portfolio construction forum

A practical measure of Alpha Potential

Andrew Kophamel & Ben Wang | Aberdeen Asset Management | August 2014

This paper investigates the possibility of using cross-sectional volatility as a practical measure of alpha potential in Australian equity market. Both equal-weight volatility and float-weight cross-sectional volatility are used to explain the dispersion of fund returns in Australia large-cap/small-cap universe. It finds that the validity of float-weight cross-sectional volatility has larger explanation power in both large-cap and small-cap markets, implying cross-sectional volatility as a practical measure of alpha potential.

Many of the more established and, indeed, successful (at least historically), equity managers now have funds under management at levels which has reduced their trading flexibility and, in some cases, caused them to invest in higher capitalisation stocks than they might otherwise. This does not necessarily define them as "bad managers", but it does accentuate issues relating to manager/client alignment.

1. INTRODUCTION

A question frequently asked by active investors is where to invest money. Outlined in the well-known *Fundamental Law of Active Management* (Grinold, 1989), the success, or otherwise, of active management is determined by two factors – investor's skill and market breadth. For a given market breadth, better performance can be delivered by selecting more highly skilled investment managers. Importantly, however, for a given level of skill, performance can also be improved by engaging in markets with larger market breadth.

Much has been written about selecting competent investment managers. This paper, however, builds on an emerging view that espouses the use of cross-sectional volatility as a practical and quantitative measure of market breadth, and therefore its latent "Alpha Potential". It reviews the literature in this area and then follows with an empirical investigation within the Australian equity market, outlining data, methodology, results and conclusion.

It finds strong empirical evidence to support cross-sectional volatility of security returns as a valid measure of Alpha Potential in the Australian equity market for both large- and small-capitalisation universes. Moreover, and consistent with other international research, it finds that float-weight cross-sectional volatility (FWCrossVol) has higher predictive power than equal-weight cross-sectional volatility (EWCrossVol).

Also refer to the associated Due Diligence Forum Presentation in the Conference 2014 Resources Kit.

1.1 Cross volatility as a measure of alpha potential

According to the *arithmetic of active management* (Sharpe, 1991), the average return of actively managed funds is equal to the average return of passively managed funds – which, in turn, is the same as the market return. It leads to the conclusion that active investment is, a "zero-sum" game with active investors betting with each other, and some investors' gains coming at the expense of other investors' losses.[1]

The *Fundamental Law of Active Management* (Grinold, 1989), further proposes that active investors perform better when employing more skilled managers but also, importantly, when there is more room for those managers to exercise their investment skills.[2] Critically, this leads to the concept of market breadth and how this can be measured.

Many authors have pointed to the cross-sectional volatility of security returns as a proxy for measuring market breadth, and therefore indicative of its latent Alpha Potential, all else being equal (e.g., de Silva, Sapra and Thorley (2001), Ankrim and Ding (2002), Gorman, et. al. (2010a, b), Yu and Sharaiha (2007)). Indeed, cross-sectional volatility is appealing in its intuitiveness – if all securities perform in-line with each other, absolute returns are driven by broader macro-related factors and there is no opportunity for investment managers to add active return regardless of their stock-picking skill; conversely, if there is a wide dispersion of security returns, then opportunities for skilled managers to add active return emerge.

De Silva, Sapra and Thorley (2001) started with the classic Capital Asset Pricing Model (CAPM), and showed that both dispersion of fund returns and (equally-weighted) cross-sectional volatility of security returns are functions of the idiosyncratic risk in a market and are, therefore, in themselves related. Specifically, their study opens up the relationship between the cross-sectional volatility of securities within a market and the Alpha Potential for active investors.

Ankrim and Ding (2002) also used the cross-sectional volatility to explain the dispersion of actively managed fund returns in U.S. large-cap, U.S. small-cap, Canada, Japan and United Kingdom markets. By using the historical data in these markets, they observed that the return dispersion increased when there was an increase in the cross-sectional volatility, again suggesting a strong linkage between the two.

