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Why We Have a Correlation Bubble

Global Derivatives Themes

Summary

- **Correlations between stocks are currently at the highest level in recent history.** This is a result of the macro-driven environment, record use of index derivatives such as futures and to a lesser extent ETFs, and high-frequency trading. The option-implied price of correlation is even higher – a result of an inadequate supply of index put options and oversupply of stock options via overwriting. **We believe that correlation levels are in a bubble-like regime and are bound to decline.**

- **Correlations impact fundamental investors** and recommendations of equity research analysts. In two simple examples we show how correlation mutes long-short returns, and how it can distort the meaning of stock price targets and ratings.

- **Europe:** Investors can monetize the high correlation levels by trading dispersion via volatility swaps or vanilla options. We look at **Euro STOXX 50 enhanced dispersion baskets** and describe a methodology to construct baskets of cheap single-stock volatility while controlling the tracking error. We also **recommend selling Dec-11 correlation on the top 11 names of the SMI and on the top 17 names of the FTSE**.

- **Asia-Pacific:** While the absolute level of option-implied correlation in Asia has come off, investors can still capitalize on the cheap single-stock volatility and rich implied correlation by selectively entering into single-stock versus index spread trades. Alternatively, investors can consider packaged OTC products such as a call versus call dispersion as a means of going long the dispersion of stock returns for a sector or a customized basket.

Global Equity Derivatives and Delta One Strategy

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See page 25 for analyst certification and important disclosures, including non-US analyst disclosures.

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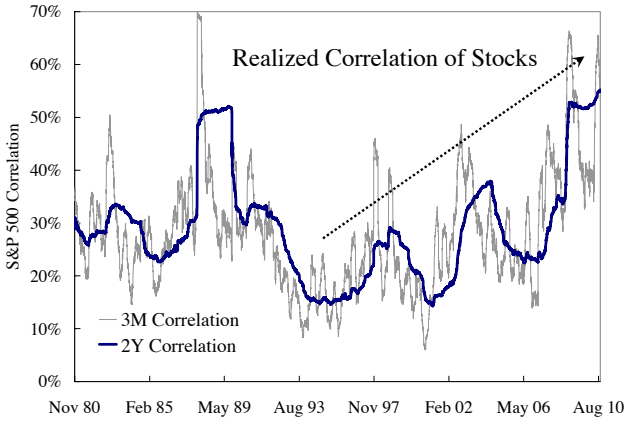
Correlation Bubble

Correlation of S&P 500 Stocks

Correlation measures the degree to which prices of stocks move together. The average correlation between all S&P 500 stocks is currently at historically high levels. In particular, the level of correlation recorded over the past two years was never realized in the recent history of U.S. markets (Figure 1). Two recent bursts of correlation (following the Lehman default and during May 2010) were matched in intensity only during the market crash of 1987. While the levels of correlation ebb and flow with business and volatility cycles, the average level of correlation was gradually increasing over the past ten years, even prior to the 2008 credit crunch (Figure 1).

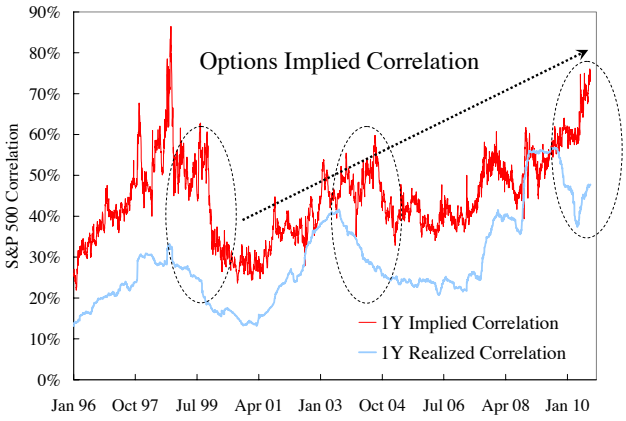
The pricing of index options relative to options on individual stocks implies the level of market correlation. Historically, correlation priced in the options market was higher than the actual realized correlation between the stocks due to excessive demand for index protection. The current level of premium of option-implied correlation (over market realized correlation) is also close to historical highs, as shown in Figure 2.

Figure 1: Realized Correlation of S&P 500 Stocks



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 2: Option-Implied Correlation Is Trading at a Steep Premium to Realized Correlation



Source: J.P. Morgan Equity Derivatives Strategy.

