Concentration in the South African equity market and its implied restrictions on the long only equity fund manager's opportunity set

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South Africa's Equity market provides a large (in terms of volume) but concentrated investment environment. Domestic pension funds are restricted from diversifying globally and are thus faced with a restricted set of investment opportunities. This article describes and quantifies the extent of the concentration on the JSE historically and at present. The article describes the consequent limitations on long-only equity portfolio construction and the implications for the domestic long-only fund manager subject to various active weight limits. The analysis shows that the higher the allowable active bet sizes, the less consistently asset managers are able to implement their views and the less symmetric their response to forecasted excess returns can be. Consequently, the less competitive a long-only fund manager can be alongside hedge funds and similarly constrained long-short managers.

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Introduction

The Johannesburg Stock Exchange (JSE), over 120 years old[1], is by far the largest of only 18 African stock markets[2] and ranks 18th in capitalisation among the world's stock exchanges at 790 billion US Dollars[3]. Although South Africa's equity exchange is one of the largest among emerging markets, the JSE represents a highly concentrated equity offering. The FTSE/JSE All Share Index (J203) is an index of approximately165 companies' shares and represents 99% of the total market capitalisation of all tradeable[4] ordinary shares in South African companies listed on the main board of the JSE[5]. Figure 1 illustrates the concentration[6] of the JSE by depicting the contribution of various shares and groups of shares to the total value of the index. Figure 2 depicts the current weight of each individual company in the All Share Index and the cumulative contribution of each share to the index's total weight.

As can be seen in Figure 1 and 2, the All Share Index has more than 20% of its weight in the largest two mining-resources companies. The largest five companies together make up more than 40% of the index. The seven biggest companies out of the total 165 represent 50% of this index and the largest 15 companies (less than 10% of the number of companies listed) comprise more than two thirds of this index.

Historical concentration on the JSE

In less than 10 years, the annual volume traded on the JSE Equities markets has increased by a multiple of 7 (refer to Figure 3). This increased market activity has not brought a material change to the South African equity market's size ranking in the world nor has it attracted greater diversity in terms of the listings on the main board. In fact, since the existence of the new JSE/FTSE indices, there has been little appreciable improvement in its concentration, as Figure 4 will show. Thanks to a declining number of companies included in the All Share Index from 1997 to 2001[7] and the relative success of South Africa's two largest resource companies since 2001, the All Share Index has, in fact, become more concentrated.

[1] Founded in 1887.

[2] *JSE Equity market profile*, 1st September 2009 [online] http://www.jse.co.za/equity_market.jsp?sindex=31

[3] Calculated by the World Federation of Exchanges as at end of August 2009.

[4] Only "free-float" shares are included in this index.

[5] *Ground Rules for the Management of the FTSE/JSE Africa Index Series*, July 2009, version 1.8.

[6] As at end of February 2009

[7] "The JSE Actuaries indices were replaced by the FTSE/JSE Africa Index Series on the 24th of June 2002. FTSE and the JSE provided historic data of the indices for the period July 1995 to December 2001 and the indicative values from the 2nd of January 2002 to the 21st of June 2002." - http://ftse.jse.co.za/history_2002.jsp

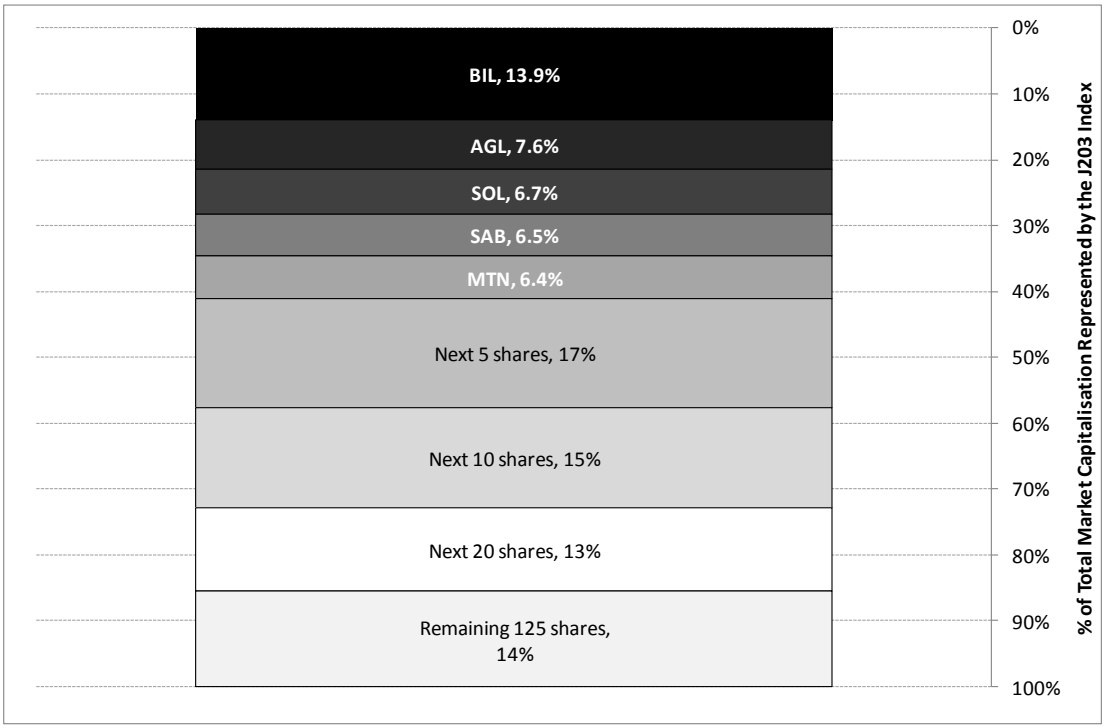


Figure 1: The distribution of (market capitalisation) weights on the FTSE/JSE All Share Index

