# Asia Quantitative General Research
## Where are the crowded trades?

Equities
Asia
Quantitative

**Shanle Wu**
Analyst
shanle.wu@ubs.com
+852-2971 7513

**Paul Winter**
Analyst
paul-j.winter@ubs.com
+61-2-9324 2080

**David Jessop**
Analyst
david.jessop@ubs.com
+44-20-7567 9882

**Nick Baltas, PhD**
Analyst
nick.baltas@ubs.com
+44-20-7568 3072

**Claire Jones, CFA**
Analyst
claire-c.jones@ubs.com
+44-20-7568 1873

**Josh Holcroft**
Analyst
josh.holcroft@ubs.com
+852-2971 7705

**Oliver Antrobus, CFA**
Analyst
oliver.antrobus@ubs.com
+61-3-9242 6467

**Luke Brown**
Analyst
luke.brown@ubs.com
+61-2-9324 3620

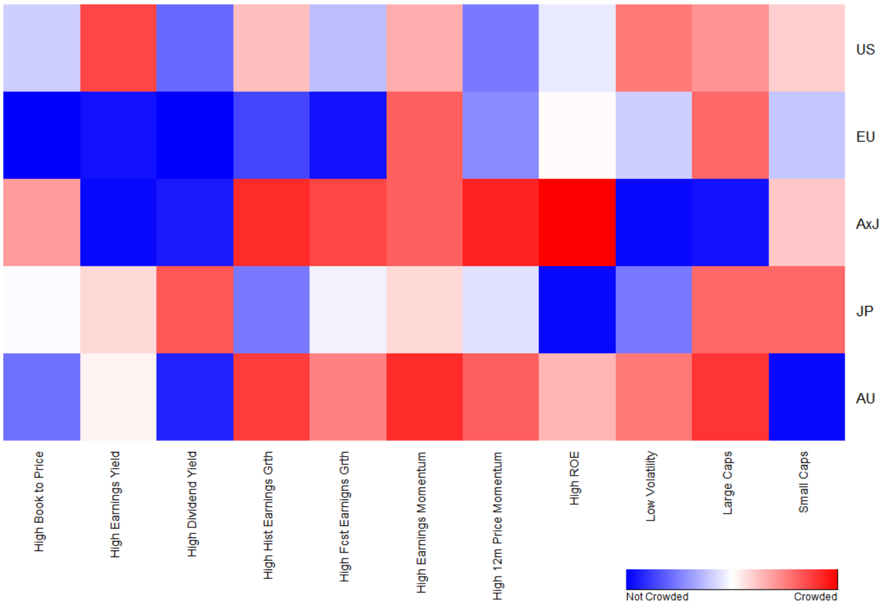
**Pieter Stoltz**
Analyst
pieter.stoltz@ubs.com
+61-2-9324 3779

### How to locate the crowds
Investors taking a position in a group of securities can cause return co-movement among those securities, hence increasing pairwise correlations. We have designed a Style Crowdedness Indicator (SCI) to measure the level of 'crowdedness' for investment styles based on the above idea, refining it so that it is comparable between different markets and styles.

### Where are the crowds?
As of December 2014, High Earnings Momentum was among the most crowded styles across markets. Large caps were also heavily traded except for Asia ex-Japan, where Small Caps were more popular. Regionally, the investment style space appeared crowded in Australia and Asia ex-Japan, with a range of styles including growth, momentum and quality being heavily traded. On the other hand, the style space was relatively quiet in Japan and Europe.

### Should we avoid the crowds?
The simple answer is that it depends. For strategies without fundamental anchors (such as price momentum), high levels of crowdedness have led to underperformance on many occasions in the past decade, and therefore we should avoid over-crowdedness in these types of strategies. For other strategies, high crowdedness has not always been associated with weak subsequent performance as other factors can affect performance. But we note that the level of crowdedness remains worth watching.

**Figure 1: Where are the crowds (December 14)?**




Source: MSCI, UBS Quantitative Research

# Where are the crowds?

## Why should we care?

**Identifying investment styles which are crowdedly traded is important both for quantitative and fundamental investors**

Quantitative strategies recorded strong performances during the late 1990s and early 2000s, but failed during the Global Financial Crisis (GFC). One criticism was that the strong performance pre-crisis led to widespread adoption by institutional investors, especially in developed markets, and quant strategies simply became too crowded causing the potential alpha to be arbitraged away.

Post the financial crisis, some investment themes such as Low Volatility, High Dividend Yield and High Quality became popular for a period of time, not only for quantitative investors but with fundamental investors as well. An increasing number of fundamental investors started taking a quantitative (or more precisely, a systematic) overlay in their portfolio selection process, as well as monitoring the style investments of their portfolios when running portfolio risk analysis. This might have increased the crowdedness within some investment styles.

As a result, identifying crowded trades is important both for quantitative and fundamental investors.

## Use stock co-movement to measure the crowdedness

**We use average pairwise correlation to measure the level of crowdedness**

The idea is simple: if investors begin to take a position in a group of securities as a basket, their trades can have a simultaneous price impact on those securities and cause return co-movement. As a result, correlation among those securities is likely to increase. We use the mean pairwise return correlation of stocks in each target style basket as a starting point and refine the measure to form our Style Crowdedness Indicator (SCI) in the following ways. (For details of our calculation method, please see the Appendix.)