In this report we explain market mechanisms responsible for the extreme levels of correlation, as well as reasons for the high premium of correlation implied by options. We conclude that both the realized correlation of stock prices and option-implied correlation are in a 'bubble' regime and forecast a significant decline of correlation over a one- to two-year time horizon. The report further highlights the impact of market correlation on the performance of fundamental long-short investors and recommendations of equity research analysts. Finally, we present region-specific correlation analyses and ideas for the European and Asian markets.

Microstructure of Correlation and Outlook

The extreme level of correlation has many implications for equity investors. While the impact is well known, few investors understand what is causing the high correlations, and what it will take to unlock the grip correlation has on stocks.

In our view, the current high level of stock correlation is caused by **1) the macroeconomic environment, 2) high usage of index futures** and to a lesser extent ETFs, and **3) increased high-frequency trading (HFT) activity**. Furthermore, the extreme level of implied correlation is caused by the inadequate supply of index protection and high level of stock overwriting activity.

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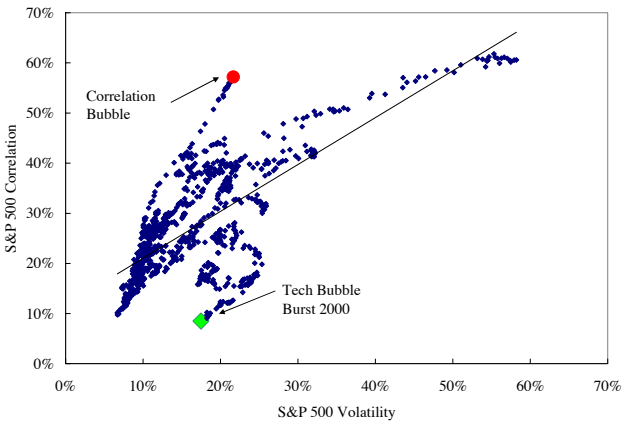
Drivers of Market Realized Correlation

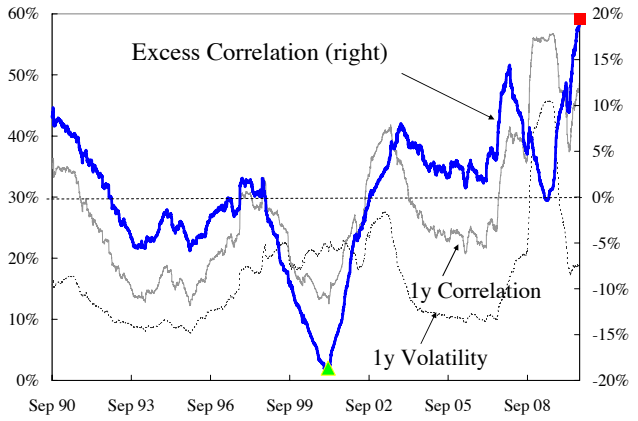
A significant driver of correlation between stocks is the prevailing **macroeconomic environment**. During periods of high macro uncertainty, stocks prices are largely driven by macro factors such as economic growth, unemployment, interest rate changes, inflation expectations, etc. Therefore, during changes in macroeconomic regimes, stock prices tend to move in unison leading to a high level of correlation. Periods of high macro uncertainty are also characterized by high equity volatility. Figure 3 below shows the regression of correlation of S&P 500 stocks, against market volatility. While the relationship between correlation and volatility is strong, occasionally these two measures have diverged. For instance, during the inflation and burst of the Technology bubble, stocks were quite volatile, yet correlation was low due to a strong divergence between stocks in the 'New Economy' (Dot-coms, Technology stocks) and stocks in the 'Old Economy' (e.g., Utilities, Industrials). This type of intersector performance divergence caused overall correlation to plummet relative to average stock volatility. Today, we appear to be in an opposite correlation regime: stocks exhibit the same level of volatility as during the Tech bubble, yet they are all driven by the macro outlook for the economy and hence exhibit extreme levels of correlation (Figure 3). The comparison of these two regimes motivates us to deem the current environment a 'Correlation Bubble'. Figure 4 shows the excess correlation[1] over market volatility, which can give us a better historical perspective of the run-up in correlation over the past ten years. While correlation has increased steadily over the past ~10 years (2000-2010), the first ~5 years of increase essentially brought correlation from the Tech bubble lows to a historical average level. However, over the past five years, correlation has been increasing more rapidly than implied by the macro environment (market volatility), pointing to the existence of additional drivers of correlation.

Figure 3: High Volatility Regimes Coincide with High Correlation Regimes – Two Notable Exceptions: Tech Bubble Burst and Now



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 4: Over the Past Five Years, Correlation Has Increased More than Macro Volatility, Pointing to Additional Drivers of Correlation



Source: J.P. Morgan Equity Derivatives Strategy.