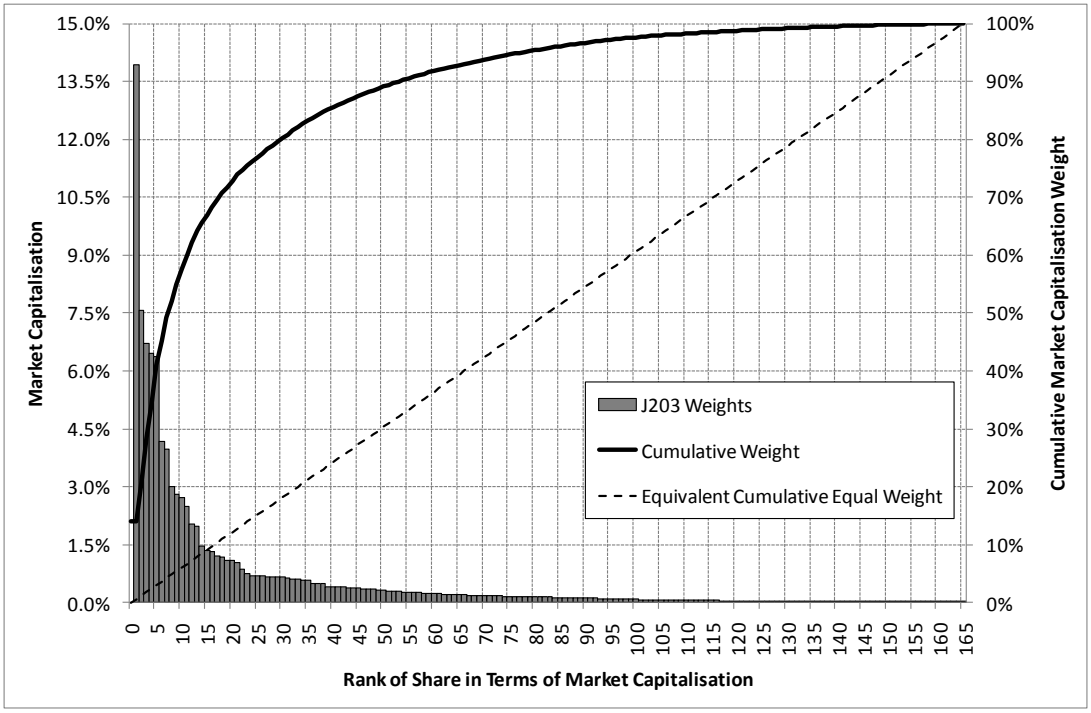


Figure 2: The Distribution of (market capitalisation) weights on the FTSE/JSE All Share Index

An article on the subject of diversification (Strongin, Petsch and Sharenow, 2000) introduced a measure of the "effective number" of shares[8] as a summary statistic of the concentration in a benchmark or market index. This effective number of shares measures how many shares the index would have if it was an equally-weighted index, given its actual distribution of weights. On this basis, as shown in Figure 4, since 2000 the All Share Index has never had more than an effective 25 shares!

Since late 1999, more than half the All Share's market capitalisation has vested in the top 10 shares and more than two thirds of the index has been represented by the largest 20 shares. Considering the fact that the JSE All Share Index represents 99% of all unconstrained equity available for investment in South Africa, this index is a very good indication of the limitation placed on investment rands in South Africa.

[8]The effective number of shares is calculated by taking the inverse of the sum of squares of the index weightings. For example, if the J203 was an evenly weighted index, the effective number of shares would be 165.

