches to be without issues and did not recommend any single approach. Instead it suggests that a fund would need to consider its investment beliefs, the ease of implementation and any associated costs.

Watson Wyatt (2005) was prompted by the unification of Royal Dutch and Shell to consider the issue of capped-weight indices for UK investors. This combined company would have, at the time, resulted in a 7.5% weight in the FTSE All-Share Index. FTSE was proposing that it capped the weights in its index at 5%. While Watson Wyatt agreed that the cap would partially address concentration, they noted a long list of issues with adopting such an approach, including:

- Not clear that volatility will decrease. (I do not believe that volatility is the key metric for risk. This is discussed further in Section 3.)
- Increase turnover for passive managers. (My observation is that this may be less of an issue for index tracking managers that use optimisation techniques rather than simple full replication.)
- Lower liquidity.
- Capital allocation distorted. (Later in the paper I briefly discuss why the theoretical underpinnings of this view are flawed.)
- Changes in sector weights. (It is not clear to me why Watson Wyatt believe this is an issue.)

They also mention that this issue is ameliorated by reducing home country bias and indicated that this is their preferred solution for UK investors.

Finally, they briefly compared market-capitalisation index construction to four alternatives:

- Capped weights. Issues: arbitrariness of cap; rebalancing; gaming; regret.
- Equal weights. Issues: illiquidity; gaming; rebalancing; completely impractical for significant investors.

- Tiered equal weights. Issues: subjective and arbitrary; rebalancing; gaming; higher turnover.

- Wealth weights (eg based on historical earnings). Issues: will place too much weight on companies with historical earnings and underweight companies with strong prospective earnings.

In short, Watson Wyatt was not in favour of the index provider capping the weights when constructing the local index. Doing so would create huge problems for index-tracking investors. But they were less concerned with using such an approach as a benchmark to measure performance of active managers, provided the active managers were indifferent to the choice of benchmark.

Chelley-Steeley (2008) studied stock market concentration in the UK and found no association between concentration and volatility. She compared the return variance of different index construction rules (equally weighted and variants with low, intermediate and high concentration) and found that moving from low to high concentration has very little impact on the volatility of the index. I believe a potential weakness of this analysis is the reliance on portfolio variance as the relevant metric when considering idiosyncratic risk. In my view, this ignores the reality that an individual stock may experience a specific shock that results in extreme tail risk that is not observable by past stock returns. This issue is more fully examined in Section 3.

2.2 Fundamental indexation

While not specifically focussed on the issue of excessive stock concentration in small markets, the concept of "fundamental indexation" deals with some of the issues encountered in this area. The ideas behind fundamental indexation were pioneered by Robert Arnott et al (2005). They suggest that capitalisation weighted indices are not mean-variance efficient and that other indices, weighted according to "fundamental metrics", i.e. metrics that are not a function of the stock's price, should outperform over time. One device they use to describe this notion is that the design of market capitalisation indices means that, if the market is not truly efficient, over-priced stocks will be overweighted and under-priced stocks will be underweighted. (See also Treynor (2005)).

The concept of fundamental indexation has raised significant debate and criticism. Some of this criticism naturally emanates from the defenders of traditional indexing. Others claim that fundamental indexing is, in fact, value investing in disguise. This debate is of little relevance to the issue at hand.

What is more interesting is the challenge fundamental indexation poses to the well established notion that a benchmark index must be capitalisation weighted. Fundamental indexes are not (or less) reliant on the stock's prices to establish the index weight. This means that stocks with prices that rise strongly relative to other stocks in the index will be less likely to dominate the index. Such alternative approaches to constructing indices may be better suited to benchmarking the performance of active managers, particularly in markets, such as Australia, with high stock concentration.

In this debate a number of commentators have listed the desirable characteristics for an index used to benchmark active managers. For example Estrada (2008) suggests that capitalisation weighted indices have three desirable characteristics:

- they properly represent the set of investment opportunities available to an active manager

- they show the returns of the average investor
- they enable all investors to link their portfolios to the benchmark at current market prices; the prices and weights are at equilibrium values[3] (i.e. they are "market clearing" portfolios)

This leads to the conclusion that fundamental indices are not proper benchmarks. But Estrada also remarks that "these objections may carry some weight with academics, but carry very little weight with investors". What is more important to investors is whether alternative benchmark indices are likely to be efficient in the future.

The general definition as to whether an index is efficient is whether it is likely to generate the highest risk-adjusted return possible with no application of insight other than that embodied in the index construction rules. Most academics and other commentators will often jump straight to variance of returns as being the measure of risk used to adjust returns of the total portfolio. This may or may not be acceptable in large markets. But for smaller markets with high concentrations to one or two stocks, the notion of variance as being a complete measure of risk must be called into question. (I discuss this further in Section 3.)

I have seen no substantive theoretical treatment of risk defined in this way. The academic objection to ideas like fundamental investing are not particularly interesting to practitioners attempting to provide solutions to investors that are robust across many measures of risk. The remainder of this paper considers this issue from such a perspective.

3 How much single company concentration is acceptable?

Should an investor even worry about single stock diversification? Even markets as small as Australia's have significant market capitalisation; the capitalisation of the Australian stock market was $1,319 billion on 31 May 2008. If a single company's capitalisation was to increase to be a significant proportion of the total market, then that company would need to be very large indeed. And while large companies are often focussed in a small number of sectors[4], the operations of a large company will often be quite diverse.

For example, should BHP Billiton succeed in acquiring Rio Tinto the operations of the combined entity are no more concentrated than they were before the merger. The combined entity will own just as many mines in just as many locations.

But, there is a very important aspect of the combined entity that is not diversified: its senior management team. The combined entity will immediately be more exposed to its corporate strategy and execution of that strategy. Indeed, the execution of the merger aspects of the strategy will be particularly critical in the months following the merger. And over time, the combined entity will merge important operations and drive concentration of operations deeper into the entity.

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[3] The curious paradox of this characteristic is that, if all investors invested according to a passive, index-tracking approach, then there would be no price discovery and no way of establishing reliable index weights.

[4] Note, the issue of concentration to one sector in an investor's overall portfolio is also an important one. But it is not the subject of this paper. This paper restricts itself to single company concentration.

Another way of looking at this issue is to consider the inherent diversification inside a large company. While most companies will have a single, well defined, corporate strategy, they will generally also have a number of different businesses, each with its own strategy. The number of such businesses, and the extent to which their fortunes are aligned or diverse, are matters of fact and judgement. Companies with many diverse businesses may justifiably represent a significant portion of an individual's investment portfolio without resulting in undue idiosyncratic risk. On the other hand, companies with many different businesses, but in aligned industries, could pose an excessive concentration to a small number of risks.

But even with a diverse set of businesses, the aggregate value of the lot is focussed in just one share price. Buy and sell side analysts build models to assess this share price. Arguably, this can create concentration of model risk, regardless of the diversity of the underlying businesses.

These are soft issues which can only be addressed using deep research into the circumstances of each case. This is the role of fundamental investment managers. But the investor needs to mandate its investment managers with objectives and rules that are principle-based and not rely on subjective, case by case, judgements. In most cases these objectives will refer to an index used to benchmark the investment performance of the manager.

At first blush, the Capital Asset Pricing Model (CAPM) provides a clue for how investors should construct such benchmark indices. In its pure form, the CAPM suggests that all investors will hold the "market portfolio"[5], which (by definition) comprises every investable asset held at that asset's relative market value, i.e. a capitalisation-weighted portfolio.

The CAPM quickly breaks down for many reasons that are well documented in the finance literature. But, for the purpose of this paper, the key disconnection between CAPM-inspired behaviours and actual behaviours is the dominance of home country equities held by investors living in countries with small equity markets.

Clearly, the CAPM is not a good descriptor of investor behaviour either at the individual level, or at the aggregate level, in countries with small equity markets. This means that the CAPM (and its implications) cannot be relied upon as relevant criteria when assessing the suitability of different index construction methods as good representations of a domestic equity market.

Without a valid theoretical torch to shine a light on this issue we are forced to revert to practical and often arbitrary rules of thumb. One approach is to start from the perspective of an investor's total portfolio and consider the extent of idiosyncratic risk that could be tolerated.

For any arbitrary evaluation period (say three months), it is possible (albeit subjective) to define the negative contribution to a fund's total returns that could be attributable to any one stock (herein labelled "idiosyncratic shock").

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[5] Under the CAPM each investor will hold an allocation to the market portfolio and cash or borrowing to obtain a level of risk consistent with his or her preferences.

Ignoring the correlation effects with the remainder of the portfolio[6], this shock can be approximately estimated as a function of the stock's weight in the portfolio and the volatility of the stock itself.

In the following example I use an evaluation period of three months applied to an Australian investor assessing the idiosyncratic risk associated with BHP.

Over the period 30 April 2000 to 30 June 2008 the volatility of BHP's monthly return was 6.9%. Assuming serial independence, the volatility of BHP's three monthly return is approximately 12%.

Recent market turmoil puts this volatility estimate into perspective. BHP's share price went from a high of $50 in mid May 2008 to $37 on 11 August 2008 (approximately 3 months). This is a return of -26%, approximately two standard deviations estimated over the previous 8 years. (Of course, it is worth noting that BHP was not alone in this turmoil and this two standard deviation event was not as a result of idiosyncratic risk.)

If 40% of the portfolio was held in Australian equities and BHP was held at index weight (12.6%), then it would have a weight of 5% in the portfolio. A two standard deviation event over three months would result in a BHP-sourced shock to the Australian equity portfolio of 3%, and 1.2% when assessed across the total fund.

If BHP merged with Rio Tinto (3.4% index weight), the investment managers held the combined entity at a 2 percentage point overweight, and the volatility of quarterly returns of the merged entity remained 12%, then this shock to the total fund would be 1.7%.

I would suggest that these levels of idiosyncratic shock are too large for most investors. If we limit idiosyncratic shock defined in this way to 1% of the total portfolio, then the maximum weight of any one stock in the total portfolio will be 4%, which implies the allocation in the domestic equity portfolio should be limited to approximately 10%. This is significantly below the index weight and is the reason why this issue has become important and difficult.

This paper deals with the practical issue of mandating a portfolio of independent investment managers. There will be instances when many (or all) of the managers hold a favourable view on a stock. If the managers are reasonably different to each other, then it is reasonable for an investor's total portfolio to hold a significant exposure to that stock. In the following analysis I have used the rule of thumb that 95% of the time the total portfolio will not hold any more than 3% in any one stock as the result of the independent actions of different investment managers.