**…further adjusted by its dispersion, overall correlation of the market and its own historical correlation level**

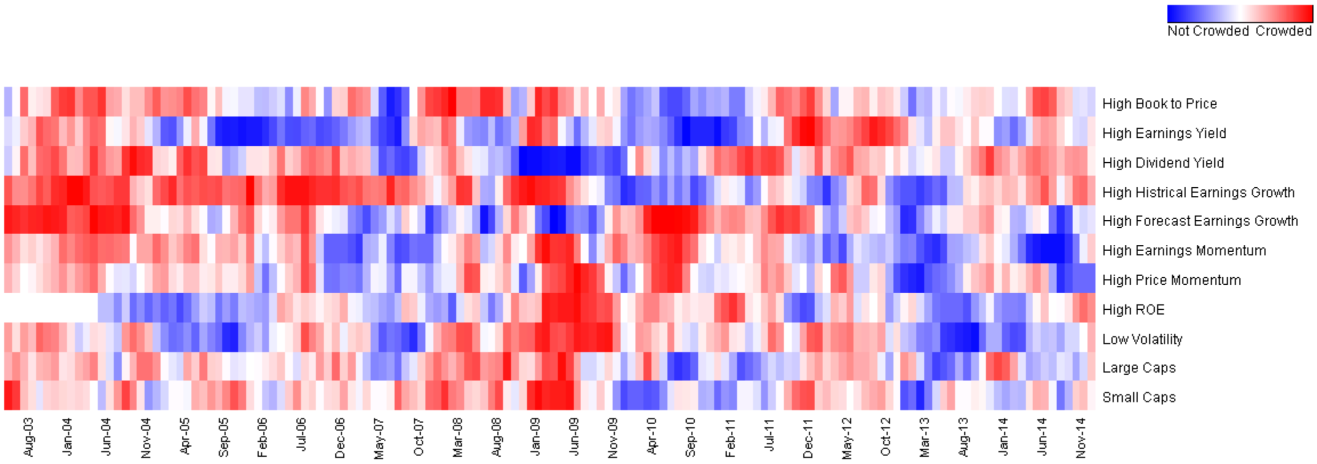
1. We scale the mean pairwise correlation by dispersion of correlation, as the high mean pairwise correlation with low correlation dispersion is a better measure of crowdedness than high correlation itself.

2. The increase/decline in a style portfolio's mean pairwise correlation may be caused by an increase/decline in the market's overall level of mean pairwise correlation. Hence we generate 1,000 random portfolios with the same number of stocks as the target style portfolio and adjust the measure by the mean and standard deviation of the measures of the 1,000 random portfolios.

3. Some investment styles can have consistently higher mean pairwise correlation than other styles. As a result, looking at the measure on a historical relative basis gives us a better idea whether the style is currently crowded or not.

We computed the SCI for various categories of styles including value, growth, momentum and quality for the main markets globally (please see the Appendix for details of our style portfolio construction). We use heatmaps to present the level of crowdedness and apply a three-month moving average to smooth the trend. Red indicates crowdedness is high, while blue means crowdedness is low.

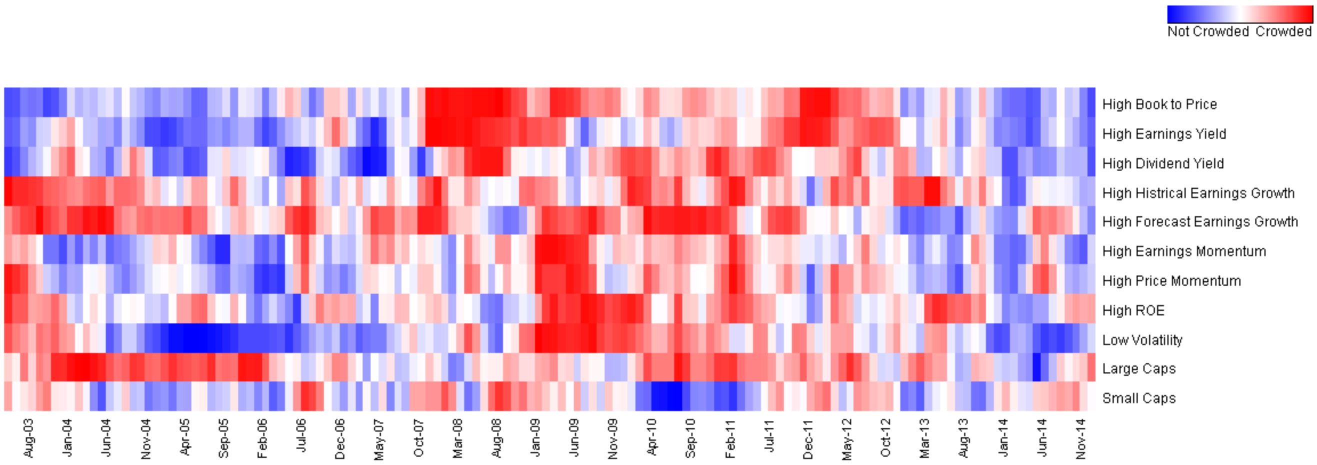
**Figure 2: US heatmap**




Source: MSCI, UBS Quantitative Research

Style investment was popular for a time in the US before the GFC. As we can see, the SCI levels were relatively high across different categories during that time. Post the GFC, High Earnings Momentum, High Price Momentum, High ROE and Low Volatility were crowded around 2008 and 2009. High Historical Earnings Growth and High Dividend Yield have been relatively crowded since mid-2013. But, in general, the level of crowdedness has been relatively low in the past few years (please see Figure 2).