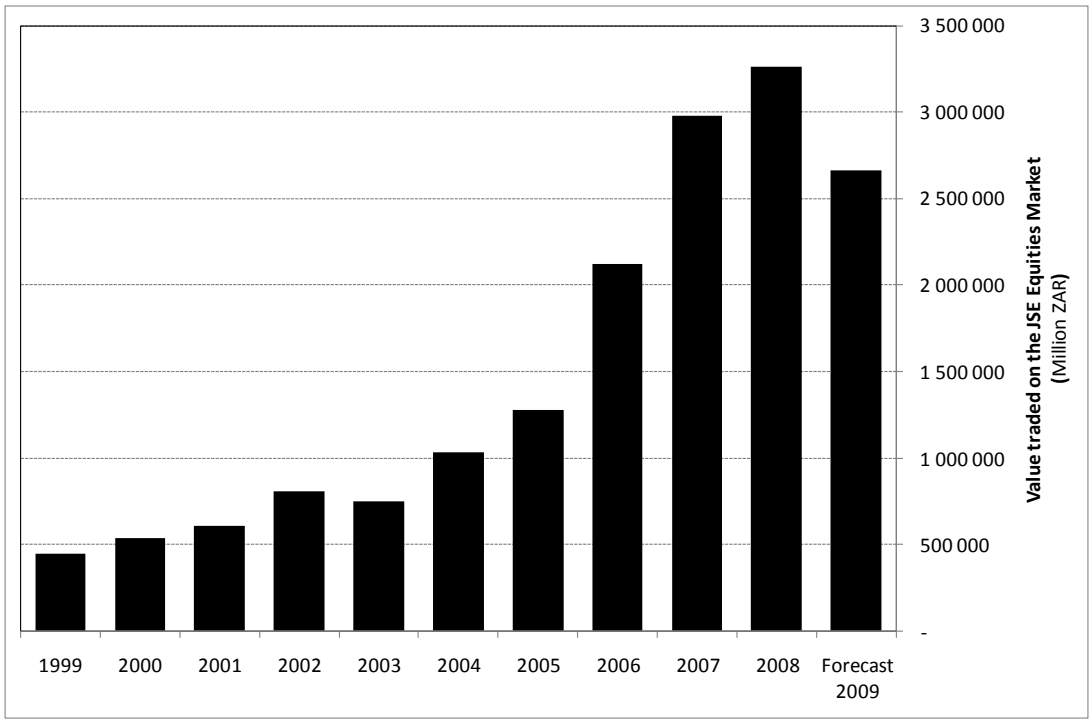


Figure 3: Rand Value Traded on the JSE Annually

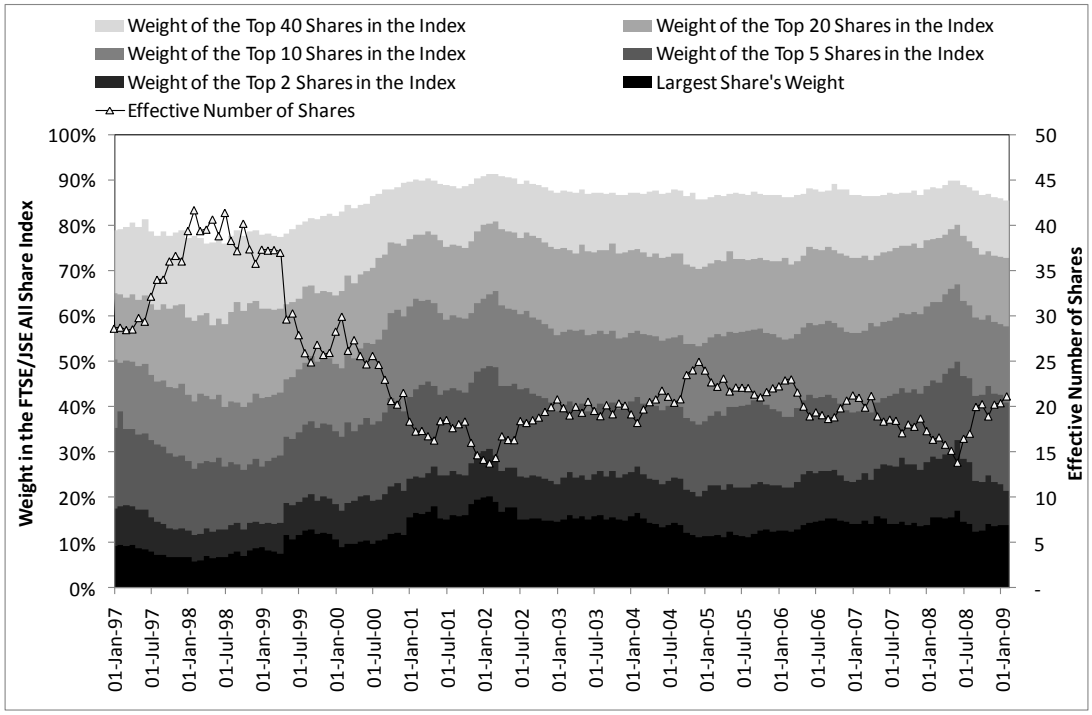


Figure 4: Concentration of the FTSE/JSE All Share Index over Time

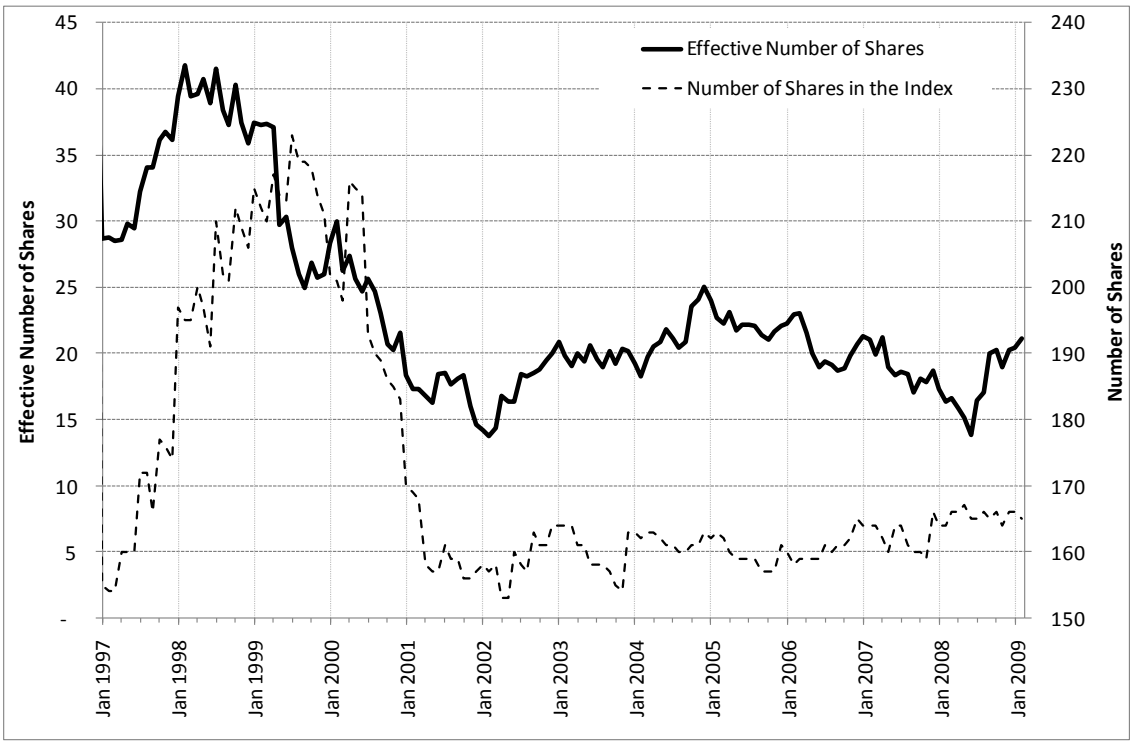


Figure 5: Number and Effective Number of Shares on the FTSE/JSE All Share Index over Time

Concentration in developed markets

In a similar way to Figure 1, Figure 6 compares the concentration of four major global indices to the JSE All Share. The accompanying Table 1 illustrates the concentration of several of these developed market indices and shows that, as an index, the JSE All Share Index is not unique in its concentration in a handful of large companies.