More recently, Bouchey et. al. (2011) explicitly referenced cross-sectional volatility as an Alpha Potential measure, and quantified the relationship between active manager return dispersion and cross-sectional volatility for US and global equity markets, finding strong and significant statistical evidence to demonstrate its efficacy as a measure.

1.2 The Australian equity market

Up until this point, however, the Australian equity market has not yet been the subject of such empirical analyses. Yet Australia remains a significant player in the world equity markets. It:

- has an equity capitalisation of A$1.4 trillion, and is the 8th largest in the world in terms of free-float capitalisation;[3]
- represents around 3% of the MSCI World index;[4] and,
- has mandatory superannuation contributions, currently at 9.25% of salary (capped), due to grow to 12% in around 2021, which sees regular inflows of capital looking for investment.

As such, it is important to investigate whether investors in Australian equity markets could also benefit from the use cross-sectional volatility of security returns as an indicator of Alpha Potential.

2. DATA AND METHODOLOGY

The authors conducted an empirical investigation into the relationship between the cross-sectional volatility of security returns and the dispersion of actively managed funds within the Australian Equity market to determine if the former was a good predictor of the latter and therefore useful as a measure of Alpha Potential.

This study was conducted for two distinct universes of Australian equity products: large-cap and small-cap and, based on research conducted in other markets, posited that there would be a strong relationship between cross-sectional volatility and active manager returns, and that this should be stronger for small-cap products.

Two different measures of cross-section volatility were used in this analysis, equal-weighted and float-weighted.

Equal-weighted cross-sectional volatility (EWCrossVol) was defined as:

$$EWCrossVol = \frac{1}{N}\sqrt{\sum_{i=1}^{N}(r_i - R)}$$

where

N = number of securities in the universe

r_i = the monthly total return of stock i

$R = \frac{\sum_{i=1}^{N} r_i}{N}$.

This is the simple standard deviation of security returns for a given market/period.

Float-weight cross-sectional volatility (FWCrossVol) was defined as following:

$$FWCrossVol = \sqrt{\sum_{i=1}^{N} w_i (r_i - \bar{R})}$$

where

N = number of securities in the universe

r_i = the monthly total return of stock i

w_i = the float-adjusted capitalization weight of stock i at the beginning of

$\bar{R} = \sum_{i=1}^{N} w_i r_i$

Previous research has used one or both of these measures, in the belief that equal-weighted cross-sectional volatility removes the impact of any distortions from highly concentrated markets, such as those found in large-cap Australian equity markets, while float-weighted measures are more relevant to active managers who are constrained from taking active positions too far removed from those index-weights. Importantly, float-weighted measures do have additional calculation complexity and data requirements compared to equal weighted. Both measures were used in this study and results compared.

In this paper, large-cap Australian equities were represented by the S&P/ASX 300 universe while the S&P/ASX Small Ordinaries data was used to represent the small-cap universe. Both equal and float-weighted cross-sectional volatility for each universe was calculated on a monthly basis from January 2004 to December 2013 i.e., a 10 year sample set covering a full economic cycle.

The dispersion of actively managed fund returns measures the difference between outperforming and underperforming investment managers within a market. Consistent with Ankrim and Ding (2002), this paper defines this as the difference in total returns between 95th percentile fund manager and the 5th percentile fund manager.[5] Returns were collected on a monthly basis, net of management fees, and expressed in local Australian dollar terms. This data was collected for the universe of both small-cap and large capitalisation Australian equity managers, as defined within Lipper Investment Management database, and were mutually exclusive in their construction. Overall, data for 817 large-cap funds and 125 small-cap funds were collected. It was free from the survivorship bias as both active and dead funds were included during the sample period.