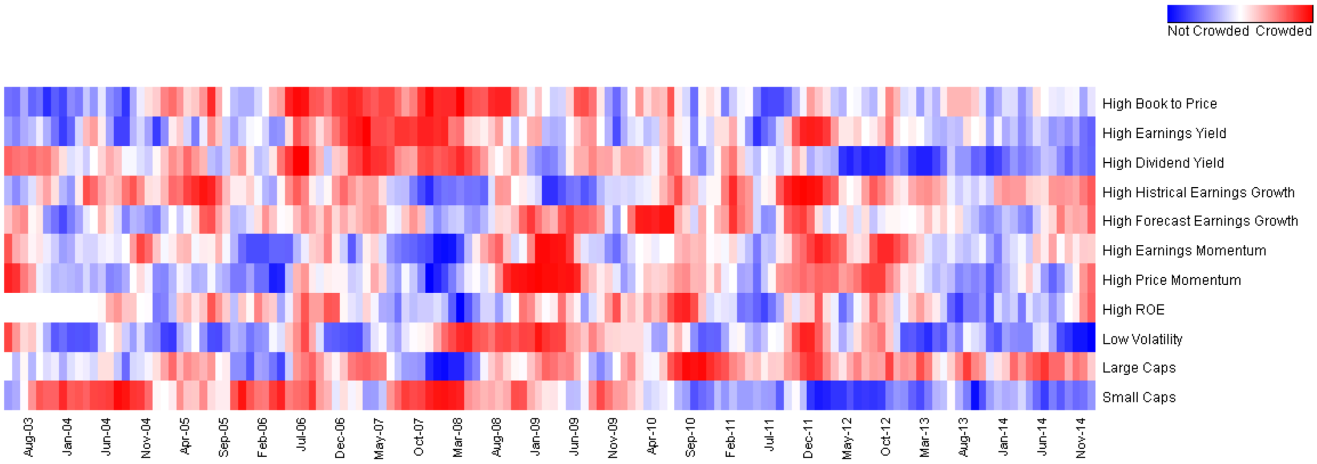
**Figure 3: Europe heatmap**




Source: MSCI, UBS Quantitative Research

In Europe, Large Caps and High Growth stocks were crowdedly traded before the GFC. Low Volatility and High ROE have been popular since the GFC. Value stocks were also heavily traded. But the level of crowdedness has declined since late 2013 (please see Figure 3).

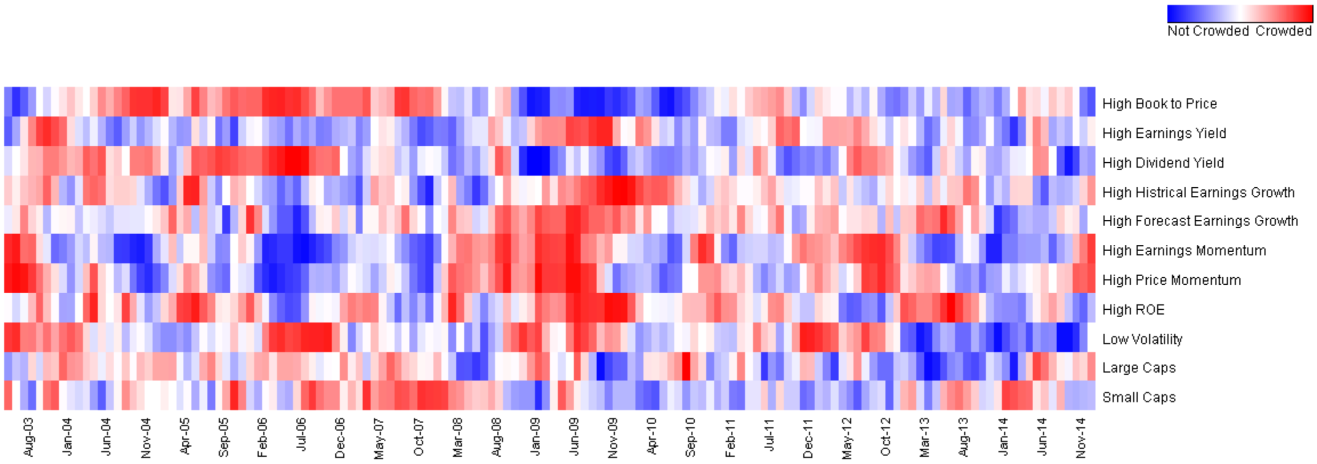
**Figure 4: Asia ex-Japan heatmap**




Source: MSCI, UBS Quantitative Research

In Asia ex-Japan, no investment styles other than Small Caps were consistently crowded over a long period before the GFC. High Book to Price, High Earnings Yield and High Dividend Yield were popular since mid-2000s up until the GFC. Low Volatility was heavily traded during the GFC. Post the GFC, High Growth stocks regained popularity. The Large Cap space has also been crowded since 2009 (please see Figure 4).