As this article will show, the concentration of an index or benchmark can materially constrain investment decisions and the portfolio construction processes, particularly when each investment is constrained to be held long. Consequently, global investors with particular mandates which are represented by these indices, suffer similar implied restrictions on account of index concentration as South African investors. However, when their collective investment opportunities are considered in the light of their potential global diversification, the effective concentration in their dollar-weighted investment universe is greatly reduced.

By contrast, South African investors, who are restricted by exchange controls from unconstrained global diversification, have little reprieve from their concentrated investment universe. Currently the pension fund regulations in South Africa allow for a maximum foreign investment (across all asset classes) of 20%. It is not uncommon for countries to restrict their pension funds' investments to domestic markets in this way. The Russian Federation has recently doubled their pension funds' foreign investment allowance from 10% to 20% from 2010 onwards; Brazil and Mexico both allow a maximum of 20% in foreign investment; Switzerland's pension funds and Korea's defined contribution funds allow a maximum of 30% foreign investment and Columbia allows 40%[9]. For this reason, a study of the implications of equity market concentration on fund management opportunities is particularly important in domains where geographical diversification is restricted and domestic markets are concentrated.

Literature review

In a recently published article (Kruger & Van Rensburg, 2008) explored the risk implications of the concentration inherent in the established JSE equity indices in 2002: the All Share (ALSI), Share-weighted[10] (SWIX), Capped (CAPI) and various combinations of the Resource (RESI) and Financial and Industrial (FINDI) indices. The authors provide a good review of the advantages and disadvantages of the use of these indices as investment benchmarks for professional fund managers. In particular, they compare their levels of concentration and find the All Share to be the most concentrated. Capped indices and indices that provide lower exposure to resource shares in general, provide an obvious remedy to the concentration of South Africa's equity market in two big resource shares. The JSE will, in the near future, launch an equally-weighted index which will further address the concentration issue.

[9] *Survey of investment regulation of pension funds*, October 2009, Organisation for Economic Co-Operation and Development [online] http://www.oecd.org/dataoecd/30/6/43939773.pdf

[10] The share-weighted index attempts to represent the collective free-float investments of all domestic investors i.e. excluding foreign holdings.

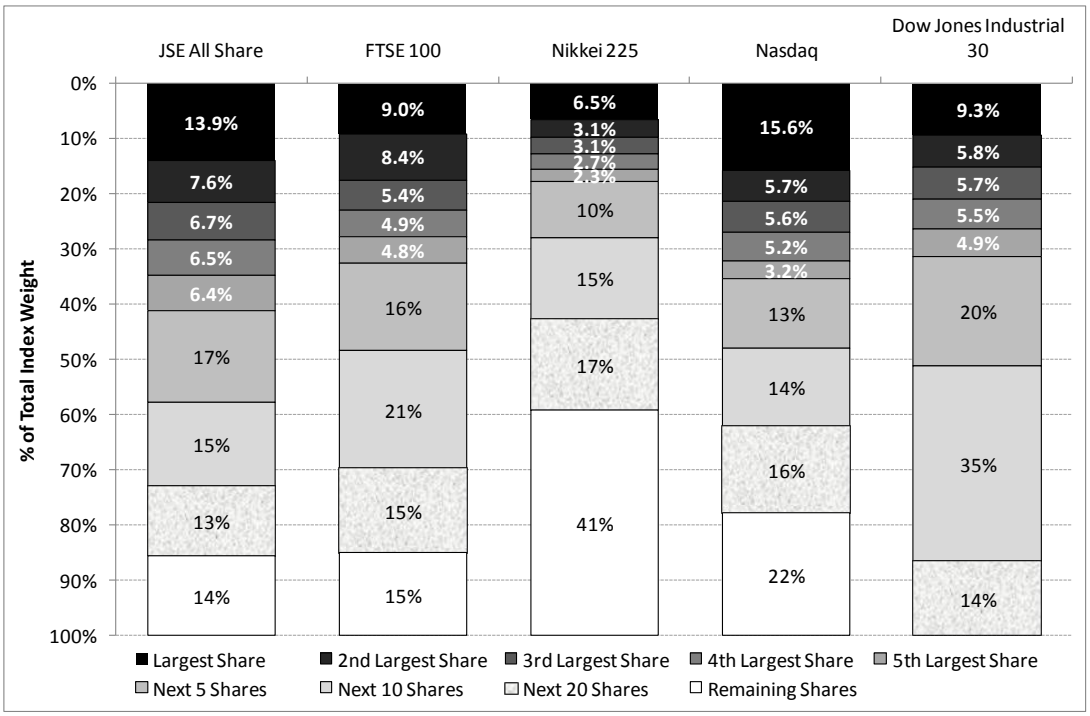


Figure 6: The Distribution of index weights on four major indices and the JSE

Table 1: Index weight of shares on the JSE All Share Index and four other developed market indices