We believe that the excess levels of correlation are related to the **increased usage of index-based products, in particular futures and some broad-index ETFs**[2]. When investors trade an S&P 500 futures contract, they effectively place a simultaneous order for the 500 constituent stocks (e.g., buying a future will cause incremental upward pressure for all 500 stocks, and selling a future will cause an incremental downward pressure for all 500 stocks)[3]. It is easy to see that if investors only traded futures (e.g., futures were 100% of all equity volumes) the correlation of stocks would be 100%. For this reason, it is reasonable to expect that market correlations should be proportional to the prevalence of index products relative to stock volumes. Broad-index ETFs (such as S&P 500 ETFs) have a similar effect on market correlation.

[1] Excess correlation is the difference between the actual correlation level and the expected correlation level given by the historical regression of correlation to volatility shown in Figure 3.

[2] Broad index ETFs are ETFs that are tracking indices such as the S&P 500. Sector ETFs and non-equity ETFs should not significantly impact market correlations and may in some cases reduce the level of correlation as explained later in the text.

[3] Even though buying a future does not directly lead to the purchase of the 500 stocks, the market impact of the future will be transferred to underlying stocks via index arbitrage programs.

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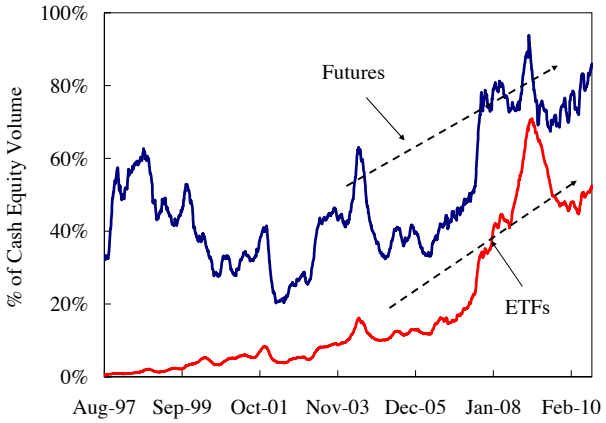
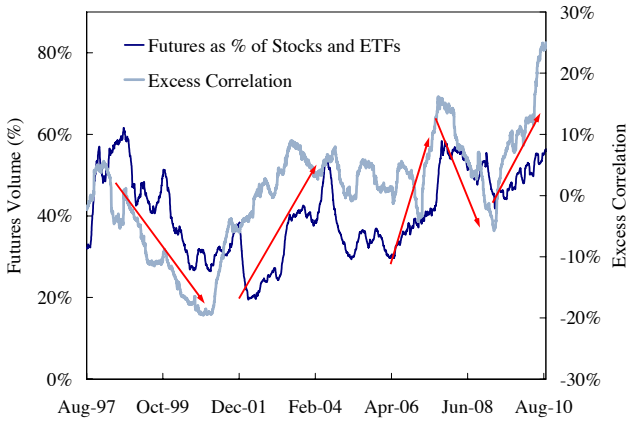
Figure 5 below shows futures and ETF volumes expressed as a percentage of total cash equity volumes. One can see that over the past ten years, trading of index products experienced significant growth relative to stock trading. In particular, the share of futures and ETFs steadily grew over the past five years, and is now ~140% of cash equity volume (i.e., futures and ETFs are roughly ~60% of all equity volumes – perhaps not a coincidence that realized stock correlation is ~60%). The growth in index volumes coincided with a rise in correlation over the past ten years. More importantly, the growth of index volumes is directly driving excess market correlation (levels of correlation above the levels implied by macro volatility). Figure 6 shows the excess level of market correlation and S&P 500 futures volume[4]. We note that the excess market correlation closely follows the ebbs and flows in S&P 500 futures usage. We believe that futures have a much larger impact on the market correlation than ETFs. The main reason is that futures notional volumes are significantly higher than ETF volumes (futures volumes are approximately double ETF volumes) and not all ETFs lead to an increase in market correlation. Currently about 60% of ETF volumes are in broad-based index ETFs that do contribute to increased correlations. However, almost ~30% of ETF volume is in sector ETFs, or ETFs with a significant sector bias. While these ETFs may lead to an increase of intrasector correlations, they may lead to a decrease of correlation between sectors (intersector correlations) thus reducing the overall average correlation between the stocks[5]. Finally, 10% of ETF volumes are in commodity or fixed income ETFs that will have little impact on equity correlations.

