

Low correlations, high volatility: big opportunity?

Do low intra-stock correlations and high cross-sectional volatilities make life easier for active managers, whether quantitative or otherwise? Our results are less clear-cut than we had expected.

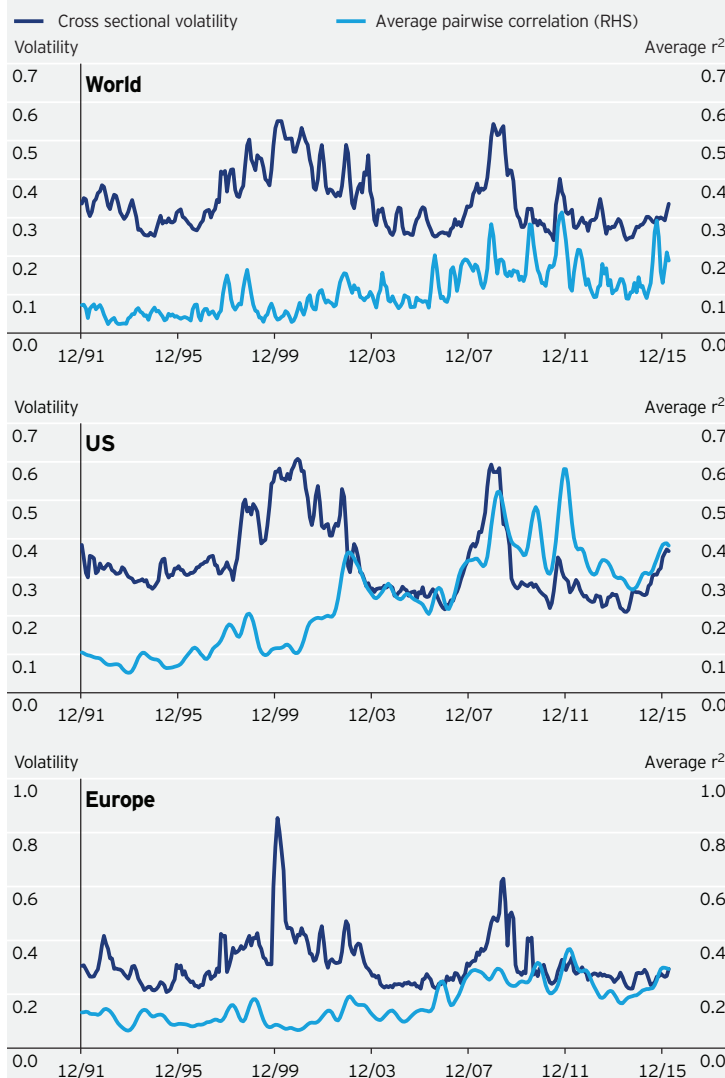
It is often taken for granted that active management will be most successful if the market differentiates greatly between stocks. This frequently leads to assertions such as “when major events dominate markets, times are challenging for stock pickers”, “this risk-on, risk-off environment is difficult” or “this volatility creates big opportunities for stock pickers”. The majority of such statements refer to challenges rather than tailwinds – maybe because humans tend to blame failures on circumstances and ascribe success to their own virtues and actions.

In line with this thinking, opportunity is often described as stocks moving fairly independently of each other, i.e. in terms of low correlation between

stocks. In the same vein, opportunity may also be thought of as high volatility, since this usually means more differentiation between stocks. Low volatility, on the other hand, means little differentiation and therefore less opportunity.

It might, however, not be quite that straightforward: the existence of return factors (such as value and momentum) implies correlations between stocks, and high volatility might occur in times in which returns are dominated by unexpected shocks. In this article, we explore the relationship between correlations and volatility on short and medium term active manager returns – in order to find out how reliable this market lore is.

Figure 1: Cross-sectional volatility and average pairwise correlations



Based on the global research universe of Invesco Quantitative Strategies comprising approx. 3000 securities.
Source: Invesco Quantitative Strategies. Data as at 31 March 2016.

We examine a number of regions and treat systematic (overwhelmingly quantitative, factor based) managers as a special subgroup of the total manager universe, possibly adding a further angle. But we begin with the question of whether pairwise correlations and volatilities are telling us the same thing. In other words: are volatilities high when correlations are high, and vice versa?