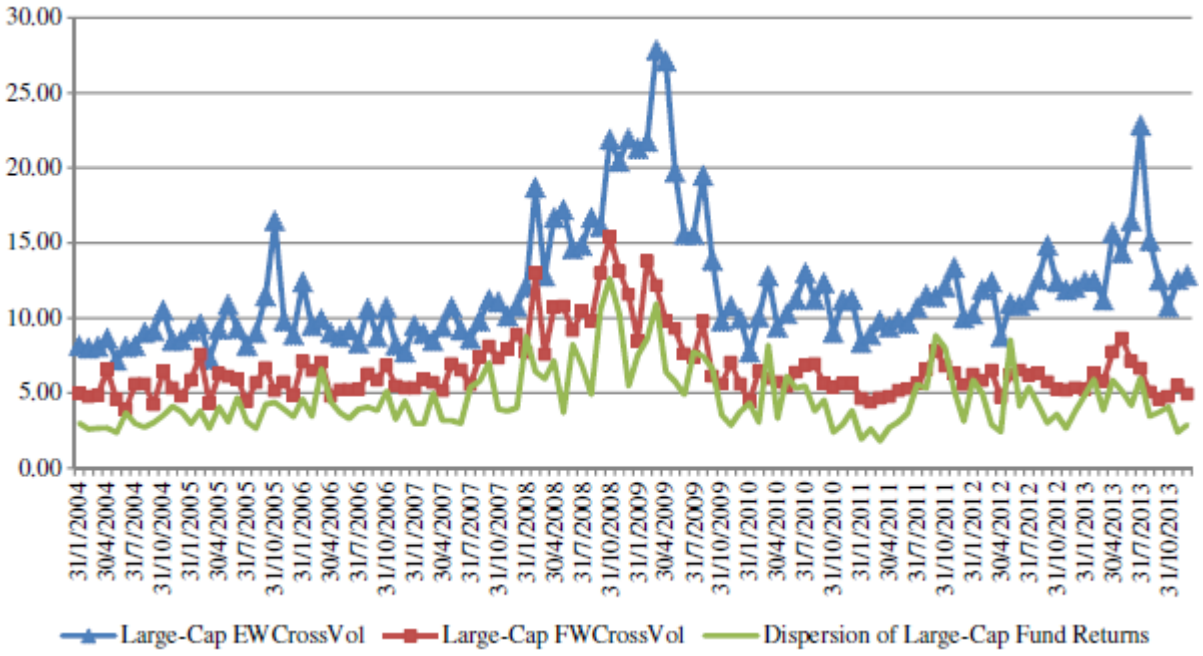
3. RESULTS AND DISCUSSION

The relationship between cross sectional volatility and manager return dispersion was first plotted visually, and then determined statistically. Finally, results for float-weighted and equal-weighted cross-sectional volatility measures were compared.

3.1 Visual results

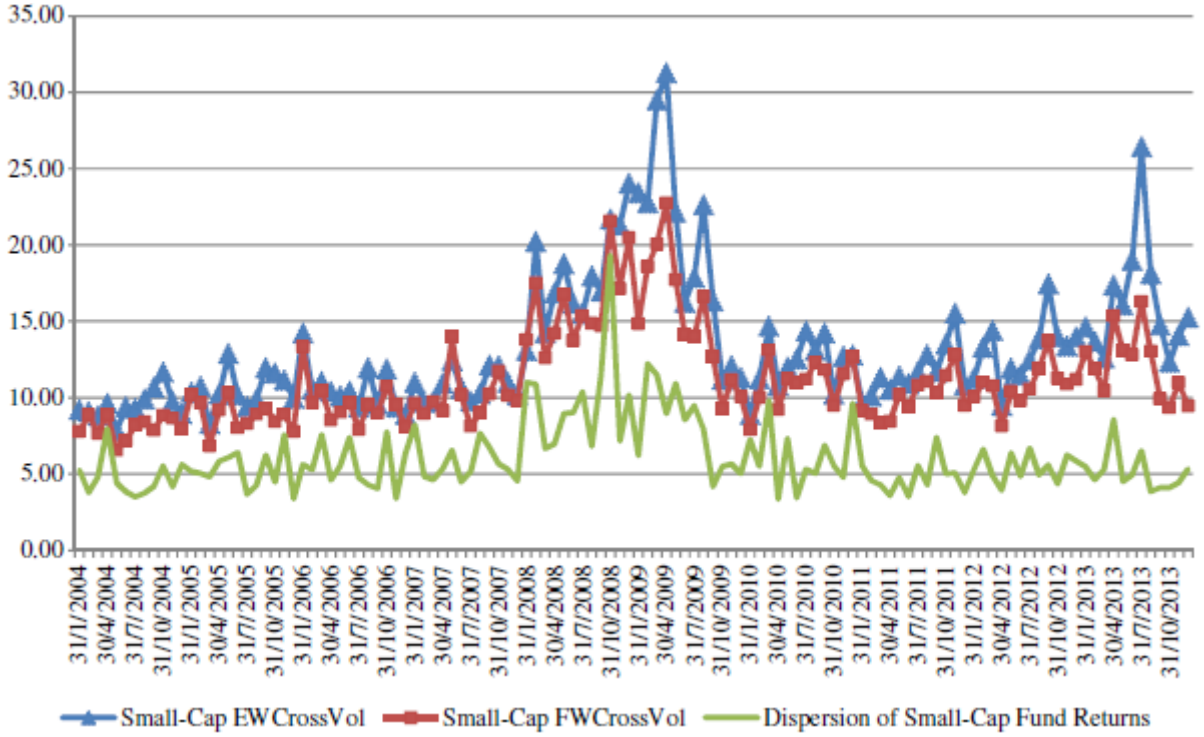
Figures 1 and 2 visually present an historical time series of fund returns dispersion and float-weight/equal-weight cross-sectional security volatility for large-cap and small-cap markets respectively.