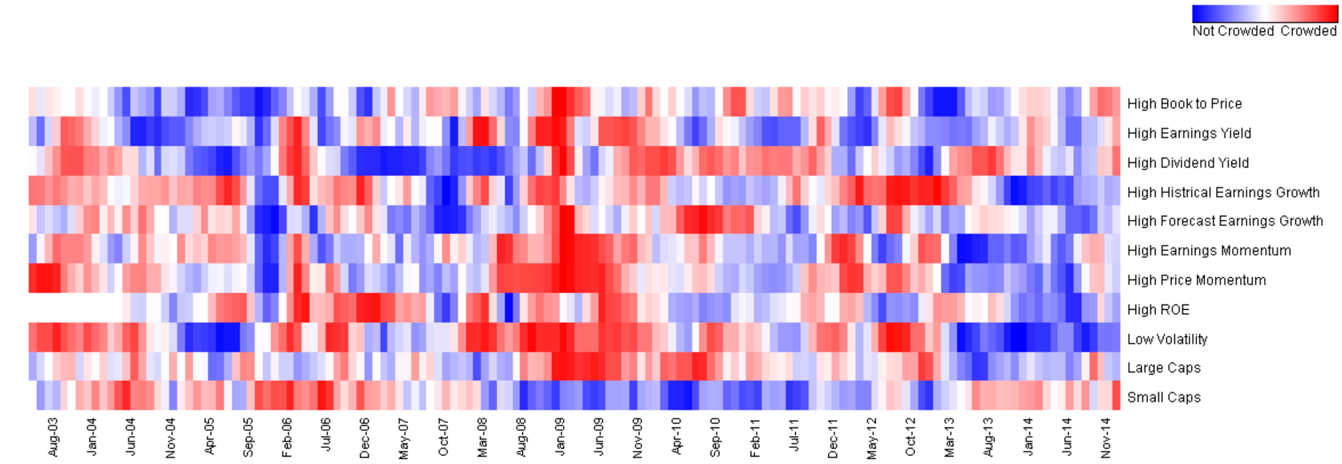
**Figure 5: Australia heatmap**




Source: MSCI, UBS Quantitative Research

In Australia, High Book to Price, High Dividend Yield and Small Caps were crowded pre the GFC. High ROE and Low Volatility started to gain popularity during the crisis up until 2010. In the past few years, investors have rotated between investment styles more often. Momentum currently appears to be popular (please see Figure 5).

**Figure 6: Japan heatmap**




Source: MSCI, UBS Quantitative Research

High Historical Earnings Growth and Small Caps had been popular in Japan before the GFC. Low Volatility and Large Caps space became crowded from the GFC until 2013. Over the past two years, investors have favoured inexpensive stocks and Small Caps (please see Figure 6).

# Should we avoid the crowds?

Now that we are able to locate the crowds, the next question to ask is: should we avoid them? The simple answer is that it depends.

**Figure 7: Did timing using the SCI improve performance?**

| | High Book to Price | High Earnings Yld | High Dividend Yld | High Hist Earnings Grth | High Fcst Earnings Grth | High Earnings Mom | High 12m Price Mom | High ROE | Low Volatility | Small Caps |
|---|---|---|---|---|---|---|---|---|---|---|
| US | Y | | Y | | | | y | y | | |
| Europe | Y | y | | | | y | y | y | | |
| Asia ex-JP | | | Y | y | y | y | y | y | | y |
| JP | | | | | | y | y | | | |
| AU | | y | | y | y | y | y | | | |

Source: MSCI, UBS Quantitative Research

**We should avoid the crowds for price momentum trades**

We found consistent evidence across markets that high levels of crowdedness (defined as SCI>0.8) in high price momentum led to weak returns in the past decade. For other investment styles, the effect was observed in some markets, but not others (please see Figure 7).

Price Momentum is a typical example of a strategy without a fundamental anchor. According to Stein[1], for this type of strategy investors do not base demand on an independent estimate of fundamental value. Typically for price momentum, demand is an increasing function of lagged asset returns. It is therefore difficult for individual investor to measure the amount of capital that other investors have placed in the same strategy and hence when to stop. When momentum strategy becomes overcrowded, arbitrage pushes the price further away from fundamentals and results in subsequent reversals in performance.

For other strategies, the level of crowdedness is not the only or the main factor that has an impact on performance. As a result, we do not see such a strong relation compared with price momentum.

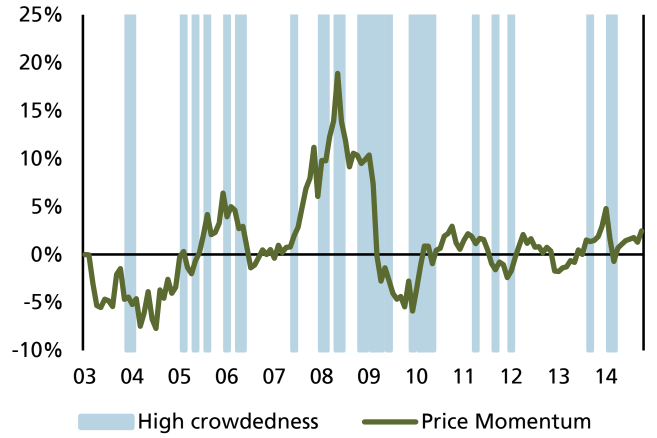
## Avoid the crowds in momentum trades

**The SCI managed to identify large momentum declines in early 2009 across markets**

High levels of crowdedness are associated on many occasions with underperformance globally during our testing period. In particular, the indicators were at their peak around the end of 2008 and early 2009 across markets, and February to May 2009 was a period when momentum strategy recorded the worst declines in the past decade globally (please see Figure 8 to Figure 12).