Figure 5: Futures and ETF Volumes as a % of Cash Equity Volumes



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 6: Futures Volume Closely Follows Ebbs and Flows in Excess Correlation



Source: J.P. Morgan Equity Derivatives Strategy.

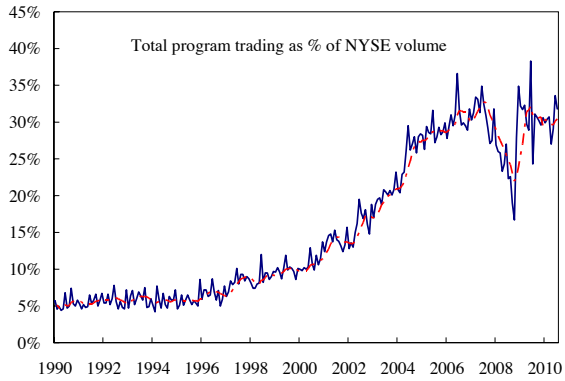
Over the past several years, program trading and in particular High-Frequency Trading (HFT) experienced strong growth. Figure 7 below shows NYSE program trading volume and Figure 8 estimated total HFT volume in the U.S. It is estimated that currently close to 60% of U.S. turnover by volume is due to HFT (in Europe, it is estimated that ~38% of trading volume is due to HFT). It is reasonable to expect that such magnitude of trading activity will significantly change the market microstructure. We believe that **High-Frequency Trading activity has increased correlations**, reduced volatility, and increased the intraday tail risk. In order to understand how HFT activity can impact the market, we will look at two common HFT strategies: index arbitrage and optimal execution of orders. Index arbitrage is an example of HFT arbitrage trading. As shown in Figure 5, current index volumes are significantly larger than total cash volumes, and a good amount of index derivative volume (Futures, ETFs) will not be directly offset by trades in cash securities. If the index price diverges from the prices of underlying constituents, index arbitrage HFT will act to realign them. For instance, if a group of stocks outperforms the index, an arbitrage program may sell these stocks and buy the index, causing their prices to realign. This trading activity will dampen the volatility of stocks and increase their correlation to the rest of the stocks in the index. HFT index arbitrage also facilitates the transfer of the market impact on futures and ETFs to the underlying stocks, thus providing a link between the high percentage of index trading and correlation of individual stocks. Another HFT trading strategy is a

[4] Futures volume expressed as a percentage of stock and ETF volumes.
[5] For an analysis of intersector and intrasector correlation, please see our report "New Framework for Correlation Investing."

statistical arbitrage. A simplified example is a pair trade between two correlated stocks. If the price of one stock increases relative to the other, an arbitrage program will sell the outperforming stock and buy the underperforming one, thus reducing the volatility of both and increasing the correlation between the two.

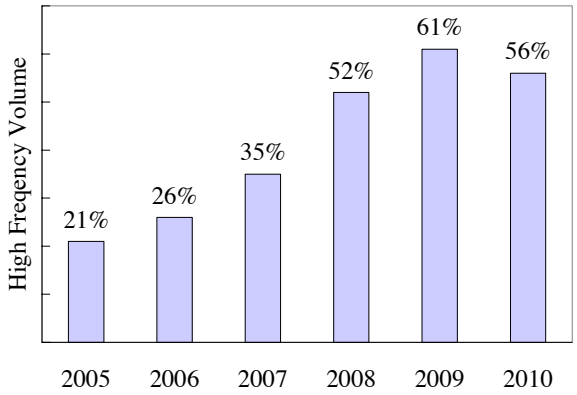
HFT also provides liquidity by breaking up larger orders and optimally allocating smaller orders across multiple sources. This activity will generally reduce the market impact of large individual orders and hence reduce the amount of stock-specific volatility. Reduced stock-specific volatility will result in lower dispersion and hence increased levels of correlation.

Figure 7: Program Trading as % of NYSE Volume (TTV)



Source: J.P. Morgan Equity Derivatives Strategy, NYSE, NYX Data.

Figure 8: High-Frequency Trading in the US (% of Turnover by Volume)



Source: J.P. Morgan Equity Derivatives Strategy, Tabb Group.