Average pairwise correlations and cross sectional volatilities

Here and in the following we have defined average pairwise correlations as the average coefficient of correlation between the local currency returns over 20 day periods for all possible pairs of stocks in a region. The cross sectional volatility has been defined as the standard deviation of monthly local currency returns within a region. Quarterly and annual readings have been generated by averaging monthly values.

It might seem reasonable to expect that periods of high volatility are also periods in which stock returns are highly correlated. There is some evidence for this (figure 1).

But we can also see an increase in average pairwise correlations while this cannot be said for cross sectional volatility. Nor is this true for all markets and all periods. Broadly speaking, correlations have increased and were generally positive across the last 10 years, whereas prior to that there were positive and negative relationships. It would seem wrong to count on a stable and positive relationship between average pairwise correlations and cross sectional volatility.

Manager returns

For our analysis, we sourced manager returns from Mercers MPA (Global, Australia, eurozone, Europe, Japan, UK and US LC Core) and the index returns from MSCI. We then created two sub-groups within each manager universe: quantitative and other.

“Quantitative” managers are those that, on the basis of their process description, the product name or the firm description, indicate that their processes are overwhelmingly quantitative in nature. “Other”

managers include managers that might have quantitative screens but have important judgmental elements and of course those that do not use quantitative elements in their processes. Unsurprisingly, Invesco Quantitative Strategies is included amongst the quantitative managers.

For those two groups and the regional universes we created monthly median and average active returns. For most months and universes, there was only little difference between the two, but especially in 2008 and 2009 average returns were skewed by fantastic outliers. We therefore consistently used median returns. It should also be borne in mind that the data set was to some extent subject to biases. Dead track records might have been removed, products with poor starts might not be included in the universes, poor returns of a product set to close might not be reported and the composites that form the basis of the reported figures might not be strictly representative, to name a few potential problems. It is therefore safe to assume that the active returns were somewhat exaggerated, especially in the more distant past.

One potentially interesting finding is that the active returns of both groups are positively correlated in all regions. Table 1 shows the correlation between the monthly active returns of quantitative and other managers in the various universes over the last ten years, i.e. over a comparatively recent period which may reflect current investment practices better than the full data history.

Average pairwise correlations

We now look at correlations between stocks. The monthly correlation within a market is defined as the average pairwise correlation (r^2) of the daily stock returns of all the market's stocks within a region. Even in a small universe like Australia, we

Table 1: Correlation of active returns of "quantitative" and "other" managers

	Coefficient of correlation
Australia	0.54
Eurozone	0.78
Europe	0.71
World	0.49
Japan	0.66
UK	0.86
US	0.50

Source: Mercer MPA for manager returns and MSCI for index data, Invesco for calculations. Data history: 31 March 2006 - 31 March 2016

have millions of pairwise correlations, and globally we have well over a billion. We then move on to look at an ordinary least squares regression between the monthly, quarterly and annual results of the average pairwise correlations and the manager returns. This analysis has been performed four times: contemporaneous on absolute and ranked levels of returns and correlations, lagging the returns by one period and using the change in the level of average pairwise correlations. Table 2 shows the summary results of our analysis.

In some markets, average pairwise correlations are high (and usually negative), but the vast majority is not statistically significant. And whilst high or increasing correlations are often negatively related to active returns, there are a fair number of positive, albeit insignificant relationships. The strongest exception in this context is the World where a majority of correlations are significant. The lack of explanatory power of levels may be connected with the noticeable upward movement in the average pairwise correlations after 2000.

Table 2: Correlations between average pairwise correlations and active managers' returns

	Absolute correlations, no lag			Rank correlations, no lag			Absolute correlations, following period's returns			Absolute correlations of changes, no lag		
	1 month	3 months	12 months	1 month	3 months	12 months	1 month	3 months	12 months	1 month	3 months	12 months
Australia	-0.07	-0.11	-0.26	-0.11	-0.13	-0.28	-0.06	-0.12	-0.10	-0.02	0.00	-0.28
Eurozone	0.00	-0.01	0.02	-0.06	-0.05	-0.09	0.02	0.06	-0.19	-0.11	-0.15	0.32
UK	0.03	0.03	0.06	0.05	0.04	0.06	0.05	0.11	0.19	-0.15	-0.18	-0.21
Europe	-0.03	-0.07	-0.15	-0.05	-0.10	-0.20	-0.01	-0.01	-0.19	-0.11	-0.13	0.06
Japan	-0.14	-0.28	-0.39	-0.14	-0.23	-0.44	-0.13	-0.19	-0.23	-0.08	-0.20	-0.26
US	-0.04	-0.11	-0.10	-0.06	-0.12	0.04	-0.05	-0.08	-0.12	0.03	-0.04	0.05
World	-0.35	-0.38	-0.28	-0.25	-0.25	-0.28	-0.02	0.08	-0.02	-0.42	-0.55	-0.47

Bold values are statistically significant at a 95% level.