Figure 1: Large-Cap EWCrossVol, FWCrossVol and dispersion of fund returns
2004-2013



Source: Aberdeen Asset Management

Figure 2: Small-Cap EWCrossVol, FWCrossVol and dispersion of fund returns
2004-2013



Source: Aberdeen Asset Management

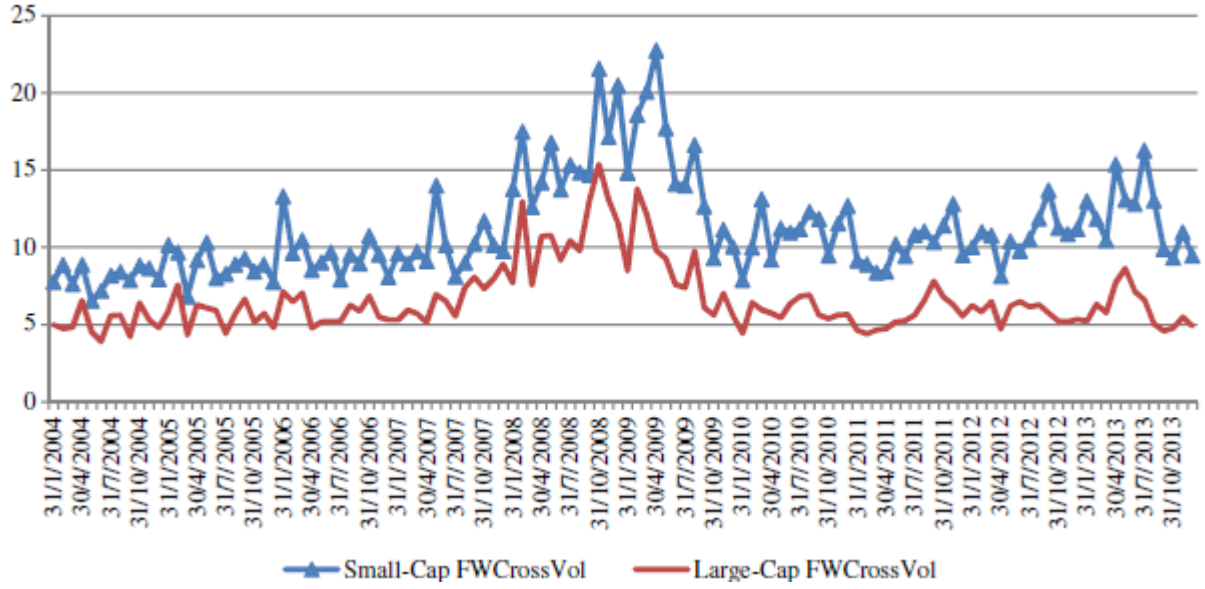
Visually, three patterns can be observed.