	JSE All Share		FTSE 100		Nikkei 225[11]		Nasdaq		Dow Jones Industrial 30[11]	
Largest Share	BHP Billiton	13,9%	HSBC Holdings	9,0%	Fast Retailing	6,5%	Apple	15,6%	IBM	9,3%
2nd Largest Share	Anglo American	7,6%	BP	8,4%	Fanuc	3,1%	QUALCOMM	5,7%	Chevron	5,8%
3rd Largest Share	Sasol	6,7%	Vodafone	5,4%	Kyocera	3,1%	Microsoft	5,6%	3M Co	5,7%
4th Largest Share	S A Breweries	6,5%	Royal Dutch Shell	4,9%	Softbank	2,7%	Google Inc	5,2%	Exxon Mobil	5,5%
5th Largest Share	MTN	6,4%	Glaxo SmithKline	4,8%	Honda	2,3%	Cisco Systems Inc	3,2%	United Technologies	4,9%
Next 5 Shares		16,6%		15,9%		10,2%		12,6%		19,9%
Next 10 Shares		15,2%		21,4%		14,8%		14,3%		35,3%
Next 20 Shares		12,7%		15,2%		16,5%		15,7%		
Remaining Shares		14,5%		15,1%		40,8%		22,2%		13,5%
Average Weight		0,61%		0,98%		0,44%		1,00%		3,33%
Median Weight		0,14%		0,34%		0,21%		0,52%		3,08%
Number of Shares in the Index		165		102		225		100		30
Effective number of Shares		21		29		69		24		23

[11]Nikkei and Dow Jones are price-weighted indices

To some extent, these solutions are artificial. Specially-designed benchmarks provide a yardstick against which to assess active performance against the same benchmark. In this way fund sponsors can carve out focussed management styles and less concentrated mandates. Capping or reducing the weight in large shares in the fund's benchmark enables a less concentrated carve-out of the investment mandate. Sharpe (1991) points out that the average actively managed rand (i.e. capitalisation weighted) cannot, before costs, deliver performance different to the average passively managed rand, by virtue of basic arithmetic. Consequently, when considering the average invested rand, which represents the wholesale equity landscape, only a capitalisation-weighted index will do and, as such, South Africa's market remains concentrated despite these bespoke benchmarks.

The creation of the SWIX specifically had the domestic pension fund investor in mind. This index excludes foreign holdings in dual listed shares and thereby, because of the dominance of the dual listed resource shares, provides a less concentrated representation of the opportunity set of equity investment to domestic pension funds compared to the All Share. Unfortunately, the SWIX is unable to remove all foreign holdings from the index as this information is not readily available and so the adjustment is not, in that sense, fairly applied. For this reason, in this analysis, the All Share is used instead of the SWIX to represent the domestic investor.

For the most part, Kruger and Van Rensburg (2008) are concerned with the lack of diversification in the various benchmarks and the contribution of that lack of diversification to the risk of funds that use them as benchmarks. While issues of diversification are certainly important, particularly in a small, concentrated investment universe such as South Africa's, this article is concerned with the application of portfolio construction in this environment. (Grinold, 1994) responded to criticisms of portfolio optimisation procedures as "alpha eaters[12]": that good excess return forecasts are distorted by portfolio optimisation procedures and the resulting portfolios consequently generate less of the profit ("alpha") which they ought to. In developing the "Fundamental Law of Active Management", (Grinold, 1994) shows that, if forecasts are treated as a product of residual volatility (which is assumed to be independent across shares) times skill (as measured by the information coefficient) times a standardised score, the resulting optimised portfolios will not exhibit the same bias toward low residual shares. (Grinold, 1994) does not mention the alpha "eating" effect of constraints on portfolios (and optimisers) but offers practical advice on how to turn a stock tip, a buy/sell list or a series of multiple forecasts into an alpha that "won't get eaten".

Clarke, De Silva and Thorley (2002) and Clarke, De Silva and Sapra (2004) continued this work by developing the "Generalised Fundamental Law of Active Management" and introducing the concept of a transfer coefficient. The authors illustrate the loss of excess risk-adjusted performance that can result from portfolio constraints, particularly the long-only constraint. They use the transfer coefficient to quantify the extent of this loss. A transfer coefficient of one implies that there is no "friction" between the manager's investment view or forecast returns and the construction of the investment portfolio. A transfer coefficient less than one implies a loss of information between the manager's investment view and the construction of the investment portfolio based on this view. The authors have pioneered the use of short-extension products which allow for modest short positions and have been shown to improve the transfer of manager skills to the fund while maintaining a net long investment.

The next section presents an analysis of the loss of opportunity, and implied decrease of transfer coefficient when long-only mandates are exercised in a concentrated market such as the South African Equity market. This section begins with an introduction to long-only active management and continues with an illustration of the extent of the decay in the transfer coefficient with increasing active weight limits. The conclusion follows.

The implied restrictions of market concentration on the active fund management opportunity set

Long-only active portfolio management

Active Portfolio Management is the allocation of fund value amongst available investments, viewed relative to a benchmark portfolio. The weight of the fund which is invested in any particular stock ($W_{fund,i}$) is the proportion of the fund's total value invested in this stock. Clearly, the sum of these weights across all investments must add to 100%. In an active management framework, the weights of individual investments are viewed relative to the weights of these same investments in a benchmark or "passive" portfolio and are expressed in terms of "active weights" or "active bets". These active weights must sum to zero in order for the portfolio to be self-financing.

