Introduction

Volatility is one of the primary risks active asset managers are tasked with managing, both on the total portfolio level as well as relative to their respective benchmarks. While investors generally prefer to minimize both total and active volatility, for a given level of return, active managers need cross-sectional volatility, or dispersion of individual equity returns in a given period, to generate alpha through stock selection. When equities are correlated and move together in tandem active managers have less opportunity to separate winners from losers, whereas when cross-sectional volatility is high, active managers may have the opportunity to reap greater rewards if they are able to correctly identify outperformers and avoid underperformers.

In previous SGA research papers, we examined and discussed both total equity market volatility as well as one measure of cross-sectional volatility and the conditions under which they have changed over time. In this paper we take a deeper dive and explore the theoretical and empirical relationship between total volatility and cross-sectional volatility and then examine how these measures of variation may impact opportunities for active management across market segments. We do this by analyzing active manager returns, gathered from the eVestment’s database, against the level of cross-sectional volatility of the indices they are benchmarked to over the same period. Finally, we apply the same analysis to the historical performance of SGA’s International Large Cap Core and US Large Cap Core strategies.

Methodology

In this paper we discuss the relationship between volatility and cross-sectional volatility in equity market indices. As such, we use various measures of each as defined below.

Volatility

Here we look at both total index volatility of various indices as well as the average of each company’s volatility within the respective index.
As we will discuss in further detail in the following section, we compare the two in order to measure the amount of risk that can be diversified by holding the entire index.

We define Total Index Volatility (TV) as the annualized standard deviation of the past 60 months of returns for an index depicted in Formula 1 below.

**Formula 1**

\[ TV_T = \sqrt{VAR(M_{t,T} \ldots M_{t,T})} \times \sqrt{T} \]

where \(VAR(M_{t,T} \ldots M_{t,T})\) is the variance of the index return from time \(t\) to time \(T\) (60 months).

We calculate the Average Company Volatility (ACV) of an index by taking the 60 month variance for each stock in the index and then calculating the weighted average of these values. Finally, we take the square root of the result and annualize it. This is formally represented in Formula 2.

**Formula 2**

\[ ACV_T = \sqrt{\sum_{i=1}^{N} w_i \times VAR(R_{i,t} \ldots R_{i,T})} \times \sqrt{T} \]

where \(w_i\) is the weight (determined by market cap) of company \(i\) of \(N\) companies in the index and \(VAR(R_{i,t} \ldots R_{i,T})\) is the variance of company \(i\)'s returns from time \(t\) to time \(T\) (60 months).

**Cross-Sectional Volatility**

In contrast to Total Volatility (TV) which measures variation in returns of an index over time, Cross-Sectional Volatility measures the variation of returns between individual companies within an index in a single time period. There are several ways to measure cross-sectional volatility, including a measure we called “CSvol” used in a previous paper which calculates the spread of returns between top performing stocks and bottom performing stocks in a given period. In this paper we look at a different measure, “Dispersion” (DISP), which also captures the variation of individual company returns in a single period, but is formulated in a way that allows us to directly relate it to TV on the same scale because they are both expressed in terms of...
standard deviation. CSvol and Dispersion, or DISP, are in fact highly correlated. For instance, the correlation coefficient between monthly CSvol and DISP for the MSCI EAFE index over the 20 year period ending February 2016 is .93.

For reference, we defined CSvol as the return spread between the 10\textsuperscript{th} and 90\textsuperscript{th} percentile company return in a given period shown in Formula 3.

\textbf{Formula 3}

\[ CSvol_t = R_{10,t} - R_{90,t} \]

where \( R_{n,t} \) is the return of \( n \textsuperscript{th} \) percentile company at time \( t \).

We define Dispersion (DISP) as the square root of the weighted average squared deviation between each company’s return and the total index return in a given period and then annualize it. Formula 4 shows the formulation.

\textbf{Formula 4}

\[ DISP_t = \sqrt{\sum_i^N w_i * (R_{i,t} - M_t)^2 * \sqrt{12}} \]

where \( w_i \) is the weight (determined by market cap) of company \( i \) of \( N \) companies in the index. \( R_{i,t} \) is the return of company \( i \) at time \( t \). \( M_t \) is the return of the index at time \( t \).

**Total Volatility, Cross-Sectional Volatility, and Diversification**

Total Index volatility, TV, differs significantly from the volatility of the average company within the index over the same period. This is because the returns of each company in the index are not perfectly correlated, so this difference in risk represents the diversification benefit of holding the entire index.