First, the return dispersion and cross-sectional volatility appear to move together. Indeed, there appear to be strong co-movements between both measures of cross-sectional volatility and return dispersion for large-cap and small-cap markets.

Second, the dispersion of security returns peaked during the fall out from the global financial crisis (c. 2009). At first glance this seems counter-intuitive given the sharp increase in security correlations observed in this period (e.g., Das, Duffie, Kapadia, and Saita (2007) and Duffie, Eckner, Horel and Saita (2009)) but, as this chart shows, correlation and dispersion can be independent, as securities may have negative returns with very different severity.

Third, both measures of cross-sectional volatility are larger for small-cap markets than large-cap, indicating that small-cap securities have a larger variety of returns than large-cap securities.[6] This is apparent from Figure 3 and suggests, perhaps intuitively, at the larger Alpha Potential within the small-cap universe.

Figure 3: Large-Cap FWCrossVol vs Small-Cap FWCrossVol
2004-2013



Source: Aberdeen Asset Management

3.2 Correlation coefficients

The co-movement visually observed in Figures 1 and 2 can be quantified by the calculation of their correlation statistics. This is shown in Figure 4 alongside findings presented in Bouchey et. al. (2011) for US equity markets as a comparator.

Figure 4: Correlation statistics

Universe	Cross Vol Index Base	Correlation between manager dispersion and FWCrossVol	Source/Period
Australian Large-Cap	S&P/ASX 300	0.73	Jan 2004-Dec 2013
Australian Small Cap	S&P/ASX Small Ords	0.72	Jan 2004-Dec 2013
US Large Cap market-Oriented	Russell 1000	0.94	Bouchey et. al. (2011) Oct 2003 - Dec 2009
US Large Cap Value	Rusell 1000 Value	0.93	Bouchey et. al. (2011) Oct 2003 - Dec 2009
US Large Cap Growth	Russell 1000 Growth	0.87	Bouchey et. al. (2011) Oct 2003 - Dec 2009
US Small Cap Market Oriented	Russell 2000	0.87	Bouchey et. al. (2011) Oct 2003 - Dec 2009
US Small Cap Value	Russell 2000 Value	0.90	Bouchey et. al. (2011) Oct 2003 - Dec 2009
US Small Cap Growth	Russell 2000 Growth	0.76	Bouchey et. al. (2011) Oct 2003 - Dec 2009

Supporting the visual relationships above, in absolute terms, it is evident that the correlation for both large- and small-cap Australian equity markets is high. However, it is also interesting to compare the results between the Australian and the US equity markets presented by Bouchey et al (2011) where the strength of the relationship appears less for Australia and US markets.

At first glance, two reasons can be put forward for this.

First, different sample periods are used. In this study, a 10-year period covering a full economic cycle is used while Bouchey et al (2011) used a shorter sample of just over six years, and one which was likely dominated by the global financial crisis.

Second, the depth of the US Equity market allows a more specific classification of managers and products, distinguished by both size but also style characteristics. This depth may help to allow better grouping of similarly invested fund managers, and to remove or reduce any systemic differences within groupings. It is perhaps interesting to note that Australian Small Cap correlations were much more in line with US Small Cap Growth, which may hint at systemic biases within the Australian small-cap market and possibly warrants further research.

3.3 Regression results

To further test statistical significance, a regression of Fund Returns dispersion against security cross-sectional volatility was conducted, with results outlined in Figure 5.