Equation 1: Definition of active weight in stock *i*

$$W_{active,i} = W_{fund,i} - W_{benchmark,i}$$

An allocation of the fund's value into a particular stock which is larger than the benchmark's weight in that stock would be considered to be a positive active bet on the future value of that investment. The fund manager would be positioning the fund to earn superior profits relative to the benchmark portfolio by being "overweight" in a stock which is expected to increase in value. The extent to which the fund manager can express conviction by increasing this positive active weight is limited only by mandate restrictions and the ability to finance this positive active bet with negative positions in other shares.

A negative view of the future prospects of a particular stock can likewise be implemented in the fund by holding a smaller proportion of such a stock in the fund than the proportion of the same stock represented in the benchmark. The greater the conviction in this negative bet on this stock, the less of the stock the fund manager will hold. An unconstrained manager, such as a hedge fund manager, can

[12] In other words, consumers/wasters of potential excess return.

go so far as to sell the stock short (i.e. $W_{fund,i} < 0$) with a view to profiting from it's future loss in value. Within a conventional long-only active mandate, such as those typically applied to pension funds in South Africa, the most negative expression of the fund manager's view in such a stock is to omit it from the fund entirely. The smallest investment weight of this stock is therefore limited by zero (i.e. $W_{fund,i} \geq 0$) and therefore the most negative active weight possible in a long only fund is the negative of the benchmark weight ($W_{active,i} \geq - W_{benchmark,i}$).

If the capitalisation of the investment universe was uniformly distributed i.e. if the equity market was an equally weighted universe of shares, the long-only investment manager would have equal opportunities to express a view in any of the component shares. However, when a stock comprises only a small weight in the benchmark or investment universe, a long-only manager's range of potential active weights in that stock becomes non-symmetrical because, although the positive active weight is uncapped, the size of any negative view is limited by the stock's own weight in the benchmark.

The effect of active weight limits

Fund managers are not usually without limits in terms of the risk exposures that they are permitted in the fund or the extent of their "active" management. Investment mandates usually stipulate the investment universe, fund objectives, and risk limits by mutual agreement between the fund sponsor and the asset manager. One such risk limit is the maximum allowable active weight of the fund in any stock. This restriction seeks to avoid large concentration of risk in the fund.

Figure 7 illustrates the implications of various sizes of such active weight limits on the potential activity of a fund manager in the concentrated equity market in South Africa. The horizontal axis represents the relaxation from left to right of maximum allowable active weights in any stock in absolute terms. For example, the extreme limit of 0% would represent a perfect All Share tracking fund whereas the 3% limit represents a mandate with more scope for aggressive active management because it allows for an active weight in any stock of anywhere between -3% and 3%. The vertical axis of Figure 7 represents the number of shares available to the fund manager under each of these restrictions, in which the manager has a symmetrical range of opportunity to express a negative or positive active view.

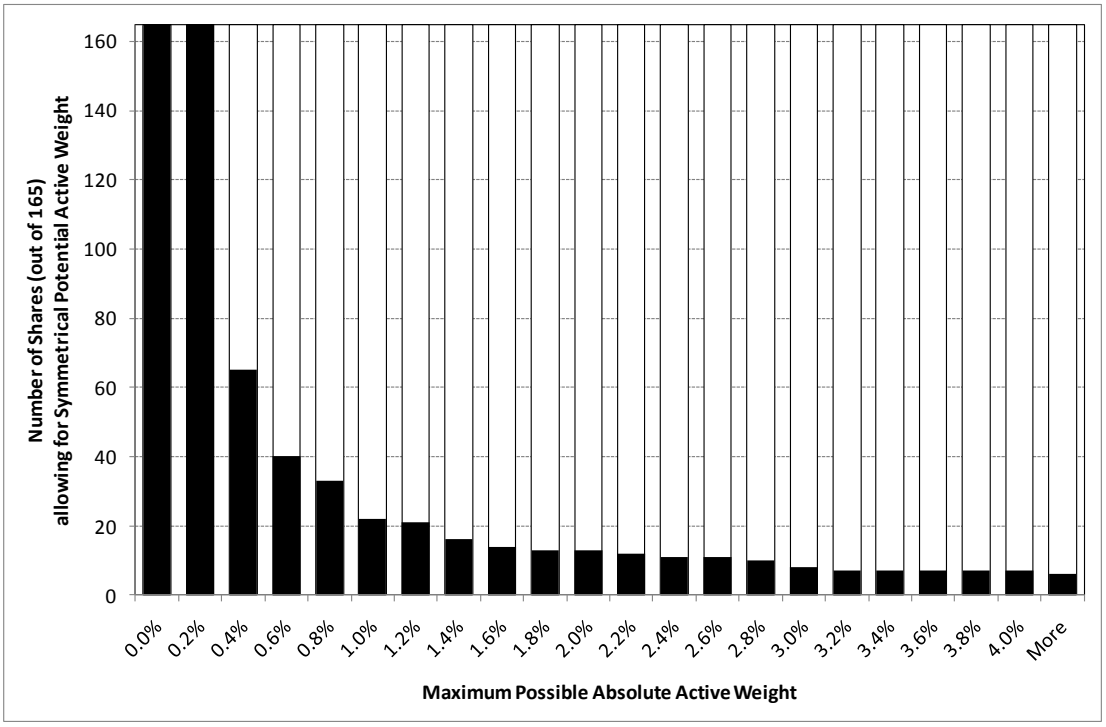


Figure 7: Maximum number of shares available at each level of active weight

For example, at a very conservative active weight limit of 20 basis points[13] (bp), the thus constrained active manager can potentially express active views anywhere between -20bp and 20bp on all 165 shares in the All Share (i.e. $- .20\% \leq W_{active,i} \leq .20\%$). This in turn implies equal consideration of the opportunities for extra profit from each of these 165 shares.