This rule of thumb requiring that <u>most</u> of the time no more than 3% is held in any one stock is crudely consistent with the <u>occasional</u> 4% maximum stock weight associated with an idiosyncratic shock of 1% of the total portfolio. Of course, these values are arbitrary and may be higher or lower depending upon an individual investor's risk preferences.

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[6] Correlation effects are not trivial, but taking them into account for these purposes is spuriously precise. The more highly correlated an asset is to the other assets, the lower will be its marginal contribution to this shock. A special case is where the remainder of the portfolio is the equity market. In this case the effect we should be measuring is the company's specific risk.

It should also be remembered that a fund may be exposed to other sources of idiosyncratic company risk other than that deriving from its holding in the stock itself. One obvious source of additional risk is if the fund were to hold any debt issued by the company. Clearly debt has a different risk profile than equity, but drivers of risk for each share a common factor in the success of the company's business. While the potential for this risk is important, I do not attempt to model it in this paper.

4 Modelling the impact of different approaches

In this section I model the impact of idiosyncratic risk resulting from different approaches to constructing portfolios.

I do this in the context of an Australian investor whose investment philosophy is to use investment managers that apply fundamental research to selecting the best assets for the portfolio. These managers include specialists focusing on the domestic market. The managers do not attempt to track the index, but may use portfolio construction techniques that measure risk relative to a benchmark index specified in their investment mandate. This specification has been deliberately defined in this way to include the manner in which MLC constructs its diversified funds[7]. These funds are designed to be suitable as holistic investment solutions for investors.

MLC's approach goes further than this specification. It involves using managers that construct high conviction portfolios, rather than managers that are merely "apply fundamental research". MLC's equity managers can generally be categorised into one of two types:

- **High conviction index aware:** Such managers hold stocks in their portfolios at weights that are significantly higher or lower than the stock's weight in the benchmark index, resulting in a deliberately high tracking error[8] to the benchmark index.

- **Index agnostic:** Such managers hold stocks in their portfolios at weights that have no regard for the weights in the benchmark index[9]. Most of MLC's managers of this type are also clearly "high conviction"; i.e. managers that build portfolios focused on their best ideas. But this category could include other approaches involving highly diversified portfolios built using techniques that ignore benchmark index weights. Equally weighted portfolios[10] would be such an example.

I have not attempted to assess the situation from the perspective of an investor who dominantly uses a passive, index-tracker approach to managing their domestic equity portfolio. Such an investor can become very exposed to a single stock at times when the largest stock in that market experiences strong and

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[7] For example, the MLC Horizon series of funds, which are diversified across many different asset classes, and have different levels of risk.

[8] Tracking error is defined to be the standard deviation of a portfolio's returns that are different from the returns of the benchmark index.

[9] In fact, even an index-agnostic manager may find higher capitalisation stocks more attractive if its process explicitly requires expected returns to include the market impact of buying and selling. This market impact would generally be relatively larger for smaller, less liquid stocks.

[10] MLC does not use equally weighted approaches.

persistent upward price momentum relative to the bulk of the rest of that market. A capitalisation-weighted index just keeps getting more and more concentrated. This, in my mind, is an important argument against passive investing. I would suggest that such investors could consider one or more of the ameliorating methods discussed in this paper, but when they do the "purism" of their passive approach is sullied and they may as well consider a broad range of more active approaches.

4.1 Base case and method

In this sub-section I estimate the probability distributions of the highest weight to any single stock that an investor could experience in his or her overall portfolio. The base case I use is:

- Asset allocation is the same as the MLC Horizon 5[11] portfolio with 35% in Australian equities and 38% in global equities.
- The portfolio has the same number of equity managers as MLC Horizon 5 (ie 10 Australian equity managers, 7 global equity managers), but equally weighted. (This is quite close to MLC's strategy.)
- The managers are constrained to holding stocks at a weight in their portfolio no greater than 15%. They are also not permitted to sell stocks short.
- All domestic managers are high conviction, index-relative managers, defined as holding a portfolio of 20 stocks with the five highest ranked stocks held at 5 percentage points overweight, and the five lowest ranked stocks underweighted by 5 percentage points (subject to the mandate constraints.) This is akin to the approach used by many of MLC's domestic managers, however some are index-agnostic.
- The global managers can, and do, buy Australian stocks. In this base case I assume that each global manager holds one Australian stock at an absolute weight of 3%. Global index weights for Australian stocks are ignored as they are immaterial.
- I assume that the managers rank stocks before applying this portfolio construction technique. I assume that the correlation of these ranks between all pairs of managers is 0.4. Please note this is not the correlation of manager excess returns, but the pair-wise correlation stock rankings. I have not attempted to empirically justify this assumption in this paper, but I do show (in Section 5.4) the sensitivity of the results to this assumption.

I construct random portfolios for each manager based on the parameters set out above. The theoretical pool of Australian stocks available to each manager is (approximately) 300 in the S&P ASX 300 index, plus several hundred smaller stocks outside of that index. In reality, most institutional investment managers cannot practically invest in the tail. To allow for this I restrict the pool of available stocks to the largest 80 in the index. I construct random portfolios for each manager from the same pool using a technique that generates correlated sets of rankings. This is achieved using Monte Carlo simulation techniques akin to those described in Fackler (1999).

[11] MLC Horizon 5 is a multi-manager, multi-sector diversified fund with an 85% allocation to growth assets and a 15% allocation to debt assets.

For each domestic manager I first select the specified number of stocks to be held at either maximum overweight or underweight (in the case of index-aware managers) or the maximum absolute weight (in the case of index-agnostic managers).

I then calculate the bet (in the case of index-aware managers) or absolute weight (in the case of index-agnostic managers) required for the remaining stocks in the portfolio to be that required to bring the portfolio to 100% invested. The algorithm for index-aware managers is:

$$Bet = \frac{\left(1 - \sum_{hi+lo} f\left(portfolio\_weight\right) - \sum_{other} f\left(index\_weight\right)\right)}{count(other)}$$

Where:

hi = set of high rated stocks held at maximum overweight

lo = set of low rated stocks held at maximum underweight

other = set of stocks in the portfolio, other than the stocks held at maximum over or under weight

f(*w*) is a function that imposes constraints on maximum and minimum absolute weights (eg such as no shorting), on a stock weight, specifically*:*

$f(w) = \max\left(minweight, \min\left(maxweight, w\right)\right)$, where

minweight = minimum weight that can be held in a stock. For the typical "no-shorting" mandate, this value would be zero.

maxweight = maximum weight that can be held in a stock. MLC mandates typically limit this to 15%.

portfolio_weight and *index_weight* are the weights in the portfolio and index respectively

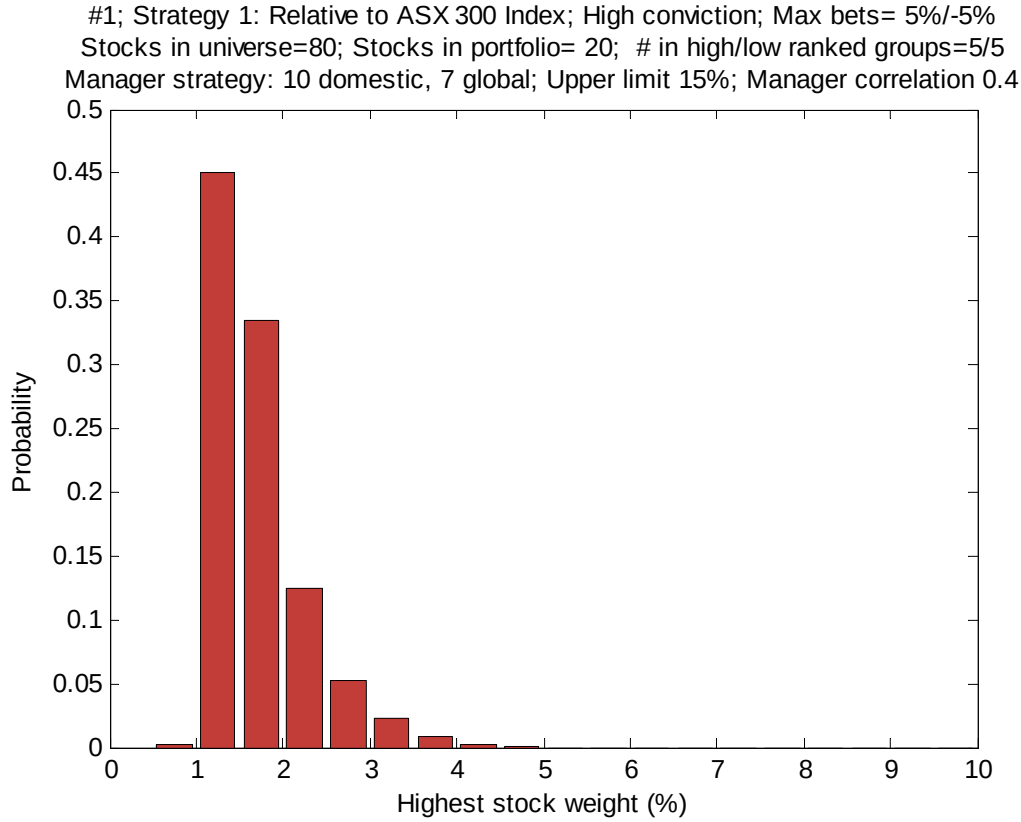
If the mandate constraints kick in for any stock the total stock weights will no longer sum to 1. Any remaining allocation (or over allocation) is spread across the unconstrained stocks in a similar manner.

The index-agnostic managers can be thought of as a special case of the index-aware managers, but with an equally weighted index. I can thus use the same algorithms that are used for the index-aware managers. I simply convert the absolute weight specifications to bets against this equally weighted index.

I treat all the investments in domestic equities by the global managers as being an absolute investment against an assumed zero index weight in their global index. This treatment ignores the immaterial non-zero weights of some Australian companies in the global index.

The result of this analysis is displayed in the form of histograms showing the probability distributions of the highest stock weight in the investor's total portfolio.

The highest bar on this first histogram for the base case indicates that there is a 45% probability that the highest weight to any one stock will fall in the range 1.0% to 1.5%. There is a 4% chance that the highest weight will be between 3% and 5%, and a very small chance that it will be higher.



This result does not have undue risk of excessive stock exposure at the total portfolio level when measured against the requirement that 95% of the time the total portfolio will not hold more than 3% in any one stock.