Figure 5: Float-weighted cross-sectional volatility of security returns against dispersion of actively managed fund returns

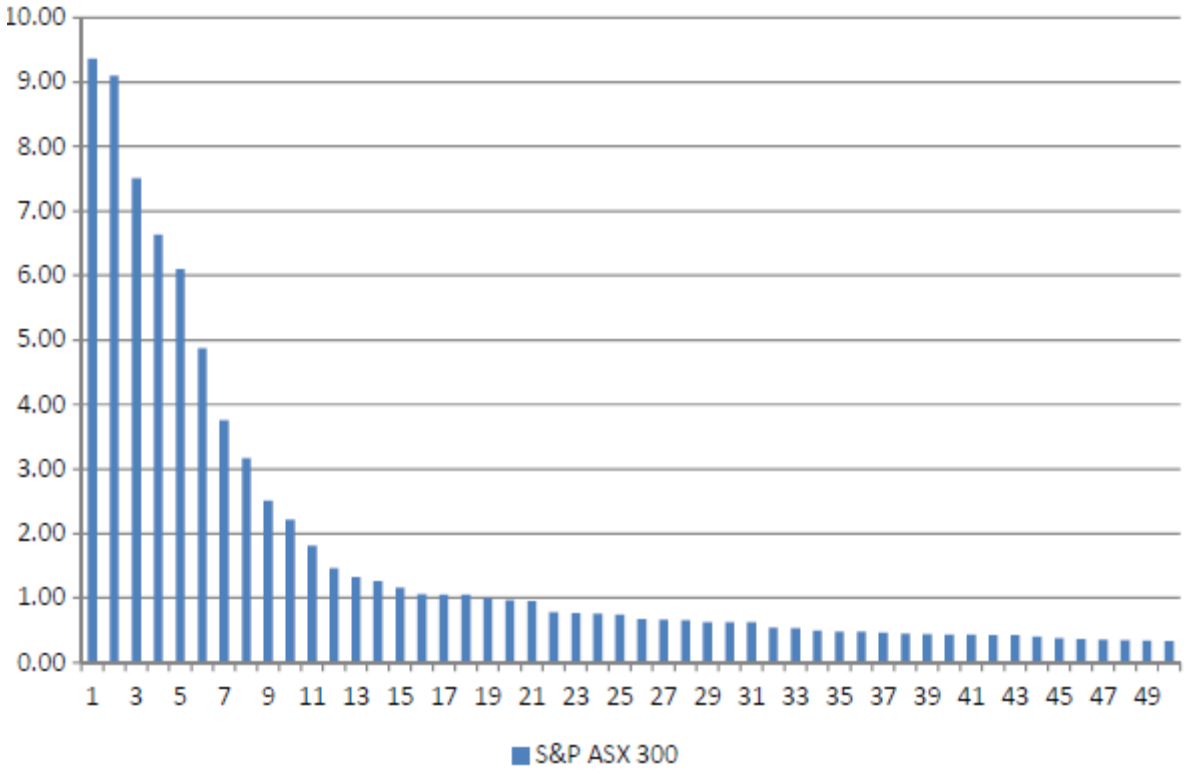
Sector	Australian Large Cap Equities	Australian Small Cap Equities
Coefficient	0.69	0.54
Standard Error	0.06	0.05
t-statistic	11.74	11.24
R^2	0.54	0.52

As presented, the independent variable is both positive and statistically significant for both large-cap and small-cap markets. Further, the regressions produces R^2 of 0.54 and 0.52 for dispersion of large-cap and small-cap fund returns respectively, which indicates that the FWCrossVol explains a substantial amount of the variation of return dispersion in both investment universes.

Again worthy of note is the difference in regression coefficient between large- and small-cap universes. From these results, a 1 per cent increase of FWCrossVol leads to 0.69 per cent increase of active return dispersion in large-cap universe, compared to 0.54 in small-caps. The pattern that FWCrossVol having a larger marginal effect in large-cap than small cap markets was also observed in the United States (Bouchey et. al. (2011))

This results needs to be interpreted in the context of the concentration within the large-cap security universe in Australia, where the top eight securities represent 50% of the market (Figure 6).

Figure 6: Security Weights in S&P/ASX 300
31 Dec 2013



The free-float dominance of the large-cap stocks may be reflected in the results above. Many active managers have constraints limiting investment in securities relative to their weight within an index. Consider, for example, two managers. One has a view that one of these large, dominant securities will out-perform, and the second has a view that one of the much smaller equities will rise. The first manager will most likely be less constrained in taking a large active position in the large-security than the second manager, and therefore will benefit more if their decision is correct. An alternative interpretation is that cross-sectional volatility identifies the latent Alpha Potential, but it is the investment guidelines that free a manager to be able to capitalise on these.