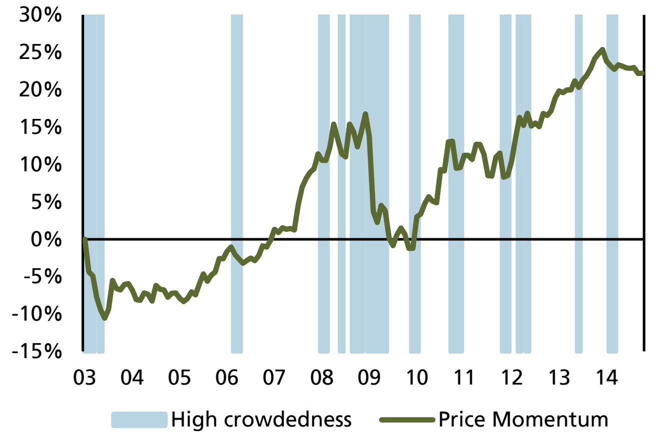
[1] Stein and Jeremy (2009), "Sophisticated Investors and Market Efficiency", *Journal of Finance 64,* p1,517-1,548.

**Figure 8: US**



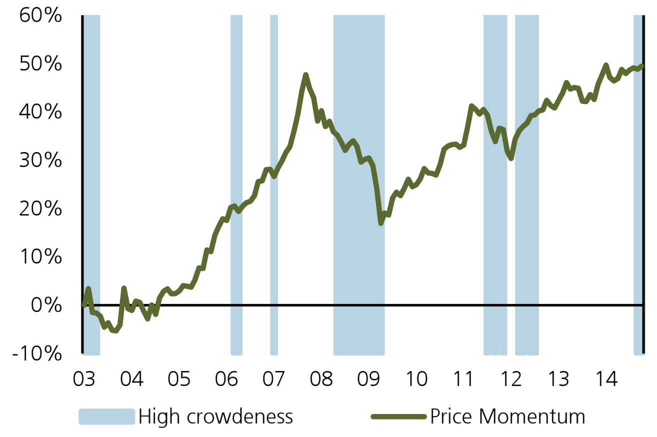

Source: MSCI, UBS Quantitative Research

**Figure 9: Europe**



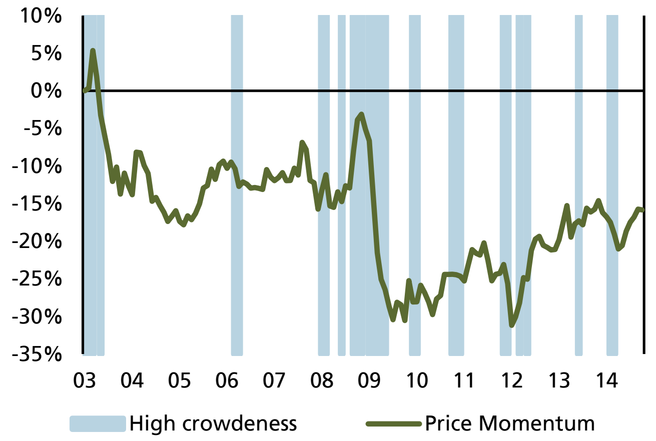

Source: MSCI, UBS Quantitative Research

**Figure 10: Asia ex-Japan**



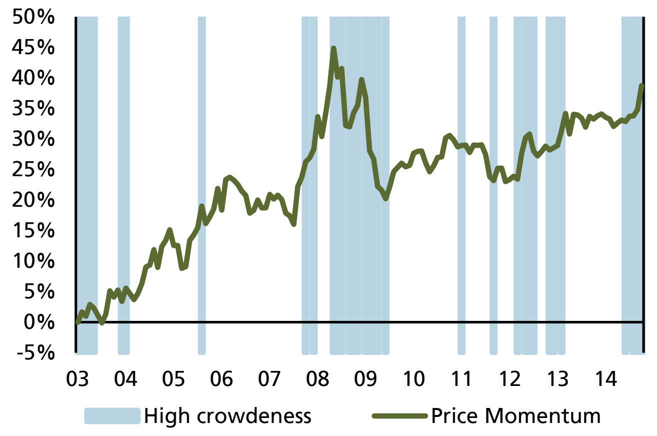

Source: MSCI, UBS Quantitative Research

**Figure 11: Japan**




Source: MSCI, UBS Quantitative Research

**Figure 12: Australia**

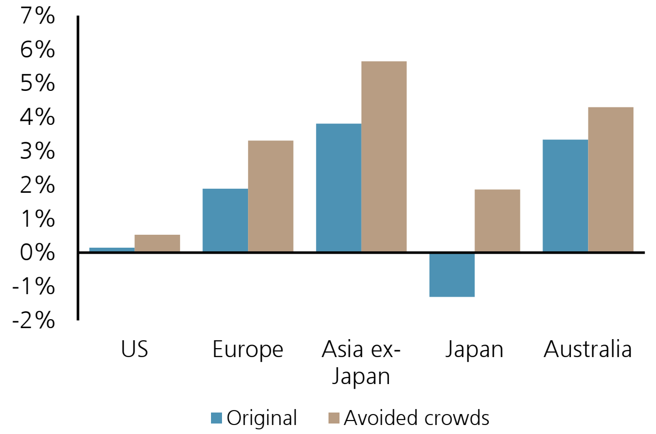



Source: MSCI, UBS Quantitative Research

We back-tested a simple strategy as follows: go long the high price momentum basket but switch to the index ETF if the value of the SCI in the previous month is greater than 0.8. The performance of the price momentum strategy improved across all the markets we tested (please see Figure 13 and Figure 14).