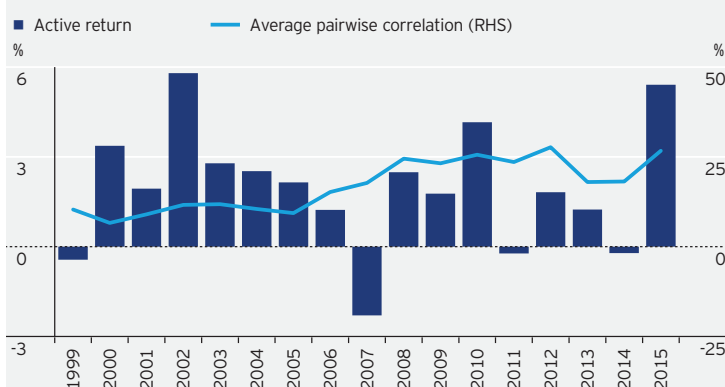
Source: Mercer MPA for manager returns and MSCI for index data, Invesco for calculations. Data history: 31 December 1991 - 31 March 2016 (from 31 December 1998 for eurozone).

Table 3: Average active returns of different pairwise correlation quintiles

	Australia	Eurozone	Europe	UK	Japan	US	World
Highest correlations	0.34%	0.80%	0.63%	0.45%	0.22%	0.16%	0.31%
Lowest correlations	0.79%	0.34%	0.90%	0.28%	1.34%	0.57%	0.91%
All	0.63%	0.48%	0.53%	0.56%	0.49%	0.31%	0.57%

Average quarterly active returns in the 20% of quarters with the lowest and highest average pairwise correlations and in all quarters. Source: Mercer MPA for manager returns and MSCI for index data, Invesco for calculations. Data history: 31 December 1991 - 31 March 2016 (from 31 December 1998 for eurozone).

Figure 2: The eurozone as an example



Source: Mercer MPA for manager returns and MSCI for index data, Invesco for calculations. Data history: 31 December 1999 - 31 December 2015 (annual data).

However, if we look at changes rather than absolute levels, the relationship between average pairwise correlations and active manager return becomes closer, and at least on a monthly or quarterly level it is often significant.

Another way of looking at the active manager returns is to group them into buckets. Table 3 shows results for five correlation quintiles, using our full data history. The pattern is not uniform. Japan, Australia, the US and the world show the lowest returns in the quintile with the highest correlations, but also below average returns in the periods with the lowest correlations. Europe, the UK and the eurozone do not conform to this picture.

Figure 2 shows recent active manager returns and average pairwise correlations for the eurozone as

an example. Over the last 10 years, the relationship between active manager returns and average pairwise correlations is usually rather weak, and added to this the relationships are more often positive than negative.

In a next step we segmented our active manager returns into two groups, "quantitative" and "other". The findings were rather sobering. The lack of significant relationships between average pairwise correlations and active manager returns was not caused by the two subgroups behaving differently.

As evidenced by table 4, we can see that, for the most part, the relationships were very similar. There is little meaningful difference between quantitative and other managers, perhaps with the exception of the eurozone and Japan.

Cross-sectional volatilities

We then went on to analyze the relationship between cross-sectional volatilities and active manager returns. As noted above, cross sectional volatility has fluctuated considerably, but unlike pairwise correlation, there has not been any level change. Presumably our expectation should be that times of high cross-sectional volatility are opportunities for active managers. On the other hand, high cross-sectional volatility may indicate crisis and unexpected developments, which could catch active managers off-guard.

So what does the data tell us? As table 5 shows, there was generally a positive relationship between cross sectional volatility and active manager return, and occasionally it was also significant.

However, the picture became far more complicated when changes were considered rather than levels.