Figure 1 plots both TV and average company volatility, ACV, for the MSCI EAFE index. We see that while TV is often high when ACV is high, there are times when the two deviate. The two shaded regions
represent the peak and collapse of the so-called Tech Bubble\(^1\) (1999-2001) and the 2008 crisis\(^2\) and subsequent 2009 recovery, respectively, which tell contrasting stories. During the Tech Bubble, ACV was very high while TV was fairly modest. On the other hand, during 2008-2009 both ACV and TV were very high. The difference was that during the Tech Bubble correlation was low, so investors could diversify away the risk of volatile individual companies while in 2008-2009 correlation was very high, so there was a more limited benefit to diversification and investors could not avoid high levels of volatility. Put this way, the gap between the ACV plot and the TV plot represents the risk that could be diversified by holding the index portfolio.

**Figure 1**

Correlation is a measure of the degree to which individual company returns move together. Alternatively, cross-sectional volatility measures the variation of individual company returns. They are not exactly inversely related, as correlation measures the relationship over time and cross-sectional volatility is measured in the same period. However, intuition tells us that when correlation is low cross-

\(^1\) The Tech Bubble/Collapse is represented here as the period between August 1999 and May 2001.
\(^2\) The 2008-2009 Crisis/Recovery is represented here as the period between May 2008 and July 2009
sectional volatility should be high. We noted ACV and TV diverge when correlation is low, so it should then follow that cross-sectional volatility increases when the gap between ACV and TV increases.

To verify this we plotted the one month DISP, our measure of cross-sectional volatility, of the MSCI EAFE index alongside the difference\(^3\) between ACV and TV in Figure 2.

![Figure 2](image)

Source: Factset, MSCI

We recall that the difference between ACV and TV represented by the orange line in Figure 2 is the diversification benefit, or the risk of holding a company with the average volatility that can be diversified by holding the entire index. Said differently, this is the stock specific, or idiosyncratic, risk in the index. From Figure 2 we can see that DISP (the grey line) tracks the stock specific risk (the orange line) very closely. In fact, the correlation coefficient between the two is .81.

While stock specific risk on the one hand represents risk that managers can avoid through diversification, active managers who target alpha through stock selection require a degree of stock specific

\(^3\) Since standard deviations are not additive, we squared the ACV and TV to obtain the respective variances, took the difference of the two variances, and took the standard deviation of the resulting difference.
risk. By definition, these types of active managers look to add value from stock selection by taking stock specific risk. From this lens, stock specific risk represents the opportunity for skilled active managers to outperform, bringing together the intuitive relationship between stock specific risk and cross-sectional volatility on top of the strong empirical relationship.

Cross Sectional Volatility: Opportunity for Active Management

In the previous section we discussed the relationship between total volatility and cross-sectional volatility, specifically Dispersion (DISP). We showed how dispersion bridges the gap between ACV and TV and can represent stock specific risk. We also made an argument that the level of cross-sectional volatility, as measured by DISP, is representative of the opportunity for skilled active management to outperform. In this section we examine whether the argument holds when analyzing actual active manager returns.

It should first be noted that we looked to test whether there was an opportunity for greater excess returns for active managers when dispersion is higher as opposed to whether active managers, in general, perform better when dispersion is higher. After all, across all market participants investing in companies in a given index, participants exceeding the index return must be offset by those that underperform as the index return represents the weighted average performance of all participants in a given period. Of course, our analysis only used a subset of market participants, specifically the universe of active managers as reported by eVestment, and managers analyzed were not restricted to invest only in the constituents of their prescribed benchmark. However, on average, it is still reasonable to expect the active manager’s excess returns as a whole to be close to zero.

That being said, we gauged opportunity for excess returns by conditioning on peer level performance. Specifically, Figure 3 and 4 take the return of the 25th percentile manager each month and compare them to the one month Dispersion (DISP) for their respective

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4 For International Large Cap Core we analyzed the universe of managers that identified themselves as “active” and identified the MSCI EAFE index as their benchmark. For US Large Cap Core we used active managers that identified the Russell 1000 index as their benchmark as reported by eVestment. We analyzed the time series of one month returns over the period of February 1996 to December 2015. The number of managers in the universe ranged from 69 to 315 over the period for MSCI EAFE managers and 313 to 1129 for the Russell 1000.
benchmark. The charts look to address the question of when examining the return of the top quartile manager each period, does the level of dispersion affect the magnitude of excess returns.

Figure 3

The 25th percentile MSCI EAFE manager’s excess returns and one month dispersion were 45% correlated. For the Russell 1000 it was even higher at 60%.

Figure 4

Source: Factset, MSCI, Russell, eVestment
From the plots we see that Dispersion (DISP – left axis) and the manager excess returns (right axis) do appear to be related. In fact, the correlation coefficient of the 25th percentile MSCI EAFE manager’s excess returns and one month DISP was .45 (Figure 3). For US equity managers vs. the Russell 1000 it was even higher at .60 (Figure 4). While the absolute level of excess returns are not necessarily higher for US managers, this may indicate that US managers who are outperforming take greater advantage of cross-sectional volatility.