4.2 Impact of different manager strategies

I now examine a number of different domestic manager strategies. The set of strategies (including the base case above) is:

1. High conviction index-aware active managers (i.e. the base case)
2. Traditional index-aware active managers
3. Extremely concentrated index-aware managers
4. Closet indexers
5. Diversified index-agnostic managers

6. High conviction index-agnostic managers

7. Extremely concentrated index-agnostic managers

In reality, an investor will possibly have a mix of managers using different approaches. But, for the point of this paper, all of the domestic managers are assumed to be of the same type. This does not mean that they have the same "style" (eg value/growth) but that they adopt similar portfolio construction techniques. Put another way, the style, or skill of a manager is expressed in the model by the rankings determined for each stock; the portfolio construction is determined by the rules relating to how many stocks are to be held in various buckets, and at what weights.

Also, in all manager strategies, the global managers operate in the same manner as assumed in the base case, i.e. they are all assumed to be index-agnostic with respect to their allocations to Australian equities.

The following table defines the manager approaches used in the modelling.

Strategy:	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Domestic managers							
Index-aware or agnostic	index-aware	index-aware	index-aware	index-aware	agnostic	agnostic	agnostic
Mandate risk	high conviction	traditional	extreme	closet indexers	diversified	high conviction	extreme
Stocks in portfolio	20	30	15	45	40	20	15
Limits[12]	15% 0%	15% 0%	15% 0%	15% 0%	15% 0%	15% 0%	15% 0%
Bet[13]	+5% -5%	+3% -3%	+7% -7%	+1% -1%	4% 0%	7% 0%	10%14 0%
# in hi/lo group[15]	5/5	5/5	5/5	10/10	5/0	5/0	5/0
Global managers							
# domestic stocks	1	1	3	2	1	1	3
Weight to each	3%	5%	7%	2%	4%	5%	7%

The results of the modelling for each of these manager strategies, and for a number of other perturbations, are displayed in the form of histograms of the total portfolio's maximum exposure to any one stock. As discussed earlier, I use a rule of thumb to assess whether any approach is acceptable in this regard, being that 95% of the time the maximum exposure to any one stock should be less than 3% of the total portfolio. This statistic is summarised in Section 4.7 for every case modelled.

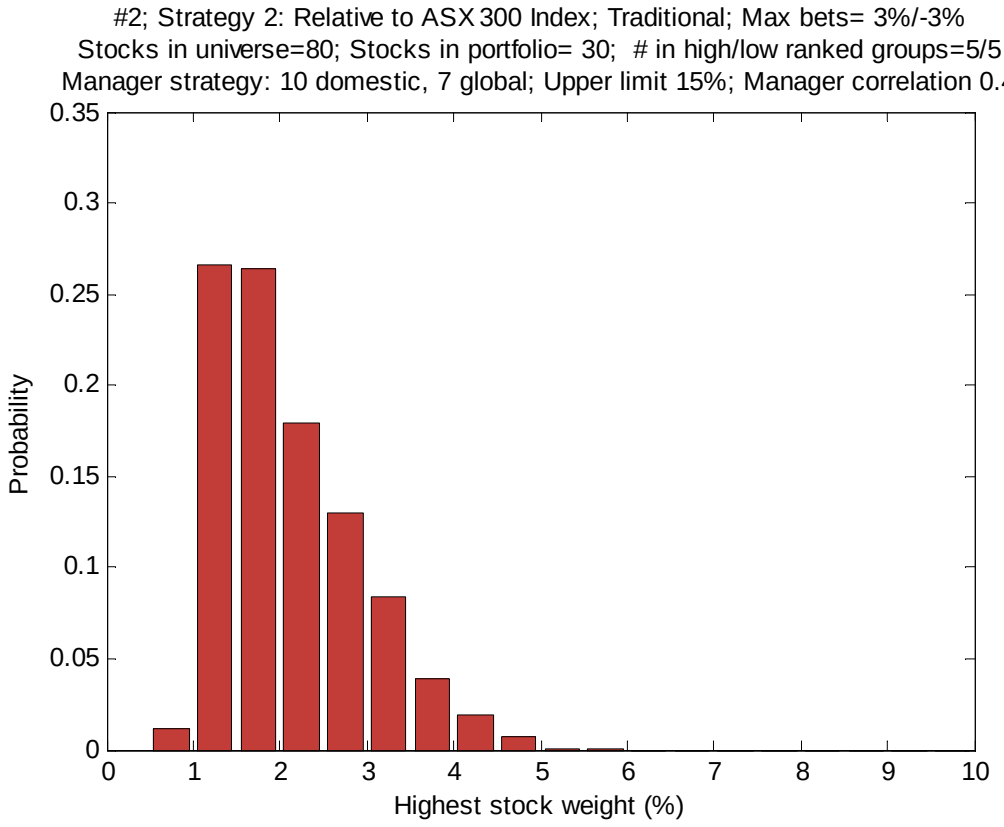
[12] This is the overriding mandate constraint, regardless of whether the manager is index aware or not. The first number is the upper limit (absolute weight) to any one stock. The second number is the lower limit (absolute weight) to any one stock. A zero here means no shorting.

[13] This is the bet applied to each stock in the high or low ranking groups. The bet is relative to index weight for index aware managers, and an absolute weight for index-agnostic managers.

[14] Fifteen stocks at equal weights will be held at 6.7% of the portfolio. Allow a rebalancing/momentum range such that the manager will sell down when any one stock in the portfolio reaches 10%.

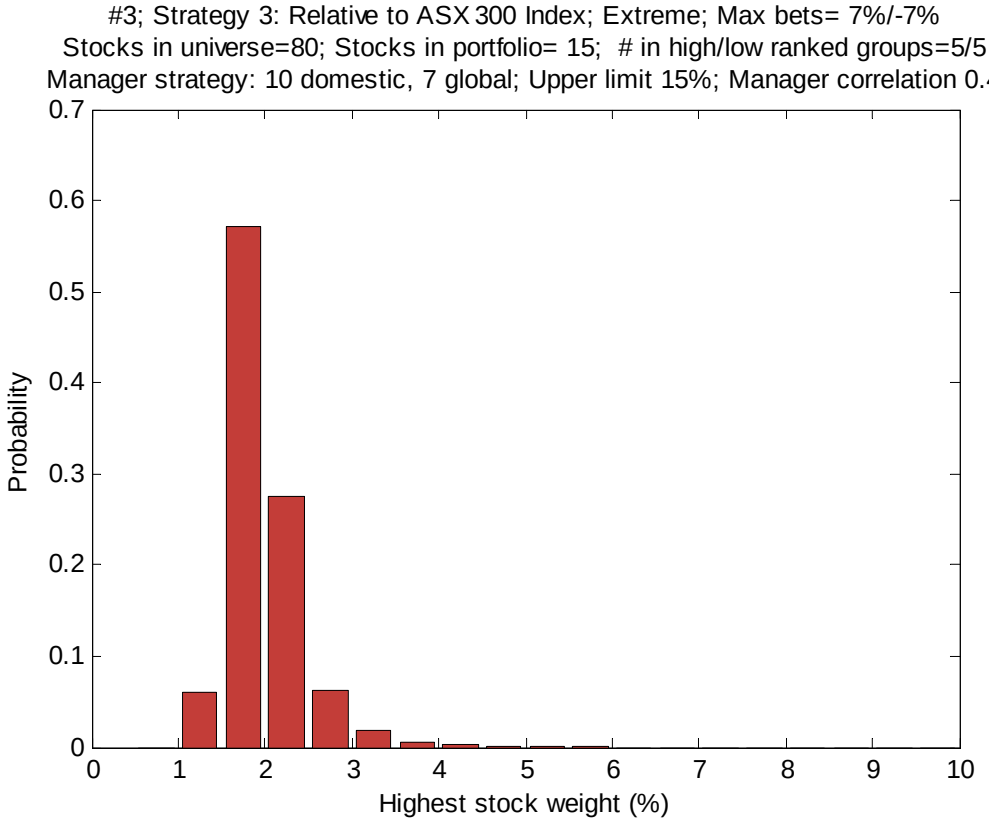
[15] This is the number of stocks in the high and low ranking groups. Stocks in these groups will, to the extent possible, receive weights based on the bet sizes specified above.

Strategy 2 is for a traditional index-relative manager. The domestic managers hold 30 stocks in their portfolios with bets for the five high and five low ranked stocks at +/- 3 percentage points.

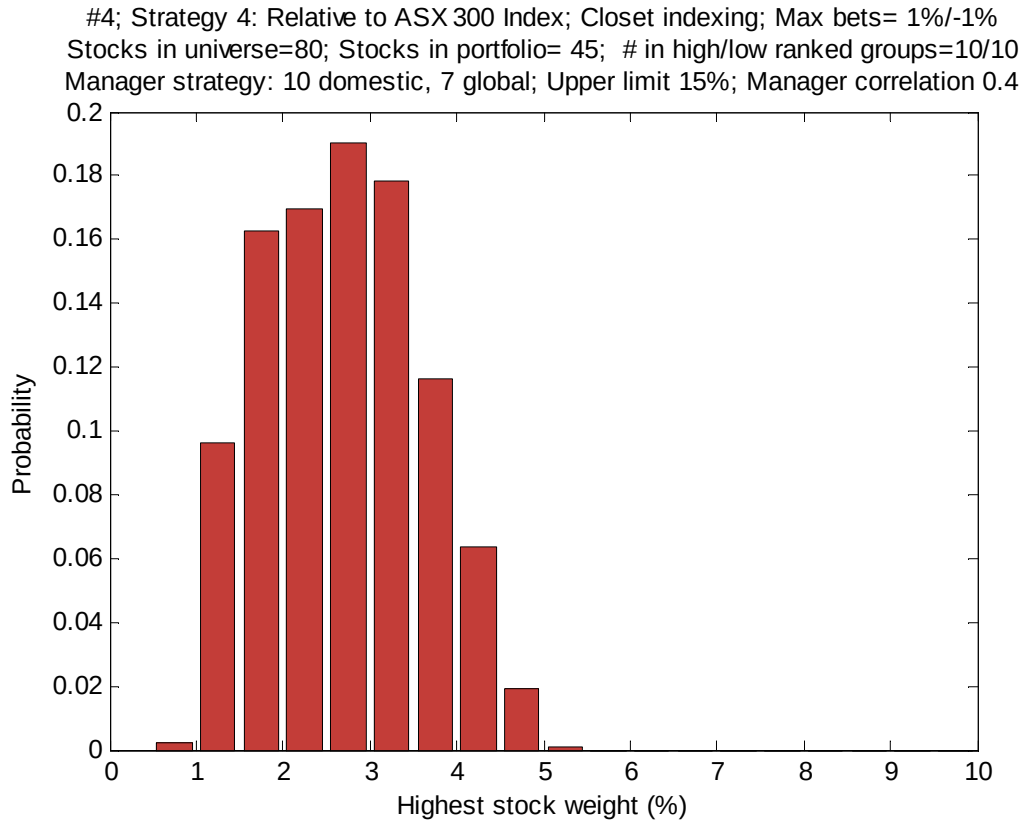


This approach yields a 15% chance of the highest weight to any one stock being above 3%, and the rare case of even higher allocations approaching 7%. Using single manager stock concentration as a measure of risk we can see that this approach is clearly **more** risky than using high conviction managers, i.e. the base case.