Under a less restrictive limitation, for example a maximum allowable active weight of 2%, the manager can only consider 13 shares in which the full range of potential active weights are possible. That is, ironically, while the 2% limit is far less restrictive, in a concentrated market, it effectively only allows the more aggressive manager the full range of opportunity to express their view (from -2% to 2%) in 13 out of the 165 shares in their investment universe. The most extreme negative bet possible in the remaining 152 shares is limited by their weight in the benchmark which is less than 2%. These 152 shares therefore cannot be considered in the

[13] 20bp = 0,20%

same way as the other 13. Any potential opportunity for excess returns in these 152 shares must be considered asymmetrically by the fund manager because there is greater potential for expressing positive active views in these shares than negative views. All things being equal, there would therefore be less point in the manager paying attention to "sell" signals in these shares than "buy" signals as the manager is less able to orientate the fund to take advantage of opportunities for profiting from negative forecasts in these shares. Thus with greater relaxation of active weight limits comes greater asymmetry in the range of opportunities available to the fund manager.

Notice from Figure 7 how the opportunity set of shares drops by almost two thirds when the maximum allowable absolute active view changes from a tiny 0,2% to a very slightly larger 0,4%. There is a further 40% reduction in the opportunity set with a change in active weight from 0,4% to 0,8%. This gives us an indication of the small sample of shares in which a long-only, aggressive active manager can meaningfully express their views both negative and positive across the full allowable range of active weights.

In their expression of the Generalised Fundamental Law of Active Management, Clarke, De Silva and Thorley (2002) introduced the concept of the transfer coefficient. They used this coefficient to generalise the Fundamental Law of Active Management first proposed by Grinold (1989) to the case of constrained portfolios. The transfer coefficient is the extent to which a fund manager's investment view can be expressed in the active weights of the fund. In particular, it is the correlation between the risk adjusted forecast returns across shares and the active weights of the portfolio.

The best case for the skilled manager is to have a transfer coefficient of 1 implying that there is no "friction" between the investment forecasts and their expression in the portfolio's active weights. Decreasing transfer coefficients imply a loss of integrity between forecast returns and the composition of the fund. Transfer coefficients are anticipated to be less than perfect (less than one) in the case of constrained investments because the constraints on the portfolio contaminate the implementation of a portfolio which is exactly true to the manager's forecasts. The more binding the constraints, the greater the reduction in the transfer coefficient.

Table 2 describes the opportunities lost as a consequence of active weight limits in a long-only fund investing in the JSE All Share Index in a similar vein to Figure 7. For example, a manager who is constrained to express no more than a maximum 1% positive view in any stock in the index, has a range of 165% of active long positions (refer column 2). An unconstrained manager could finance these with symmetrical short positions, thereby creating a total opportunity set of 328% possible active weights (column 4) for the unconstrained manager. By contrast, a similarly constrained long-only fund manager, who is unable to sell a stock short, cannot take a negative active position which is more negative than each stock's own weight in the benchmark. Such a manager would be able to generate a maximum of 1% underweight in each of only 22 out of the 165 shares. The maximum possible negative position in the remaining 143 shares would be limited by their individual benchmark weights. As such, the long-only manager thus constrained would have a range of only 47% in total negative active weights (refer column 3). Therefore, the total opportunity range for such a manager is 211% possible active weights (164% plus 47% - refer column 5). This implies that a long-only manager with a 1% active weight limit has only 64% (211% of 328%) of the opportunities that a similarly constrained long-short manager has at this active weight limit which implies a transfer coefficient of 0.64 (last column).

Table 2: Implied Transfer Coefficient at Various Active Weight Limits for the Long-Only Investor in the JSE All Share

Maximum limit on active bet	Sum of maximum possible positive active weights	Sum of maximum possible negative active weights	Maximum possible active share: Unconstrained portfolio	Maximum possible active share: Long only portfolio	Implied transfer coefficient
0,00%	0%	0%	0%	0%	1,00
0,10%	17%	12%	33%	29%	0,87
0,20%	33%	20%	66%	53%	0,81
0,50%	83%	34%	165%	117%	0,71
0,75%	124%	42%	248%	166%	0,67
1,00%	165%	47%	330%	212%	0,64
2,00%	330%	62%	660%	392%	0,59
5,00%	825%	84%	1650%	909%	0,55
15,00%	2475%	100%	4950%	2575%	0,52

Referring to the Fundamental Law of Active Management, Information Ratio is Transfer Coefficient (TC) times Information Coefficient (IC) times breadth. Therefore, if two managers both have the same investment opportunities from which to choose (breadth) and the same success at predicting returns (IC), the one with the higher Information Ratio will, by definition, be the one who best reflects their expected risk-adjusted returns in their portfolio i.e. the one with the higher transfer coefficient.

Clearly, with increased maximum active weight limits, come increased opportunities for active management and increased expectation of risk taking relative to a passive investment. However, with increased active weight limits, the long-only manager's opportunity set becomes increasingly restricted relative to a long-short manager thereby allowing a long-short manager an increasing competitive advantage in a more aggressive active management environment.

Figure 8 charts this evidence by depicting the decrease in Implied Transfer Coefficient with increasing active weight limits. At an active weight limit of 15% (larger than the largest stock in the All Share), the decay in the transfer coefficient reaches it's minimum of 0,52 - roughly half the information lost when the portfolio is formed. However, note the rapid decay in transfer efficiency within the first, relatively conservative active weight limits. From the active weight range of a pure tracker to a very conservative enhanced index fund, the loss of opportunity decreases materially. At a fairly reasonable active management limit of 1%, the long-only investment in the JSE All share is already hamstrung to the order of a 30% relative to their hedge fund counterparts.