In addition, we continue to see a relationship between manager excess returns and dispersion when we compare the average excess return of the 25th percentile manager in periods of high dispersion versus periods of low dispersion. Figure 5 separates monthly periods over the same 20 year time period (1996 - 2015) into five buckets (1 being time periods with the highest DISP, 5 being lowest) according to the MSCI EAFE level of DISP. The bars represent the average monthly excess return of the 25th percentile international equity manager over the periods within the respective DISP bucket. Figure 6 shows the same analysis, for US equity managers and the Russell 1000.

It is clear that the 25th percentile manager outperforms to a greater degree when dispersion is highest.

Source: Factset, MSCI, Russell, eVestment

It is clear that the 25th percentile manager outperforms to a greater degree in time periods when dispersion is highest and the relationship is nearly monotonically decreasing across DISP bucket. This supports the argument that managers when outperforming, outperform to a greater degree when dispersion is higher in the market.
Up until now we have only discussed the 25th percentile manager, which begs the question of whether the relationship between dispersion and active manager excess returns holds true across the entire distribution of managers. In fact, we found that the relationship does exist and it is dependent on the level of peer relative performance. Earlier we noted that the 25th percentile MSCI EAFE manager’s excess returns were 45% correlated with dispersion in the MSCI EAFE Index. Looking at the correlation at additional percentile breakpoints (Figure 7 and 8) we can see this relationship between peer relative manager outperformance and dispersion. Specifically, the excess returns of the 5th percentile manager are more correlated with dispersion than those of the 25th percentile manager monotonically down to the 95th percentile manager where excess returns are negatively correlated with dispersion.

Figures 7 and 8 show that when levels of dispersion are high, managers who are outperforming enjoy greater excess returns. Alternatively, managers who are underperforming do so to a greater degree during periods of high dispersion. Said differently, when cross-sectional volatility is high, greater opportunity for increased excess returns do exist; however, active managers who are unable to skillfully separate winners from losers have the potential for greater underperformance. So when markets present managers with the increased opportunity that cross-sectional volatility provides, all else equal, they are also exposed to more active risk, particularly stock specific risk.
SGA Performance and Dispersion

In the previous section we saw that active managers who outperformed yielded greater excess returns in periods with higher cross-sectional volatility. As a next step we sought to see if the same relationship held for SGA’s international and US strategies. Figures 9 and 10 show SGA’s monthly excess return by dispersion quintile for periods that SGA outperformed its respective benchmark for its International Large Cap and US Large Cap strategies, respectively. As before, the first quintile includes months where dispersion was highest and quintile 5 where dispersion was lowest.

From the charts in Figure 9 and 10 we can see that the SGA excess returns were slightly bettermic in the top two dispersion buckets for both International and US, however, the effect is not as dramatic as the universe of managers as a whole. One explanation for this is that SGA’s risk model and portfolio construction process not only take into account common risk factors relative to the benchmark, but also incorporate stock specific risk relative to the benchmark.

5 SGA’s International Large Cap Core Strategy outperformed the MSCI EAFE benchmark 74 of 123 months since inception (Dec 2005 - Feb 2016). SGA’s US Large Cap Core Strategy outperformed the Russell 1000 benchmark 57 of 104 months since inception (July 2007 – Feb 2016). The information presented here is not intended to imply that SGA’s strategies outperformed their indices or the universes of their peers over the entire 123 or 104 months since inception, respectively.
the goal of achieving consistent excess returns over time and across market environments.

Conclusions

Cross-sectional volatility, specifically dispersion, explains much of the difference between average company volatility and total volatility of an index. This difference represents both the stock specific risk that can be diversified by holding the entire index portfolio as well as the opportunity for stock selection to achieve greater excess returns when a manager is able to accurately separate the winners from the losers. In fact, our analysis of the eVestment universe of active managers shows that higher ranked managers have larger excess returns in periods when cross-sectional volatility is higher. On the other hand, SGA excess returns have been more stable across different levels of dispersion in the market, coming in only marginally higher in periods where dispersion is highest.

About Strategic Global Advisors, LLC

Founded in 2005, Strategic Global Advisors, LLC (SGA) is an SEC Registered Investment Advisor, managing international, domestic and global equity portfolios for institutions and individuals. SGA is headquartered in Newport Beach, California. Our team of investment professionals has an average of 17 years of investment experience in quantitative methods, fundamental research and global investing. SGA’s investment management team has developed investment strategies within a collaborative environment, while maintaining a focus on a bottom-up decision making process. Through our disciplined investment process that integrates quantitative and fundamental methods, we construct portfolios focused on stock selection, rather than country and sector market timing. We have been dedicated to integrating quantitative and fundamental methods since the firm’s inception.

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