To demonstrate this paradox further, you can see in the histogram below that the "extreme" high conviction approach is even less risky than the base case with only 3% of a maximum stock weight being higher than 3% (compared to 4% in the base case). There is a tiny chance that the maximum stock weight could be greater than 5%.

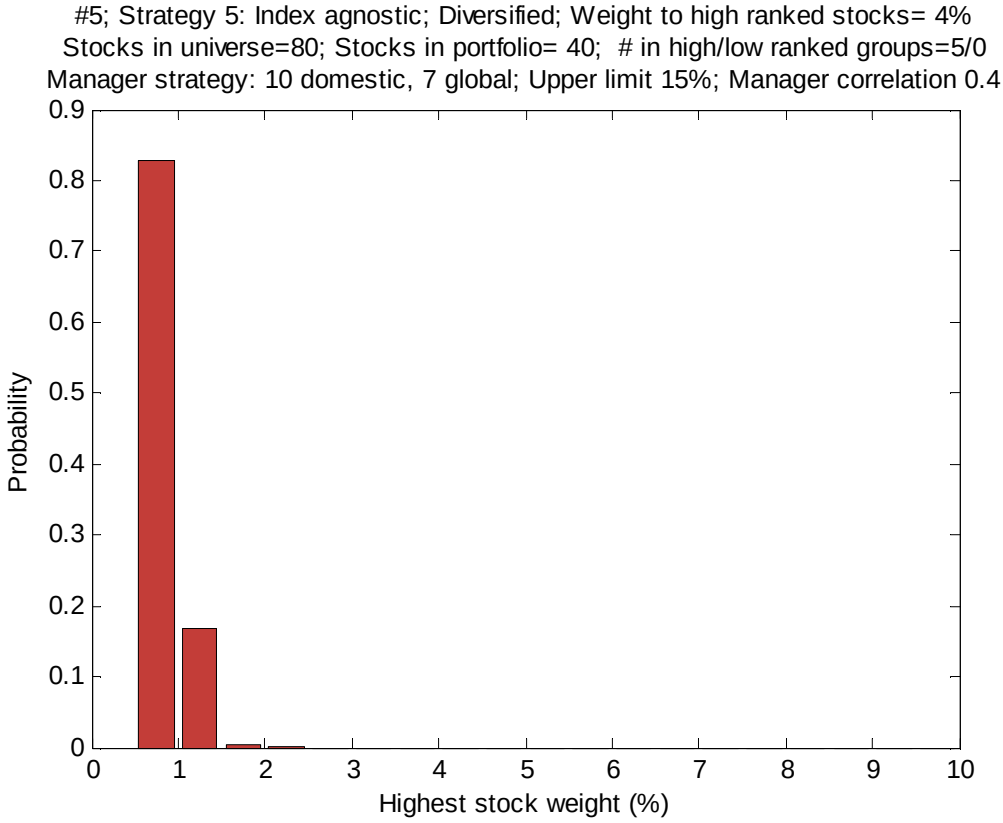


And, the "closet indexing" approach at the other end of the scale is quite risky with a whopping 38% chance of a maximum stock weight in excess of 3%:

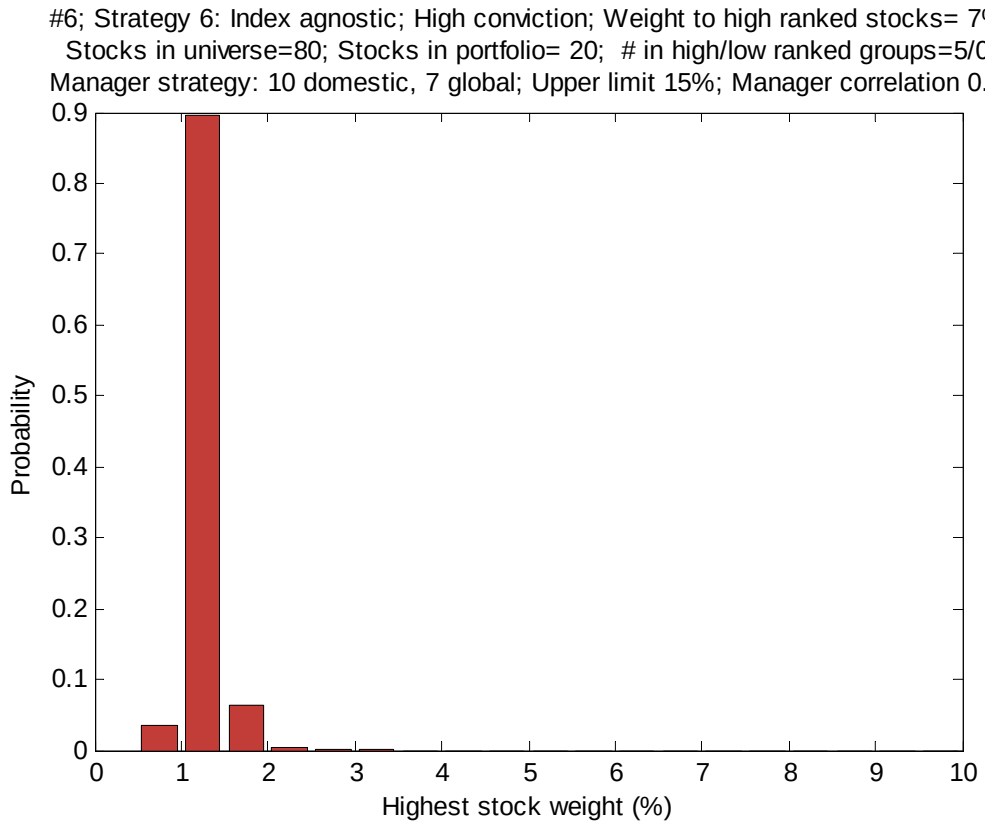


This case is closest to pure indexing which would have the total fund with a 4.4% allocation to BHP deriving from domestic managers alone.

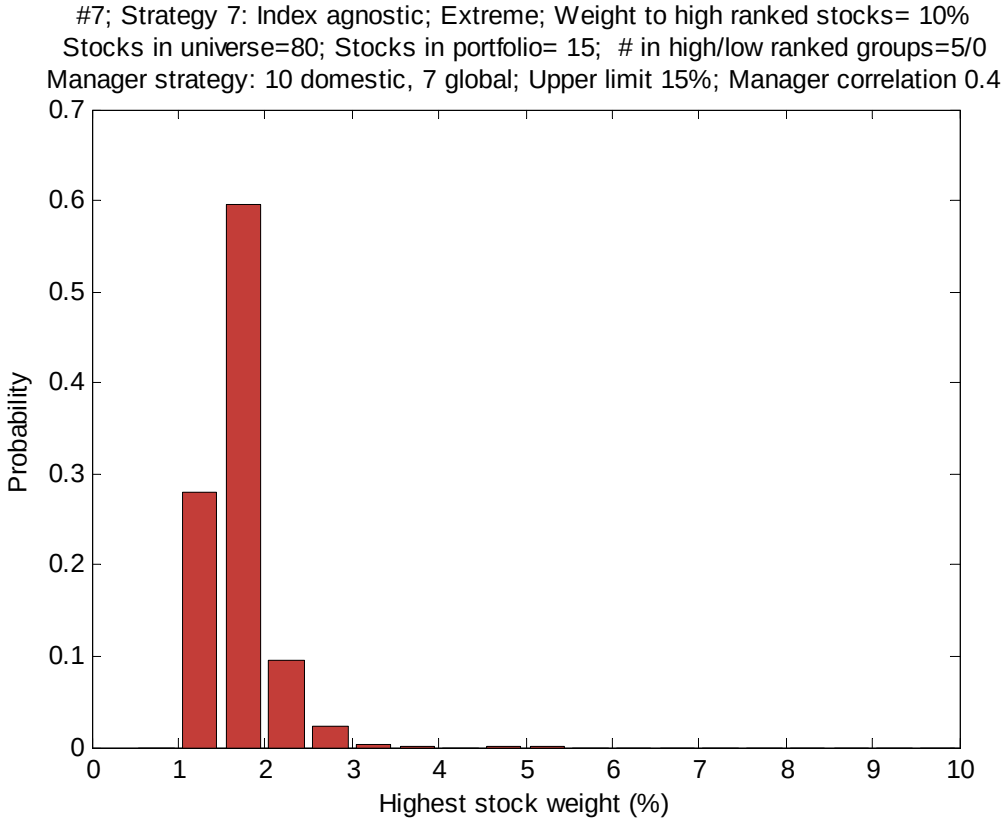
So, what about index-agnostic forms of investing? We start with a "diversified" index-agnostic approach where each domestic manager holds 40 stocks, with 5 held at a maximum weight of 4% and the remaining 35 held at 2.3%. Under this approach the maximum weight to any one stock in the overall portfolio is likely to be under 1%, with virtually no chance of being greater than 1.5%. This approach is very low risk, measured on this basis, but would be quite high risk as measured against traditional (and generally flawed) risk metrics such as tracking error or peer risk.



A high conviction, index-agnostic approach also yields very low risk associated with excessive holdings in any one stock. This approach will also be risky measured against traditional and flawed risk metrics, such as peer risk, but should yield higher returns than the diversified approach (Strategy 5) if the managers are skilled.



I finally turn to a more extreme form of index agnostic approach with only 15 stocks in the portfolio, with the five highest ranked held at 10% each. This demonstrates some greater chance of higher stock concentrations in the total portfolio than the other index-agnostic approaches. But, even this approach is far less concentrated than any of the index-relative approaches.