Table 4: Correlations between average pairwise correlations and managers' returns - quantitative and other managers compared

	Absolute correlations, no lag			Rank correlations, no lag			Absolute correlations, following period's returns			Absolute correlations of changes, no lag		
	1 month	3 months	12 months	1 month	3 months	12 months	1 month	3 months	12 months	1 month	3 months	12 months
Australia												
Quant	-0.06	-0.09	-0.26	-0.10	-0.10	-0.34	-0.06	-0.13	-0.21	0.02	0.09	-0.11
Non-quant	-0.06	-0.11	-0.24	-0.11	-0.11	-0.26	-0.06	-0.11	-0.08	-0.03	-0.01	-0.29
Eurozone												
Quant	-0.09	-0.17	-0.40	-0.14	-0.19	-0.43	-0.07	-0.05	-0.33	-0.16	-0.28	-0.15
Non-quant	0.01	0.02	0.05	-0.03	-0.02	-0.09	-0.10	-0.10	0.39	-0.10	-0.15	0.35
UK												
Quant	-0.06	-0.10	-0.08	-0.07	-0.08	0.00	-0.02	0.05	0.07	-0.22	-0.35	-0.27
Non-quant	0.03	0.04	0.08	0.06	0.05	0.10	0.06	0.12	0.18	-0.15	-0.17	-0.18
Europe												
Quant	-0.03	-0.04	-0.01	-0.02	0.00	-0.04	-0.01	0.02	-0.15	-0.11	-0.16	0.22
Non-quant	-0.04	-0.10	-0.22	-0.05	-0.12	-0.22	-0.02	-0.05	-0.20	-0.10	-0.12	-0.03
Japan												
Quant	-0.05	-0.07	-0.18	-0.05	-0.07	-0.25	-0.06	-0.10	-0.15	0.05	0.07	-0.05
Non-quant	-0.15	-0.29	-0.39	-0.15	-0.24	-0.47	-0.13	-0.19	-0.21	-0.09	-0.23	-0.30
US												
Quant	-0.04	-0.10	-0.11	-0.02	-0.05	0.06	-0.03	-0.05	-0.02	0.02	-0.05	-0.09
Non-quant	-0.02	-0.08	-0.05	-0.07	-0.14	0.05	-0.05	-0.08	-0.15	0.02	-0.03	0.11
World												
Quant	-0.14	-0.22	-0.35	-0.17	-0.27	-0.32	-0.17	-0.24	-0.32	0.03	0.02	-0.07
Non-quant	-0.21	-0.25	-0.39	-0.25	-0.31	-0.42	-0.13	-0.15	-0.22	-0.10	-0.12	-0.31

Bold values are statistically significant at a 95% level.

Source: Mercer MPA for manager returns and MSCI for index data, Invesco for calculations. Data history: 31 December 1991 - 31 March 2016 (from 31 December 1998 for eurozone and Europe, 31 March 1996 or Japan, 31 December 1995 for Australia, 31 December 1994 for UK, since before the number of active managers was too small for a meaningful analysis).

Table 5: Correlations between cross-sectional volatilities and active managers' returns

	Absolute correlations, no lag			Rank correlations, no lag			Absolute correlations, following period's returns			Absolute correlations of changes, no lag		
	1 month	3 months	12 months	1 month	3 months	12 months	1 month	3 months	12 months	1 month	3 months	12 months
Australia	0.07	0.04	0.10	0.07	0.05	0.08	-0.03	-0.19	-0.24	0.11	0.28	0.34
Eurozone	0.01	0.09	0.21	0.08	0.15	0.15	0.04	0.13	0.29	-0.04	-0.05	-0.09
UK	0.04	0.06	-0.04	0.05	0.10	0.01	0.04	0.07	0.25	0.00	-0.01	-0.40
Europe	0.13	0.29	0.34	0.09	0.24	0.22	0.14	0.15	0.23	-0.01	0.23	0.13
Japan	0.07	0.13	0.26	0.01	-0.01	-0.02	0.04	0.08	-0.13	0.03	0.06	0.40
US	0.09	0.22	0.46	0.04	0.11	0.14	0.21	0.33	0.37	-0.23	-0.23	0.13
World	-0.02	0.04	0.13	0.01	0.03	0.04	0.06	0.12	0.32	-0.10	-0.12	-0.23

Bold values are statistically significant at a 95% level.