3.4 Float-weighted vs Equal-weighted measures of cross-sectional volatility

Finally, this paper compared results between float-weighted and equal weighted measures of cross-sectional volatility within Australia. Results are shown in Figure 8, with Float-weighted measures repeated from Figure 7 for convenience.

Figure 7: FWCrossVol vs. EWCrossVol

	Australian Large Cap Equities		Australian Small Cap Equities	
	FWCrossVol	EWCrossVol	FWCrossVol	EWCrossVol
Coefficient	0.69	0.32	0.54	0.31
Standard Error	0.06	0.04	0.05	0.04
t-statistic	11.74	9.11	11.24	7.61
R^2	0.54	0.41	0.52	0.33

The results show that float-weight cross-sectional volatility has higher explanatory power than equal-weight cross-sectional volatility for both large-cap and small-cap markets. As found in other studies, this result is expected and is again consistent with mutual funds having investment constraints in taking constraining managers from taking significant active positions relative to benchmarks.

4. CONCLUSIONS

This paper presents the findings of an investigation into the relationship between the cross-sectional volatility of security returns and the dispersion of actively managed fund returns within the Australian equity market (large-cap and small-cap markets). In line with research conducted in other countries and markets, the results have shown that both float-weighted and equal-weighted measures can be visually and statistically linked to the dispersion of active fund manager returns, thereby supporting their use as a valid indicator of Alpha Potential within the Australian equity market.

These results have implications for two distinct groups.

First, use of cross-sectional volatility may be useful for those involved in the ex-ante decision making, either at an asset-allocation or security level. For example, tracking and monitoring cross-sectional volatility within markets may help in deciding when to enter equity markets, splitting an asset allocation between large and small-cap managers, or investing via active or passive managers.

Second, knowing the Alpha Potential that was available could be useful in the ex-post evaluation of individual investment managers. Arguably, out- or under-performance, typically viewed solely as the difference between a fund and its benchmark, should be seen in the context of the Alpha-Potential available to that manager in that period. After all, a 1% out-performance could mean much more in low cross-sectional-volatility environments than high cross-sectional-volatility environments.

Finally, the findings presented here merit further research efforts and improvements. Data refinements, such as the use of gross returns in the dispersion calculation, as well as daily weighting results instead of monthly weighting may have serve to improve results further and provide a cleaner theoretical basis. Further, and in the context of the concentration of very large securities within the Australian market, if a sufficiently large active manager universe could be determined it would also be useful to more narrowly define the large-cap universe to include only those managers benchmarked against the top 20 securities in the market. Finally, further investigation of other asset classes (e.g., corporate bonds) and groupings (growth vs. value) may also shed interesting results.

ENDNOTES

1. Sharpe's claim was empirically evidenced in Fama and French (2010). By using US data, the authors showed that the alpha of value-weight portfolio of active funds was close to zero.

2. This is based on the assumption of the existence of skilled fund manager. Fama and French (2010) showed there are outperformers who beat their peers persistently. The authors concluded that this was due to skill not luck.

3. Australian Securities Exchange, 2012

4. As at 31 Dec 2013

5. The 95th and 5th percentiles fund returns instead of maximum and minimum fund returns are used to minimize the impact of outlier fund returns.

6. Gorman, Sapra and Weigand (2010b) demonstrated that time-series volatility and cross-sectional volatility were highly correlated. Thus, our observation is consistent with the usual sense that small-cap securities are more volatile than large-cap securities.

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Andrew Kophamel is Head of Performance Asia Pacific with Aberdeen Asset Management (Sydney). Andrew has been in his current role for four years, prior to which he spent six years with State Street managing the firm's regional fixed income attribution, performance, and market data, and four years with Deutsche Asset Management as a fixed income performance manager.

Ben Wang, PhD, is a Performance Analyst with Aberdeen Asset Management (Singapore).