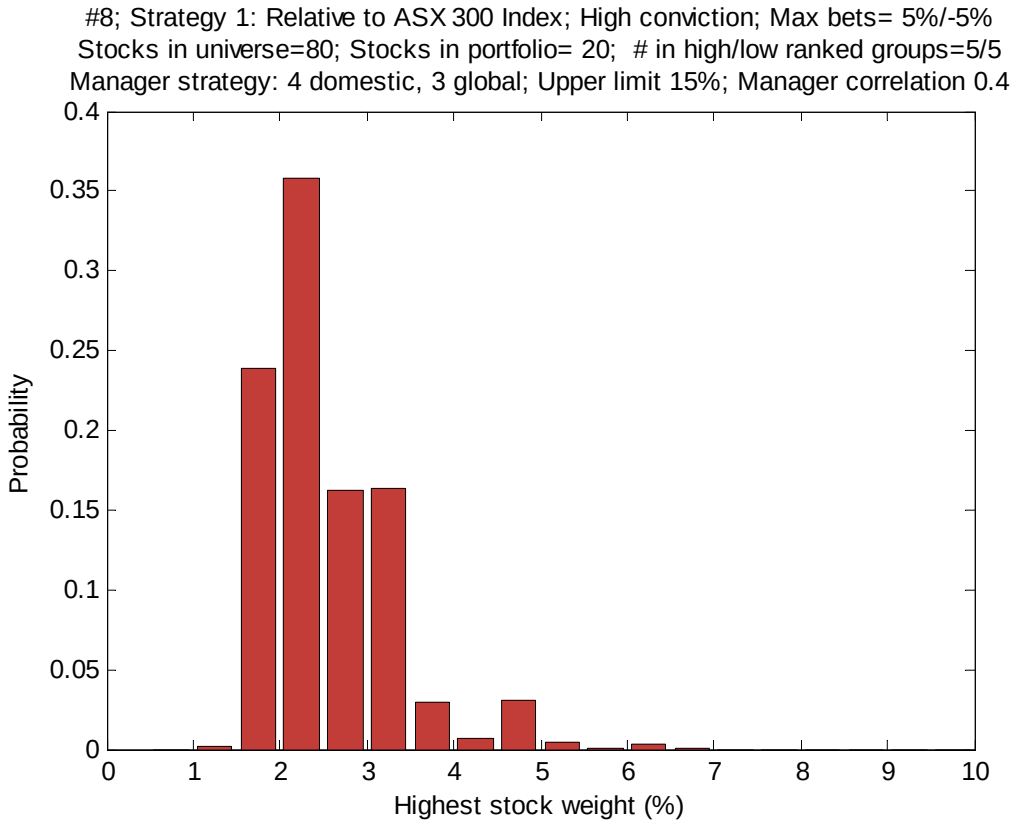


Clearly if you are able to encourage your managers to ignore the index the issues around stock concentration in the local domestic index become academic. Of course, achieving this end is very difficult as virtually all Australian equity managers construct their portfolios with some eye to the index. Even most of those that tout 'high conviction' investments still baulk at the business risk associated with being completely out of BHP even if they believe other investments will make more money (i.e. real money, not relative money). And the behaviour of clients of these managers will certainly be important in determining how the managers themselves behave.

4.3 Impact of manager diversification

The MLC approach has 10 domestic equity managers, more than most funds. Does this make a difference? To test this I compare the base case to an imaginary fund with 40% allocated to four Australian equities managers and 30% to three global equities managers, each with 10% of the total portfolio.

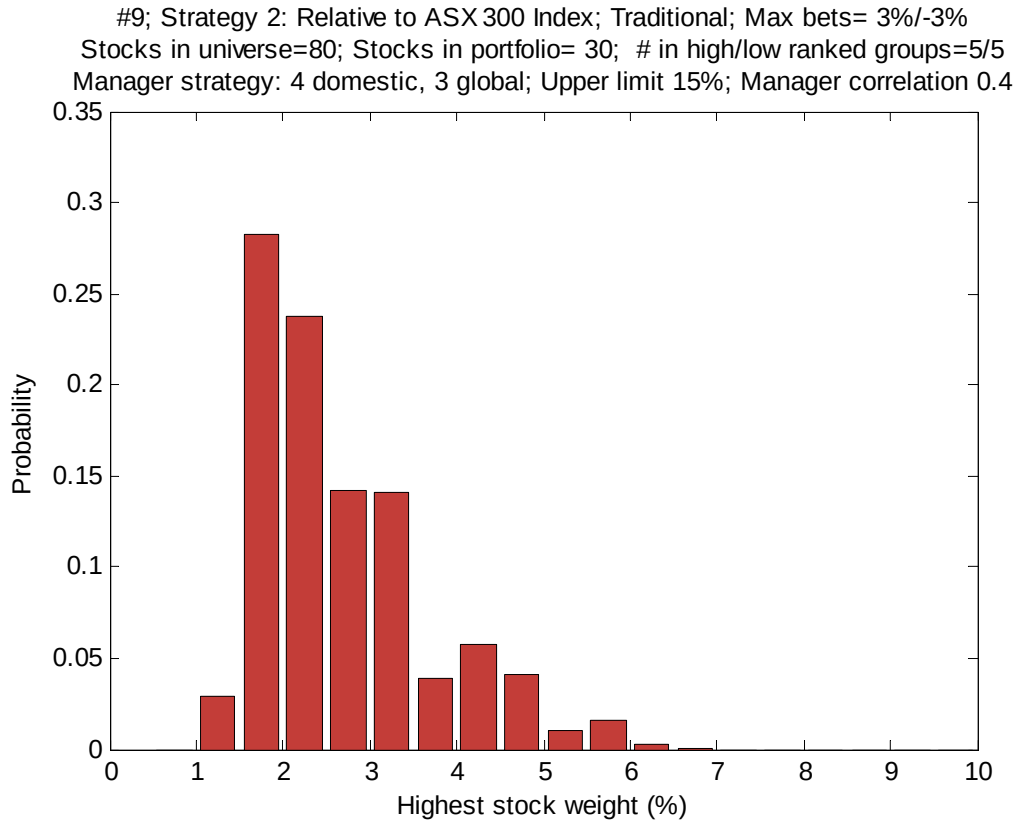
I model this fund using the same high-conviction, index-aware manager approach used for the base case, but just with different manager and asset class weights.



The results are considerably more concentrated than for the base case. There is a 13% chance that the maximum stock concentration will be above 3%. This compares to only a 4% chance for the base case which has much more extensive manager diversification.

Clearly, the more domestic managers you can hold, the less likely it is that you will experience excessive exposure to one company in your overall portfolio.

But this analysis assumes all of the managers build high conviction portfolios. Most investors would not have the tolerance to adopt a high conviction approach with only 4 domestic managers. If they adopted a more traditional approach the outcome would be even more concentrated:

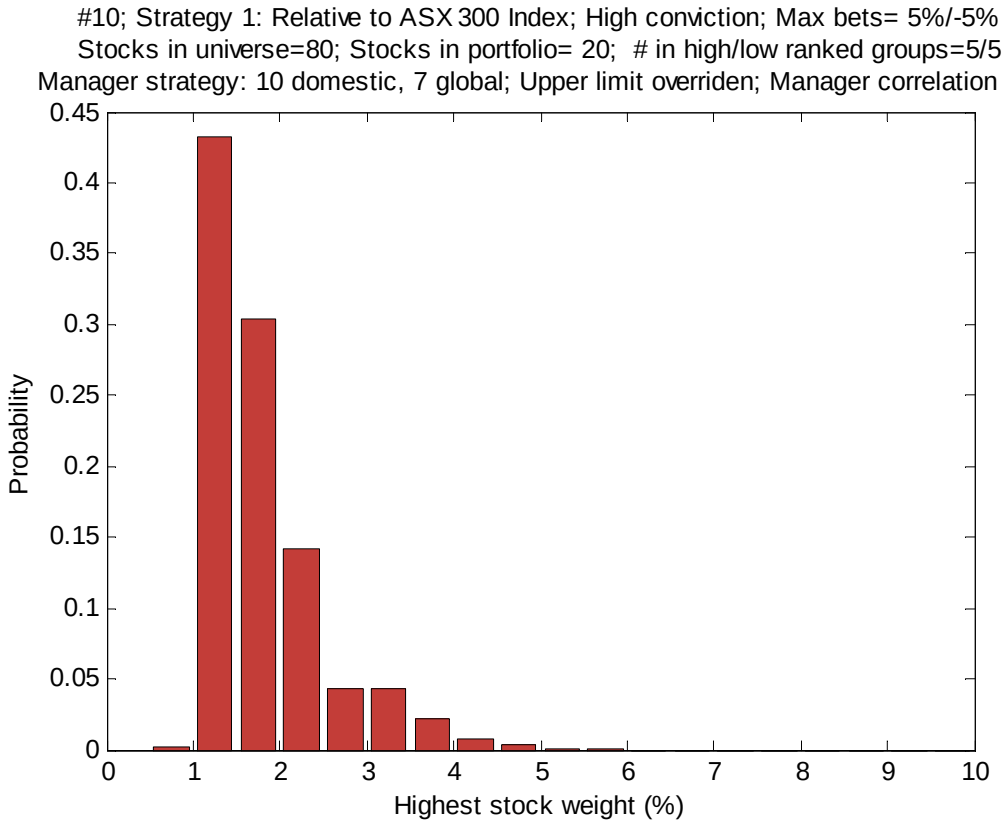


This strategy has a 20% chance of a stock weight in the total portfolio greater than 3%, and a 3% chance that it would be greater than 5%. Strategy 2 with 10 domestic equity managers (Section 4.2) has only a 14% chance of a stock being greater than 3% of the total portfolio. Again, this demonstrates that manager diversification is a very effective (but insufficient) technique to ameliorate the issue of excessive exposure to just one company.