Source: Mercer MPA for manager returns and MSCI for index data, Invesco for calculations. Data history: 31 December 1991 - 31 March 2016 (from 31 December 1998 for eurozone).

Table 6: Average active returns of different cross-sectional volatility quintiles

	Australia	Eurozone	Europe	UK	Japan	US	World
Highest volatilities	0.64%	0.28%	0.64%	0.48%	0.74%	0.49%	0.55%
Lowest volatilities	0.53%	0.15%	0.22%	0.31%	0.60%	0.33%	0.27%
All	0.63%	0.48%	0.53%	0.56%	0.49%	0.31%	0.57%

Average quarterly active returns in the 20% of quarters with the lowest and highest cross-sectional volatilities and in all quarters.

Source: Mercer MPA for manager returns and MSCI for index data, Invesco for calculations. Data history: 31 December 1991 - 31 March 2016 (from 31 December 1998 for eurozone).

Then we saw a number of significant relationships, positive and negative.

When separating the returns into buckets again, we found that active managers did better in periods of high cross-sectional volatility (table 6). But the picture was mixed relative to all periods. So high is better than low, but not necessarily good.

A factor example

So far we have used real life active manager track records. But what would a factor-based portfolio look like? Obviously we cannot answer this for all possible portfolio set-ups, but we can look at a specific and in our view interesting case.

For this we deployed an equal-weighted blend of momentum, quality and value (based on the respective

global MSCI Indices with monthly rebalancing) and again looked at the correlations of cross-sectional volatilities and active returns (table 7).

We could conclude that, over one-month periods, the relationship between the cross-sectional volatility and the returns of the strategy was not significant. Over three or twelve month periods, however, we did find significant relationships between the change in cross-sectional volatility and returns.

Rising volatility was positive, at least during the last 10 calendar years, but we should not attach too much significance to this. There were only two years (2008 and 2009) of elevated volatility over that period, one of which was followed by an exceptionally poor year for the blended strategy (2009; -4.3%). The results over the full sample remained essentially unchanged,

Table 7: Correlations between cross-sectional volatilities and the active returns of an equal-weighted factor portfolio

	Full sample			2005 - 2015		
	1 month	3 months	12 months	1 month	3 months	12 months
Absolute correlations, no lag	-0.09	0.01	0.08	-0.11	0.05	-0.13
Absolute correlations, following period's returns	-0.06	-0.10	-0.30	-0.05	-0.25	-0.59
Absolute correlations of changes, no lag	-0.03	0.17	0.49	-0.07	0.43	0.42

Bold values are statistically significant at a 95% level.

Source: MSCI for index data, Invesco for calculations. Data history: 31 December 1991 - 31 March 2016.

Table 8: Average active returns of an equal-weighted factor portfolio for different cross-sectional volatility quintiles

	Monthly	Quarterly	Annual
Highest volatilities	0.02%	0.28%	0.62%
Lowest volatilities	0.10%	0.44%	1.50%
All	0.16%	0.49%	1.94%

Average active returns in the 20% of periods with the lowest and highest cross-sectional volatilities and in all periods.

Source: MSCI for index data, Invesco for calculations. Data history: 31 December 1991 - 31 March 2016.

even if we neutralize 2008/9. We cannot prove a significant relationship between the absolute level of cross-sectional volatility and the relative return of our factor-based strategy.

We also analyzed whether possibly deviations from a “normal” level are meaningful, by dividing the months in our sample in buckets of 20%. Table 8 shows our findings.

The 20% of months with the highest cross-sectional volatility returned a slightly negative average active result while the least volatile 20% of periods showed an average relative return of 0.10 percentage points. This was both below the average (and consistent with quarterly and annual figures). It seems that high is indeed bad but low is slightly worse than average. No wonder linear regressions show a lack of significant relationships.

Summary

There is no clear evidence for a universal link between active managers’ returns and cross-sectional volatility or pairwise correlations of stocks. In addition, there is a lack of evidence for a strong differentiation between quantitative and other managers. Over monthly and quarterly periods, average pairwise correlations and active manager returns are generally negatively correlated, whereas the manager returns are positively correlated with cross-sectional volatility. For both measures, we find a negative correlation with changes in the measures. The results of our hypothetical factor example as well as differences between the regions warrant further research.

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