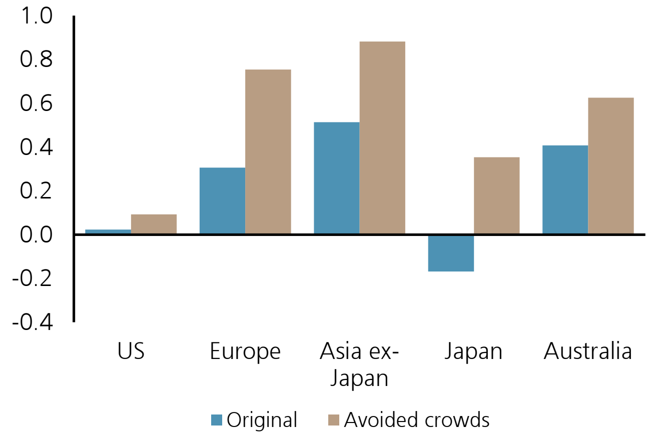
**The price momentum strategy that avoided the crowds outperformed across markets…**

**Figure 13: Annualised returns (relative to benchmark)**




Source: MSCI, UBS Quantitative Research

**Figure 14: Risk-adjusted annualised returns**

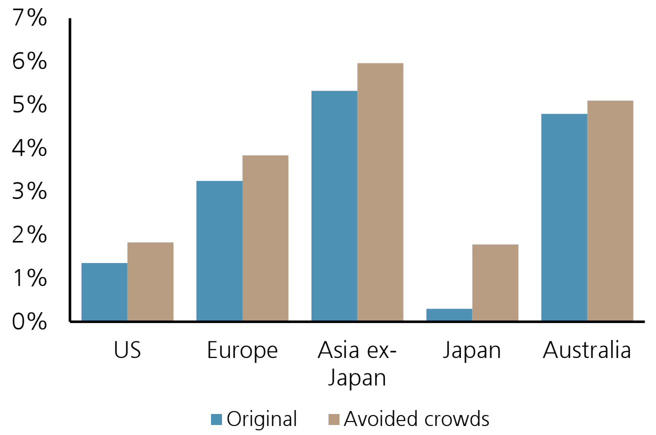



Source: MSCI, UBS Quantitative Research

The momentum downturn at the beginning of 2009 was a rare event and will certainly distort the results, making the performance of strategies where we avoided crowds look much stronger than the original. As a test of robustness, we removed the February to May 2009 period. The performance of the original high price momentum strategy improved substantially, as expected. Nevertheless, the strategy of avoiding crowds consistently further enhanced the performance across all markets, suggesting that it also works under 'normal' conditions.

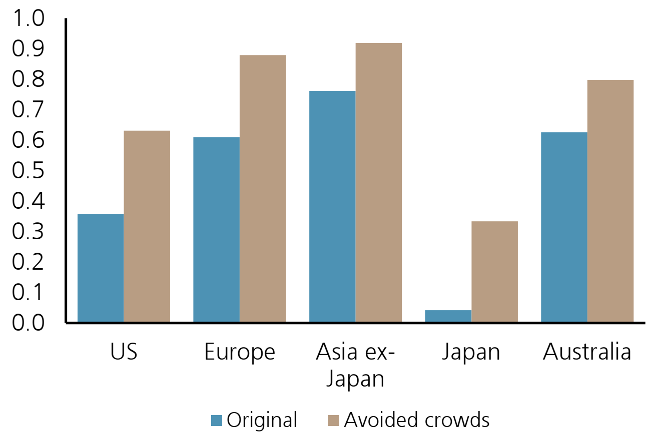
**… and the result is robust when we remove the February to May 2009 period**

**Figure 15: Annualised returns (relative to benchmark)**




Source: MSCI, UBS Quantitative Research

**Figure 16: Risk-adjusted annualised returns**




Source: MSCI, UBS Quantitative Research

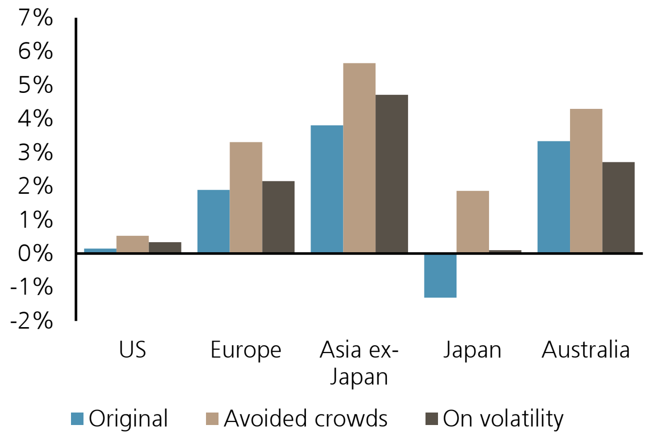
## Timing based on the SCI versus timing based on volatility

**Timing based on the SCI provides better results than timing based on volatility**

The volatility of momentum return is a popular signal for timing momentum strategy. We simulated the performance of a strategy which normally goes long high price momentum portfolio but switches to the index ETF if volatility is high (please see the Appendix for more detail). This strategy applies exactly the same structure as the one with the SCI in order for the results to be comparable.