4.4 What about imposing mandate constraints?

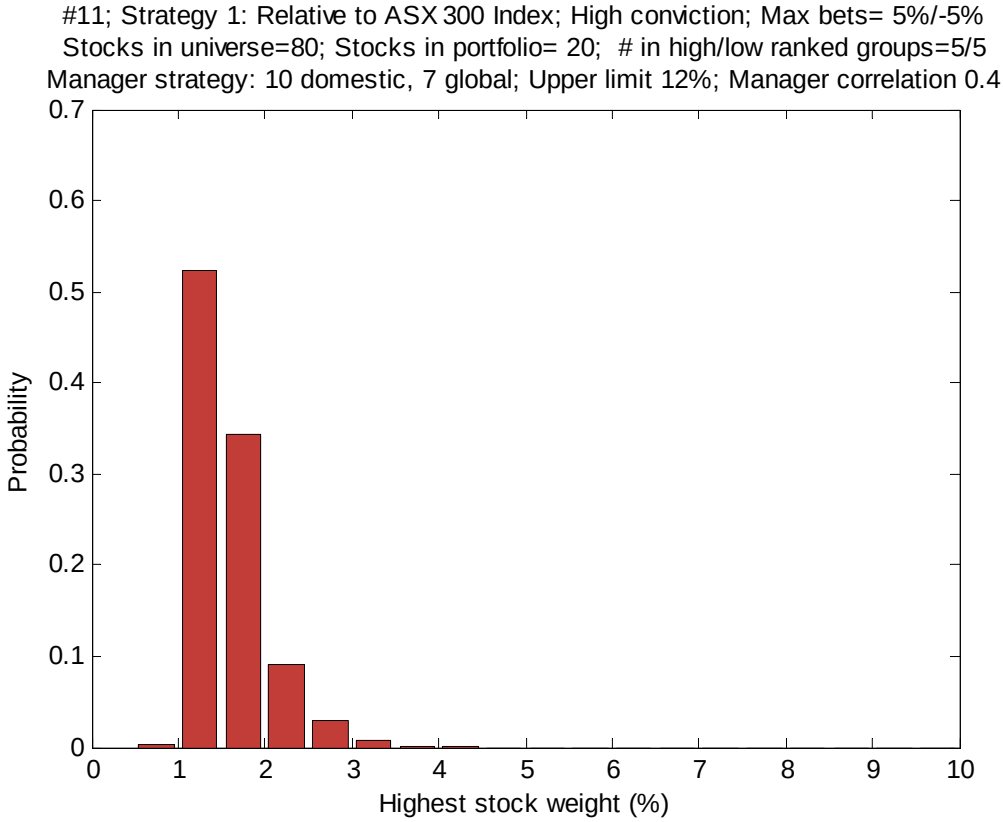
MLC limits most of its managers to a maximum 15% exposure to any one stock in the manager's portfolio. Clearly, this mandate constraint limits the ability of high conviction index-relative managers to overweight BHP. (And, as I analyse later, if BHP and Rio Tinto merge, no manager would even be allowed to hold the combined stock at index weight!)

Is this restriction effective in managing stock concentration at the total portfolio level? This limit was applied in all of the previous analysis. The impact on the base case, without this limit, is shown below:

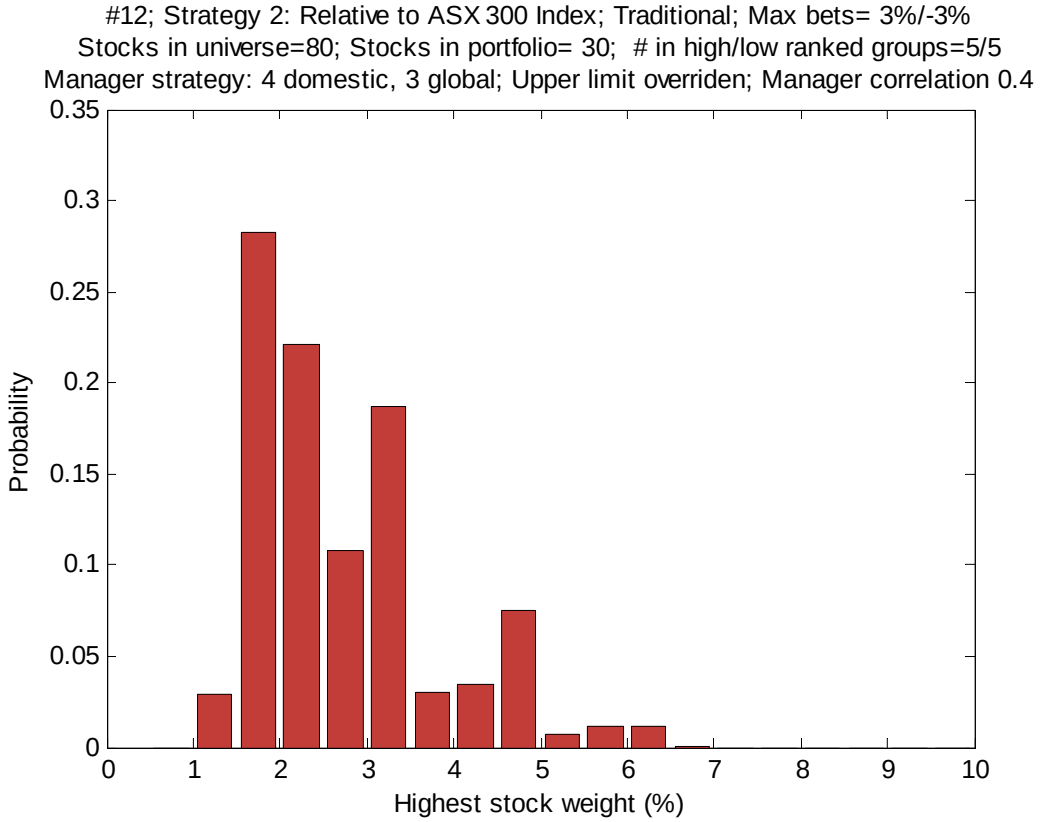


This indicates that the 15% limit has only modest success in controlling the total portfolios exposure to just one stock. The probability that this exposure is greater than 3% without the limit is 8%, somewhat higher than the 4% of the base case (and not acceptable according to my rule of thumb). Imposing the limit is somewhat helpful in controlling the risk at higher levels.

If the limit were made more restrictive, to say 12%, then the chance of maximum stock concentration in the range 3 to 4% reduces to 1%. But in this case all managers would be denied attaining index weight to BHP and could certainly not overweight it.



What if a client did not have extensive manager diversification? The impact of removing this limit is shown for the typical portfolio (with 4 domestic equity managers of 10% each) and traditional (not high conviction) index-aware managers:



Compare this to the second figure in Section 4.3. There is a 36% chance of the maximum stock weight being greater than 3%, much greater than the 20% chance if the limit was imposed.

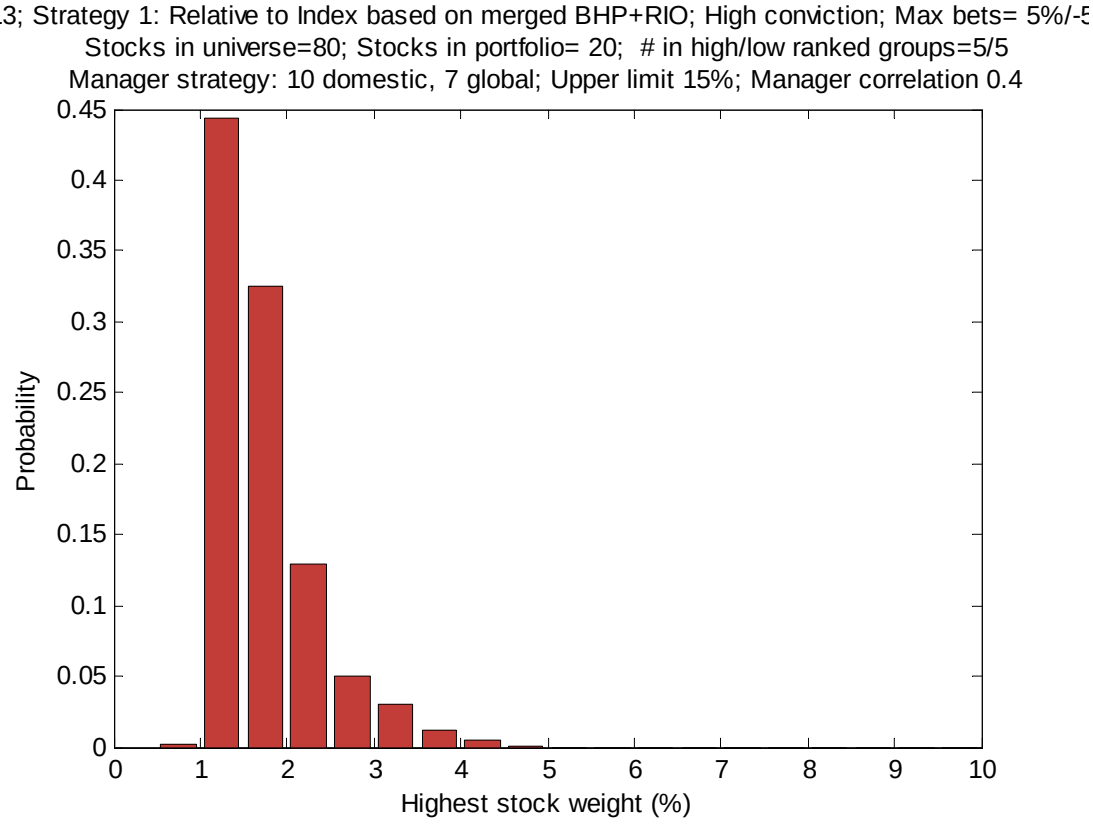
The chance of the maximum weight being greater than 5% is about 3% in both cases.

Clearly the imposition of manager limits is much more effective if the investor uses fewer domestic managers and adopts a less high conviction approach.

4.5 What if BHP and Rio Tinto merge?

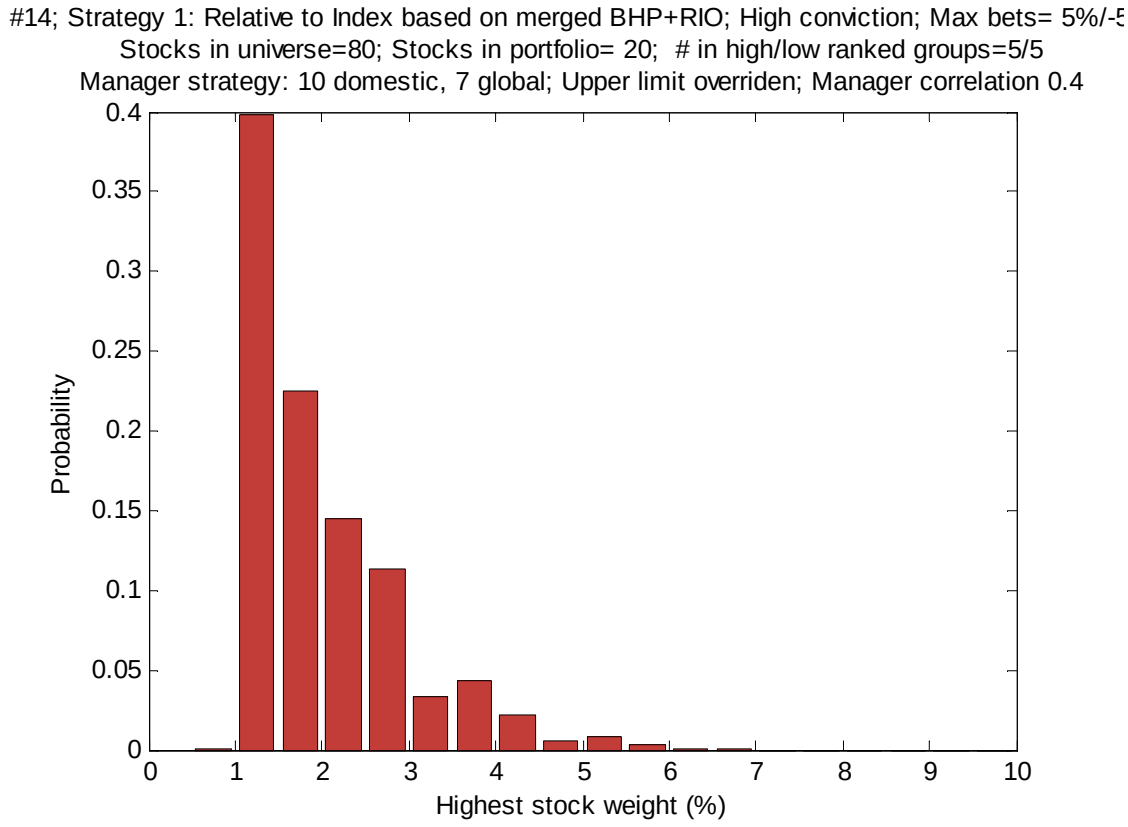
If BHP and Rio Tinto were to merge their combined stock weight will be 16%. The immediate impact of this would be to draw attention to any mandate constraints that limit an index-aware manager from holding the stock at index weight. This will be the case for the MLC mandates, and is one of the catalysts for this analysis.