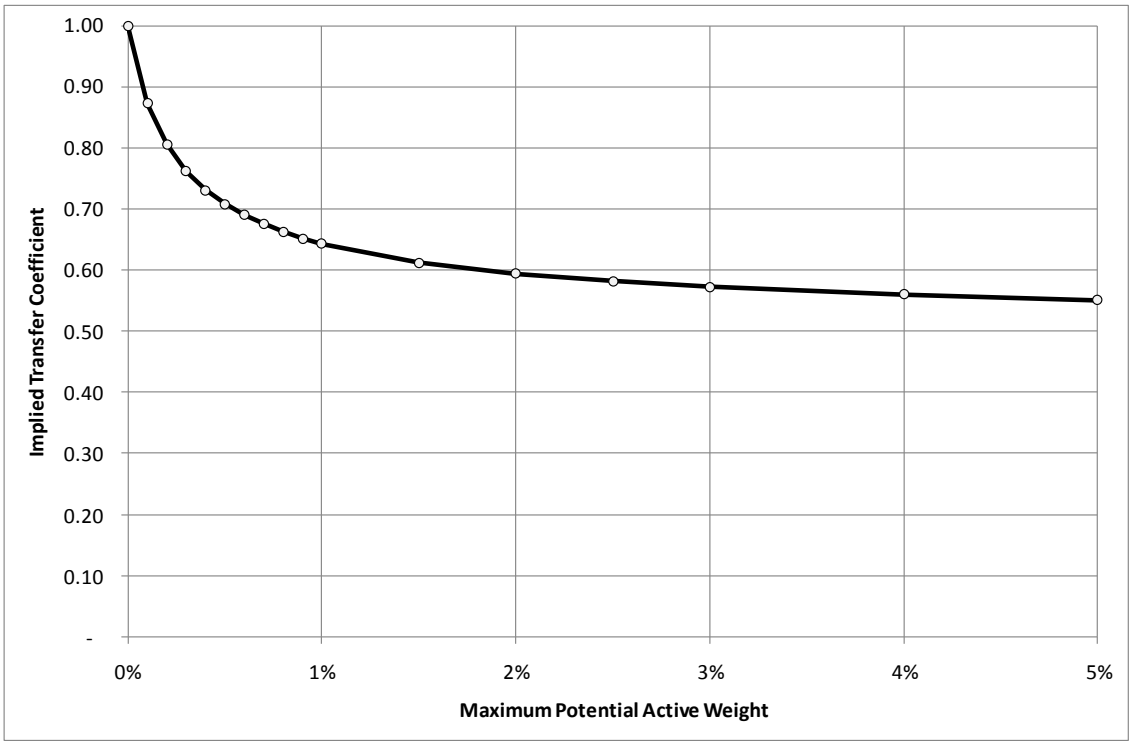


Figure 8: Decreasing implied transfer coefficients with increasing active weight limits

Conclusions

Active fund managers can only express their views in an environment where their conviction and level of risk taking is commensurate with their constraints. The higher the allowable active bet sizes, the less competitive a long-only fund manager can be alongside hedge funds and similarly constrained long-short managers. This competitive disadvantage is exacerbated by a concentrated benchmark/investment environment such as the JSE indices where only a few of the shares comprise most of the total investment weight.

The more constrained the investment environment, both with regard to mandated constraints and the concentration of South Africa's equity market, the less consistently asset managers are able to implement their views and the less symmetry there is in their range of potential responses to forecasted excess return. Short sale restrictions, in particular, are intended to avoid incurring a liability on the portfolio's behalf. However, the impact of short sale restrictions combined with mandated constraints on active weights in a concentrated market serve, not to limit risk levels, but to artificially concentrate the level of active investment activity in a handful of listed companies.

The disadvantage to active management within more aggressive active weight allowances, speaks to the success of low active risk, enhanced-index type strategies in the South African market. In a long-only, concentrated environment, low risk active strategies provide investors with the best "bang for their buck" because long-only fund managers have the opportunity to act more fully on their active views across the full cross-section of available

equities at these low active weight limits. By contrast, to compel or encourage long-only managers into a more aggressive active space in a concentrated investment environment is, ironically, only to constrain them further in their abilities to express their best active view.

References

Cartillier, J. 2006. 'African stock markets seek to work in concert', *Mail and Guardian*, 19 September. [online: http://www.mg.co.za/article/2006-09-19-african-stock-markets-seek-to-work-in-concert]

Clarke, R G. De Silva, H. & Thorley, S. 2002. 'Portfolio constraints and the fundamental law of active management', *Financial Analysts Journal*, **September/October**, 48 - 66.

Clarke, RG., De Silva, H. & Sapra, S. 2004, 'Toward more information-efficient portfolios', *Journal of Portfolio Management*, **Fall**, 54 - 63.

Grinold, R C. 1989. 'The fundamental law of active management', *Journal of Portfolio Management*, **Spring**: 30 - 37.

Grinold, RC. 1994. 'Alpha is Volatility Times IC Times Score', *Journal of Portfolio Management*, **Summer**: 9 - 16.

Kruger, R. & Van Rensburg, P. 2008. 'Evaluating and constructing equity benchmarks in the South African portfolio management context', *Investment Analysts Journal*, **67**: 5 -18.

Martielli, J.D. 2005. 'Quantifying the benefits of relaxing the long-only constraint', *SEI Investments*, **January.** 1-18

Sharpe, W.F. 1991. 'The arithmetic of active management', *Financial Analysts Journal*, **47**(1): 7 - 9.

Strongin, S., Petsch, M. & Sharenow, G. 2000. 'Beating benchmarks', *Journal of Portfolio Management*, **26**(4): 11 - 27.