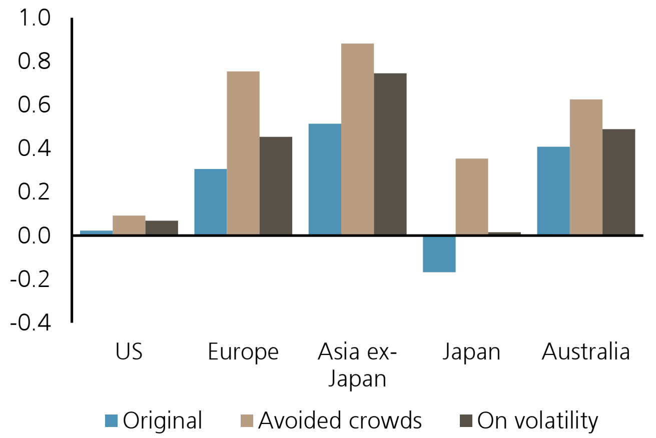
As expected, timing by volatility reduced the volatility of the strategy across markets, as well as enhancing returns in most markets except Australia. As a result, the risk-adjusted returns increased for all markets. Nevertheless, timing based on the SCI provides much stronger returns for both absolute and risk-adjusted bases (please see Figure 17 and Figure 18).

**Figure 17: Annualised returns (relative to benchmark)**




Source: MSCI, UBS Quantitative Research

**Figure 18: Risk-adjusted annualised returns**




Source: MSCI, UBS Quantitative Research

# Conclusion

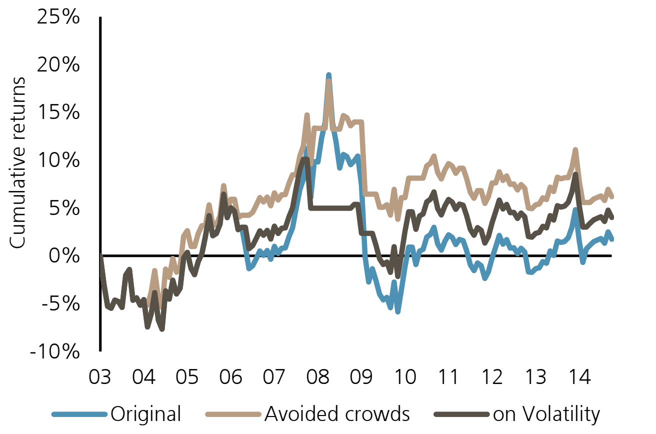
We defined the SCI to measure the level of crowdedness in investment styles. This measure is comparable between different styles and across different markets. Our results suggest that currently investment styles are more crowdedly traded in Asia ex-Japan and Australia than in Japan, the US and Europe.

We investigated the relation between level of the SCI and subsequent returns and found that high SCI levels (greater than 0.8) in high price momentum baskets have been associated with weak subsequent returns on many occasions in the past decade across markets. For other investment styles, the relation has also been observed in some markets but not others. As a result, we suggest investors watch out for crowded trades in style investment, especially over-crowdedness in price momentum strategy.

# Appendix

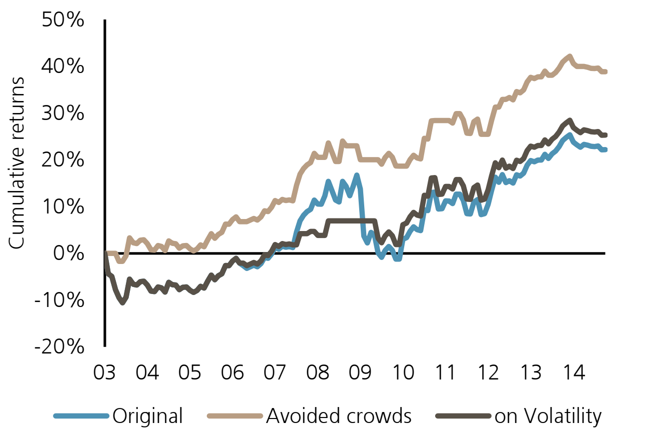
## Performance charts for Price Momentum strategy