Once again, I show the impact of this change on the base case, i.e. an allocation akin to MLC Horizon 5 fund, using high conviction managers. For now, I continue to impose the 15% limit on each manager's portfolio.



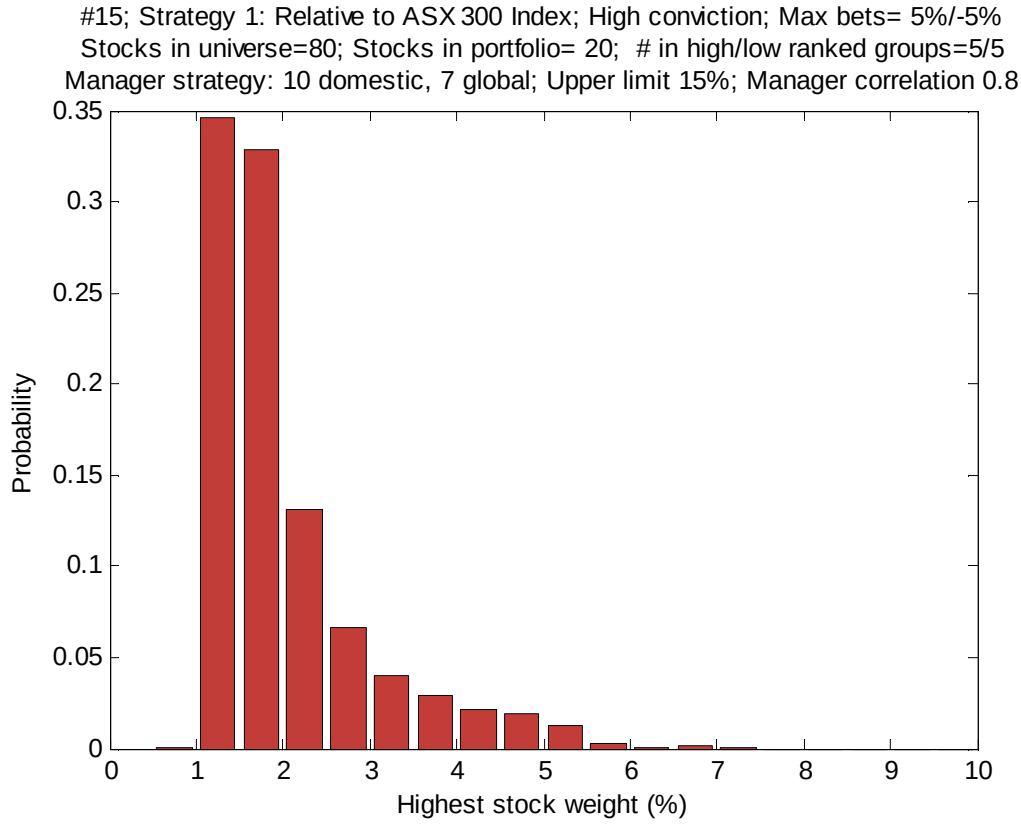
There is a 5% chance that the maximum stock weight will be greater than 3%. This is slightly worse than the 4% in the base case.

If the mandate limits were removed this probability rises to 12%, with a 1% chance of breaching the 5% barrier. This is clearly worse than the 8% probability shown in Section 4.4. The histogram for this case is:



4.6 How important is manager skill/style diversification?

The model encapsulates a manager's skill or style in the rankings generated for each stock. In all of the preceding analysis these ranking processes were modelled to have 0.4 pair-wise rank correlations. Lack of diversity of manager skill/style can be modelled by increasing these correlations. Doing so should create more instances of portfolios doubling up on each other. To test this I re-ran the base case with pair-wise rank correlations increased to 0.8.



This has a considerable impact on the maximum exposure to any one stock. The probability that this exposure is higher than 3% grows to 13% from the 4% in the base case. And we are starting to see evidence of more disturbing higher exposures.

4.7 Summary of results

Clearly, this analysis above shows that manager diversification is important, not only in terms of the number of managers, but also in the differences between the managers.

#	Strategy	Perturbation	Probability Highest Stock Weight > 3%	
1	1. Index aware, high conviction (20 stock portfolios)		4%	✓
2	2. Index aware, traditional (30 stock portfolios)		15%	✗
3	3. Index aware, extreme (15 stock portfolios)		3%	✓
4	4. Index aware, closet indexers (45 stock portfolios)		38%	✗
5	5. Index agnostic, diversified (40 stock portfolios)		<0.1%	✓
6	6. Index agnostic, high conviction (20 stock portfolios)		<0.1%	✓
7	7. Index agnostic, extreme (15 stock portfolios)		1%	✓
8	1. Index aware, high conviction (20 stock portfolios)	fewer managers	13%	✗
9	2. Index aware, traditional (30 stock portfolios)	fewer managers	20%	✗
10	1. Index aware, high conviction (20 stock portfolios)	no upper limit	8%	✗
11	1. Index aware, high conviction (20 stock portfolios)	tighter upper limit	1%	✓
12	1. Index aware, high conviction (20 stock portfolios)	fewer managers with no upper limit	36%	✗
13	1. Index aware, high conviction (20 stock portfolios)	BHP+Rio merge	5%	✓
14	1. Index aware, high conviction (20 stock portfolios)	BHP+Rio merge; no upper limit	12%	✗
15	1. Index aware, high conviction (20 stock portfolios)	Manager correlation very high	13%	✗

5 How to ameliorate single company risk

The previous section set out the impact of different portfolio construction techniques. I draw on these results in this section to comment on a number of methods to ameliorate the risk associated with being excessively exposed to just one company. This assessment is limited to the exposure to a company due to ownership of its common stock. I do not attempt to incorporate any credit risk that may exist through ownership of the company's debt, nor do I assess the risk associated with exposure to drivers of a company's return (eg commodity prices) that may be common to a number of other companies owned by the investor.

The methods discussed are:

1. Reduce the allocation to domestic equities
2. Live with the occasional periods of high stock concentration
3. Limit the maximum concentration that each equity manager has to any one stock

4. Ensure manager diversification by using several managers for domestic equities that have different styles and skill
5. Use index-agnostic managers
6. Manage the maximum concentration to any one stock at the total portfolio level
7. Use a capitalisation-capped index to benchmark the managers
8. Benchmark the managers using an index with a weighting system that is not based on capitalisation

Depending on the circumstances of the investor, a cocktail of these approaches could be adopted.

5.1 Reduce the allocation to domestic equities

Clearly, reducing the allocation to domestic equities will proportionately reduce the exposure to any one domestic stock in an investor's overall portfolio. The removal of this risk will generally not be replaced by excessive exposure to a non-domestic asset as the pool of available stocks to global equity managers is huge, and commonality of holdings is relatively unusual. Even if the global stocks were held in an index, the global indices do not have the same extent of stock concentration that we see in the indices of small markets such as Australia.

I have not bothered to demonstrate this impact as (a) it is obvious, and (b) the issues surrounding the allocation to domestic equities are much larger than this issue. Investors tend to hold disproportionately large allocations to domestic equities for many reasons, including tax, consumption-matching, peer risk, cost, currency risk, familiarity, confidence in manager skill and patriotism. The by product of excessive stock concentration is generally considered a second order issue to be dealt with by other approaches.

I thus do not consider this approach to be a practical amelioration for this issue and do not mention it again.

5.2 Live with the occasional periods of high stock concentration

In cases where a number of complementary domestic equity managers are used the investor may be happy to accept the occasional period of high stock concentration (at the total fund level) if it can be shown that these periods are, indeed, unusual and that the reason for the high concentration is due to a confluence of similar bets arising from very different insights by the different managers. The type of analysis conducted in Section 4 could be used to ensure that high total fund stock concentration was an aberration.

Indeed, there may well be incremental information in such a confluence arising from different investment processes that would support an argument for amplifying aggregate bets in such cases. This notion is not explored in this paper.

In order for this approach to be acceptable the investor would need to be convinced that the aggregated concentration arose predominantly from stock picking and not just index-risk management by the managers. I suggest that the following conditions would be required to adopt this stance:

- The fund use a broad range of domestic equity managers, with none having a dominant weight. Four managers is probably insufficient; ten is more than enough.

- Each of the managers adopt approaches that diversify the insight into selecting stocks.
- All of the managers adopt high conviction approaches, preferably ignoring the index in portfolio construction as much as possible.

5.3 Limit the maximum stock concentration

This approach involves specifying, for each equity manager, the maximum exposure they may invest in any one stock in their portfolio.

As discussed earlier, MLC limits most of its managers to holding no more than 15% of their portfolios in any one stock. The efficacy of this approach is modest in MLC's case. It does seem to reduce the chance of stock exposures occurring in the 3%-5% range, but MLC's approach would rarely generate higher concentrations even without this limit.

However, such a limit could be considered for strategies with poorer domestic manager diversification.

5.4 Manager diversification

The previous analysis showed just how important effective manager diversification can be in reducing this risk. Section 4.3 shows a clear deterioration between a 10 domestic manager portfolio and a 4 domestic manager portfolio. And Section 4.6 shows that manager diversification requires not just more managers, but the managers must be complementary to each other.

5.5 Use index-agnostic managers

The analysis in Section 4.2 clearly indicates that the most effective approach to reducing the risk of excessive concentration to just one stock is to use index agnostic managers. Such managers will build portfolios without any regard to the company's weight in the market index. A simple (but not common) approach to portfolio construction may be to hold stocks in the portfolio at equal weights. Subtle enhancements could include lower weights for new entrants and different approaches to letting winners run (price momentum) and rebalancing (mildly contrarian). But provided that the manager maintains a maximum weight to any one stock, then the issue becomes quite manageable from the perspective of the investor's holistic strategy.

But this solution is far from easy to implement. Few managers are genuinely prepared to adopt true index-agnostic approaches. Given that the market for investment managers is a free and efficient one, the reason for this dearth must be laid at the door of the buyers of investment management services, and their influencers.

In my experience managers respond directly to incentives. Investment management revenue is akin to an annuity stream, but only while the manager is retained. For this reason, managers are most strongly motivated to avoid losing clients. So managers mould their businesses around their observations of client behaviour. Client and consultant behaviour is easily observed by reading the trade rags. Indeed, this behaviour is usually overt with focus on short term **relative** returns (and 3 years is short term in assessing manager skill) leading to "please explain" interviews and watch lists.

So… if you can convince your managers that you do not exhibit these behaviours you may be able to get your manager to construct index-agnostic portfolios. But don't hold your breath. Few managers have the head space to build genuinely unique product when virtually all of their business is driven by short term, index-focussed clients and consultants.

5.6 Manage stock concentration at the total portfolio level

With sufficient implementation resources it may be possible to manage the total portfolio's single-stock concentration using one or more "overlay" measures including:

- leaving the manager portfolios unchanged, and shorting the excessive level of stock ownership at the total fund level
- issuing ad hoc instructions to one or more of the managers requiring them to sell down some their holdings to a level lower than otherwise allowed by the mandate
- dynamically budgeting the manager mandates in a way that reallocates the maximum stock allocation budget from managers that do not use it to managers that would like to use it

The first of these measures requires the investor to monitor the aggregated stock exposures of its managers on a continuous basis and to trade (sell short) when aggregate concentration goes beyond a specified limit. Most investors are not well positioned to do this and I doubt whether this would be a practical approach for even the most sophisticated multi-manager operators. Moreover, such naïve overlay activity is not informed by fundamental company analysis and may lead to suboptimal portfolio construction which could be expected to damage the outcomes for the total portfolio over time. If the underlying managers were aware that their decisions were being reversed by their client they may well have made other portfolio construction decisions.

The second of these measures also requires the investor to monitor the aggregated stock exposures on a continuous basis. This is an onerous requirement and will generally not be practical, even for the most sophisticated multi-manager operators. It does, however, have the advantage of not requiring the investor to trade, pushing this activity to its managers. This also has the benefit of the managers making deliberate alternative decisions in their portfolio construction.

But perhaps the clinching disadvantage of the second approach is that the ad hoc instructions are provided after the fact. The managers will sometimes be forced to sell down just after they have purchased. This will not endear the managers to their client, will cause unnecessary turnover (with transaction cost and tax consequences) and will still leave the total portfolio exposed for a period of time to high single company exposures.

These disadvantages are less of an issue under the third approach, in which the managers are allocated a budget to the large capitalisation stocks. The aggregate of this budget will be consistent with acceptable stock level concentration at the total portfolio level. Allocation of budget is transferred from those managers who do not favour the stock in question to those that do, or which are have a more index-aware portfolio construction approach.

But even this third approach is not flawless. It limits the ability of those managers who have had budget removed to buying into some stocks as their views change. This could be a significant (and unevenly

applied) constraint which would open the door for managers not taking full accountability for their performance.

In general, the disadvantages of managing stock concentration at the total portfolio level appear to outweigh any benefits.

5.7 Use a capitalisation-capped index to benchmark the managers

Under this approach the investor defines the mandates it provides to its managers to refer to a capitalisation-capped benchmark index[16]. The capitalisation-weighted index may be available from an external index constructor, or could be constructed by the investor.

Regardless of who builds the index, construction rules need to be clearly defined and available to the managers. This is particularly important for any indices that are other than capitalisation-weighted, as it is only capitalisation-weighted indices that do not naturally require rebalancing[17]; if BHP performs relatively strongly, then at the time of index-rebalancing the weight to BHP will have grown beyond its cap and the index will need to be re-weighted.

The caps on this index would clearly need to take account of the capacity of the total portfolio to have its domestic equity component performing differently to the typical market index. If this peer/business risk can be accepted by the investor, then it may make sense to set the cap level to be such that, should any or all of the domestic managers elect to overweight BHP, then they will do so at acceptable levels.

For example, MLC imposes a 15% limit on any one stock in the mandates it awards to most equity managers. A benchmark index capped at 10% would allow a manager with a high conviction, index-aware approach consistent with +/-5% bets to fully and symmetrically express their views to all stocks.

This, of course, assumes that index-aware managers are, in fact, index aware. If they are then one would expect that they will construct different portfolios for different clients if they are measured against different benchmark indices. This may be a naïve assumption in some cases where a manager's portfolio construction process contains subjective elements. Before commencing along this path the manager's behaviour must be fully understood. Examining cases where the manager constructs different portfolios driven by different benchmark-indices is critical.

5.8 Use a non-capitalisation weighted index

Setting an arbitrary cap on a stock's weight in an index is, of course, just one approach to defining the benchmark in a way that is not dominated by the capitalisation of a small number of stocks. Any number of alternative approaches could be considered. One approach, which is currently receiving wide debate, is that

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[16] Clearly, this notion does not apply to managers who are truly index-agnostic, and for whom the mandate does not refer to a benchmark index.

[17] Even capitalisation weighted indices require occasional reconstitution.

of fundamental indexation, which has been described in the earlier literature survey. Another approach may be to use equally weighted indices.

Clearly any alternative benchmark construction approach will have its pros and cons. The first consideration is whether the benchmark is likely to provide efficient returns for the investor. Efficiency in this context is defined as the highest return possible for the desired level of risk. And risk should be viewed in the context of the total portfolio's likelihood of achieving its investment objectives. Other notions of risk, such as tracking error and variance of returns are easier to estimate and monitor, but are clearly too narrow. And, in the case of an investor with a large allocation to a small market, it is critical that risk (at the total portfolio level) include the risk associated with a high exposure to the equity of just one company.

The next consideration is whether the benchmark index will be accepted by active managers as a sensible point of departure in their portfolio construction. Extreme index constructions, such as an equally-weighted index, would be unlikely to be accepted by managers for both theoretical and practical reasons[18]. An obvious practical reason is the lack of liquidity and tenuous price discovery of many smaller stocks. Clearly some level of market capitalisation must be reflected in index weights for anything other than tiny portfolios.

Finally, simplicity and objectivity must be the hallmark of any sensible benchmark that results in desirable behaviours of index-aware managers. The capitalisation-capped index described in Section 5.7 is such an benchmark, albeit with an arbitrary cap. I find it difficult to propose other non-capitalisation weighed indices that improve on this simplicity and objectivity.

6 Conclusion

Increasing concentration in the Australian share market has the potential to make the total portfolios of many Australian investors excessively exposed to the fortunes of a handful of companies and sectors. This paper assesses how serious this issue can be and suggests various approaches to ameliorating any problems.

In Section 3 I suggest that if the level of "idiosyncratic shock" associated with BHP Billiton was limited to 1% of an investor's total portfolio, then the investor should generally hold no more than 4% of his or her portfolio in that stock. This level of shock is arbitrary, and will depend on each investor's preferences. And it is not necessary to impose a hard limit; there may well be circumstances in which a higher exposure is acceptable.

A reasonable rule of thumb may be to ensure that 95% of the time the total portfolio will not have any more than 3% invested in any one stock.

Investors can consider a cocktail of solutions to achieve this objective. In the paper I have found the most effective to be:

[18] An equally weighted index assigns a weight of $1/n$ (where n is the number of stocks in the index) to each stock in the index, and a weight of 0 to any stocks outside of the index. This binary cliff is clearly unappealing and is not a feature of capitalization weighted indices. From a theoretical point of view, it is clear that an equally weighted index bears no relationship to how the market allocates capital. From a practical point of view, only the tiniest of investors would be able to invest in the small capitalisation stocks without moving the market.

- Reducing the allocation to Australian equities, but only as part of a broader asset allocation review that considers all relevant issues. In many cases the forces pushing to home country bias (e.g. peer risk management) will overwhelm the need to manage single stock risk. This means that this solution will often not be available.

- Using index-agnostic managers, or a multi-manager solution that uses truly index-agnostic managers. While a true index-agnostic manager strategy is extremely effective at eliminating this issue, the practicality of adopting such a strategy is problematic for two reasons:

    - First, such a strategy creates huge tracking error to the index, and to peers. While this tracking error is unlikely to translate into higher absolute return risk for the investor, the business and/or personal risks associated with assuming this degree of peer risk may be unacceptable to the investor.

    - Second, in my experience, there are very few investment managers who are genuinely prepared to ignore the benchmark index (and thereby assume significant business risk).

- Setting a capped-weight index as the benchmark to measure manager performance, and allow the managers to take significant overweight positions relative to this benchmark. A modest cap (e.g. 10%) combined with a maximum exposure to any one stock (e.g. 15%) will allow managers that wish to express overweight positions to any stock while not creating idiosyncratic risk in the investor's total portfolio. But the investors must understand that their portfolios may well underperform the index and peers at times when the capped stocks outperform the market.

- Using many managers who are diversified by skill and style.

- To the extent that managers refer to the index when constructing portfolios, make sure that they have high conviction in their stock decisions. If they do load up on the large stocks in the index, at least they will be doing so deliberately rather than just chasing the index.

To the extent that an investor can use one or more of these approaches to ensure that, most of the time, the level of single stock exposure is not excessive then the investor may well be prepared to live with the occasional period in which the exposure is higher.

But any higher exposures should be the result of deliberate stock picking by a number of managers who have come to similar conclusions about the stock, but for different reasons. At such times there should be little, if any, "passive" holding. This is clearly achieved if all managers are index-agnostic. And it is probably acceptable if all index-relative managers run high conviction portfolios and hold the stock at or near maximum bet (positive or negative).

However, if any of the managers hold the stock to manage risk (i.e. as a "filler", or as part of an passive mandate), then any excessive concentration to one stock at the total portfolio level is likely to be unwise. In such circumstances, the investor should reconsider whether any of the solutions listed above can be applied to a greater extent. If this is not possible, then the investor will be forced to consider less effective solutions, such as:

- Impose restrictive limits in each manager's mandate.
- Manage the excessive concentration at the portfolio level using approaches discussed in Section 5.6.

All of these latter approaches come with significant disadvantages and should be avoided if possible.

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