**Figure 19: US**



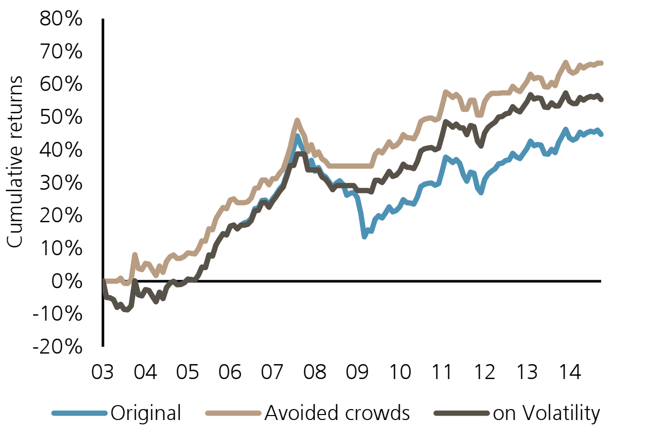

Source: MSCI, UBS Quantitative Research

**Figure 20: Europe**



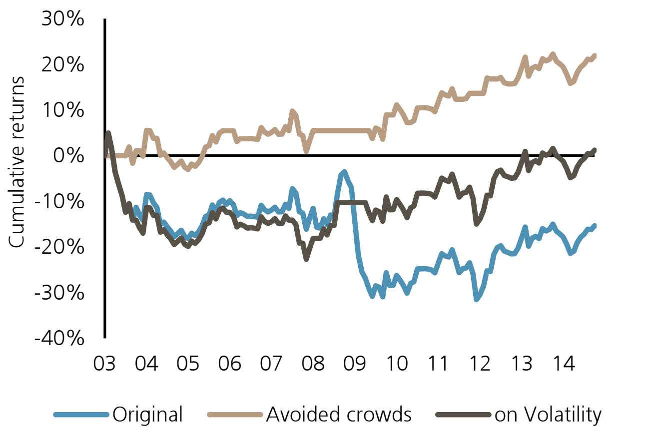

Source: MSCI, UBS Quantitative Research

**Figure 21: Asia ex-Japan**



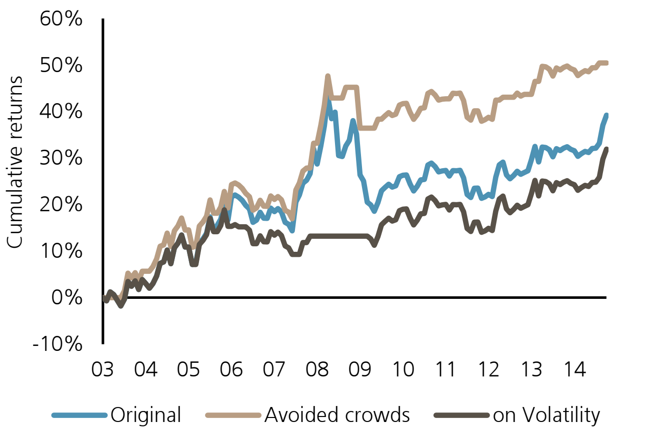

Source: MSCI, UBS Quantitative Research

**Figure 22: Japan**




Source: MSCI, UBS Quantitative Research

**Figure 23: Australia**




Source: MSCI, UBS Quantitative Research

## Defining style baskets

The style baskets are defined based on MSCI AC World index universe. We first divide the universe into thirteen basic core building block geographies: UK, EU ex-UK, US, Canada, Japan, Hong Kong, Singapore, Australia, New Zealand, emerging Asia, EMEA, emerging Latin America and Israel. Each core geography is then categorised into three size subsets: large, medium or small, where the top 80% of cumulative market cap is allocated to the large cap band, the next 15% medium cap, and the remaining 5% small cap.

These subsets are then sorted by the relevant style value (e.g. Book to Price, Earnings Growth, etc.) and further divided into three groups (with same number of stocks) to give the high, medium and low baskets in each geography/size peer group. Baskets are rebalanced monthly and performances for these baskets are calculated on a market cap-weighted basis.

These subsets are rolled up to form higher level baskets and indices. For example, Asia ex-Japan is a combination of Hong Kong, Singapore and emerging Asia.

## Style Crowdedness Indicator (SCI)

At the end of each month, we calculate the SCI for each of the target investment styles in the following steps:

1. At the end of month $t$, calculate the pairwise-correlation for the style portfolio (denoted as $r_{ti}$, where $i = 1, 2, \ldots, n$, and $n$ is the number of pairs), using the past one month's daily relative returns (relative to benchmark);

2. Apply Fisher transformation to the correlations

$$R_{ti} = \operatorname{arctanh}(r_{ti}) = 0.5 * \ln\left(\frac{1 + r_{ti}}{1 - r_{ti}}\right)$$

3. Compute the mean of the transformed correlations across all pairs of stocks in the style portfolio and adjusted the mean by dispersion of the transformed correlations (denoted as $FMPC_t$)

$$FMPC_t = \frac{mean(R_{ti})}{stdev(R_{ti})}$$

4. Generate 1000 random portfolios with the same number of stocks as the target style portfolio. Repeat the step 1 to 3 for these 1000 random portfolios (denote as $MMPC_{tj}$, where $j = 1, 2, \ldots, 1000$);

5. Calculate the market relative z-score

$$Z_t = \frac{\left(FMPC_t - mean\left(MMPC_{tj}\right)\right)}{stdev\left(MMPC_{tj}\right)}$$

6. Calculate the percentile of the monthly $Z_t$ (compared with its past 60 months of history) to get the Style Crowdedness Indicator, $SCI_t$.

## Timing price momentum with volatility

At the end of month $t$, we calculate the volatility using that month's daily relative returns of momentum strategy:

$$\sigma_t^2 = \sum_{d=1}^{n} r_d^2$$

where $r_d$ are the daily relative returns of the momentum strategy in month $t$, $n$ is the number of trading days in month $t$. We then calculate the percentile of the monthly $\sigma_t^2$ (compared with its past 60 month history), $P_t$.

The timing strategy goes long the high price momentum portfolio at month $t+1$ if $P_t \leq 0.8$, and switches to benchmark index ETF if $P_t > 0.8$.

**Statement of Risk**

Our quantitative models rely on reported financial statement information, consensus earnings forecasts and stock prices. Errors in these numbers are sometimes impossible to prevent (as when an item is misstated by a company). The models also employ historical data to estimate the efficacy of stock selection strategies and the relationships among strategies, which may change in the future. Additionally, unusual company-specific events could overwhelm the systematic influence of the strategies used to rank and score stocks.

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|---|---|---|---|
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| **Neutral** | FSR is between -6% and 6% of the MRA. | 42% | 32% |
| **Sell** | FSR is > 6% below the MRA. | 11% | 21% |
| **Short-Term Rating** | **Definition** | **Coverage[3]** | **IB Services[4]** |
| **Buy** | Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event. | less than 1% | less than 1% |
| **Sell** | Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event. | less than 1% | less than 1% |

Source: UBS. Rating allocations are as of 31 December 2014.
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