HFT is frequently quoted as a cause of market volatility. This is not justified in our view. As we showed in examples above, a typical HFT strategy may dampen volatility and increase correlation, which is consistent with the current record spread of correlation over volatility. Perhaps a reason for connecting HFT and market volatility is because HFT strategies thrive during volatile markets, when the stock moves captured by HFT are significantly higher than the transaction cost to execute a high-frequency trade. However, we believe that HFT may increase the probability of an intraday tail event such as the flash crash of May 6th. HFT liquidity-providing strategies essentially follow a set of trading rules that were designed to work in a normal market environment. As a HFT strategy is executed by computer code, it can not interpret significant fundamental news such as results of a court ruling, a large order imbalance, or the likelihood of a sovereign debt crisis. To protect trading profits, HFT strategies are likely to implement circuit breakers and pull liquidity as a response to significant idiosyncratic outliers that can't be interpreted by the HFT code. The result of a sudden pull in liquidity by many HFT programs could be a sharp drop in the price of a security (or the whole market) similar to what we saw during the flash crash.

Drivers of Option-Implied Correlation

An expectation for market correlation can be backed out from prices of index and stock options. Higher prices of index options (relative to stock options) lead to a higher levels of implied correlation. By looking at Figure 2 (page 3), we see that the option-implied correlation is now at extreme levels and significantly higher than the current realized correlation (e.g., 1Y implied correlation is 25 points higher than the most recent 1Y realized correlation). We believe that the current high levels of option-implied correlation are not a result of market expectations for high correlation in the future, but are a result of an extreme supply/demand imbalance in the listed option market. Demand for downside index protection steadily increased as the market started recovering from the 2009 lows. Given the recent memory of a market crash, investors started accumulating 'tail risk' protection in the form of out-of-the-money puts. At the same time, the supply of index volatility dried up as proprietary desks scaled back their activity due to wariness around regulatory changes, and a number of volatility arbitrageurs reduced their risk-taking activity or closed their funds altogether. The ensuing supply/demand imbalance resulted in a high price of downside index protection, and both index-implied correlation premium as well as implied volatility skew reached historically high levels.

In addition to the described supply/demand imbalance for index puts, a lack of market direction and elevated levels of volatility prompted many fundamental investors to start overwriting their portfolios. Overwriting is virtually always implemented by selling calls on individual stocks as many investors are allowed to sell calls only if they hold the underlying stocks. Overwriting activity is also largely driven by a fundamental view on a company, and fundamental investors prefer to sell stock calls rather than index calls[6]. Supply of call options via overwriting put pressure on stock volatility levels, and further caused a steepening of volatility skew.

The increased supply of stock volatility via overwriting, and decreased supply of index volatility due to regulatory changes and low risk appetite, created an imbalance between index and stock volatility that currently translates into extreme levels of implied correlation premium as shown in Figure 2.

Correlation Outlook

Several mechanisms that led to the current high levels of correlation are self-reinforcing. For instance, with high macro uncertainly, an increased number of investors trade index products creating an upward pressure on correlations. Higher correlation prompts remaining long-short investors to scale down stock-picking activity, thus pushing correlation higher. High levels of market volatility and index trading invite increased activity from HFT arbitrage programs, which reinforce correlations. Investors find that not only is there the most liquidity in index products, but that they can equally well hedge their portfolios with the S&P 500 as by trading their actual holdings, and so on. These types of reinforcement mechanisms caused the current correlation level to be near its extreme levels (55-60%), or about twice the average historical correlation of 28%. However, when the macro uncertainty declines and equities start recovering, these mechanisms should also be reinforcing on the downside and could push correlation below historical averages (e.g., lowest historical levels of 6M correlation were below 10%).

We believe that the factors that are currently causing extreme levels of implied and realized correlation are bound to revert and cause a large decline of implied and realized correlation over a medium-term time horizon (within 1-2 years). The current correlation environment is similar to that in the second quarter of 2003, when the market started recovering from the high macro-volatility period of 2001-2003. During the early stages of the 2003 recovery, implied correlation was still high and sharply declined over the next two years. **Based on our views, we recommend selling one- to two-year implied correlation on the S&P 500.** At the current levels of ~80%, implied correlation cannot go much higher, in our view. In that respect, we view a correlation trade as essentially a free call option on the market recovery. In fact, the realized correlation, even at its extreme levels, is still ~20 points below implied and, if properly implemented, the trade should have a positive carry.

The risk for a correlation trade is if the implied and realized levels stay high as a result of a secular market change (e.g., use of index products and HFT). While we showed that excess correlation steadily increased over the past ten years, we believe the current levels are not sustainable. It is our view that the increase of excess correlation during the 2000-2005 time period only brought the market back to average correlation levels following the low-correlation regime of the Tech bubble. The bulk of excess correlation over the past three years was triggered by the market crisis that started in 2008 and is bound to revert, in our view.

Impact on Long-Short Portfolio and Equity Research Recommendations

High levels of correlation can create a serious challenge for long-short managers. While a long-short portfolio may yield up to twice as much as a long-only portfolio in a low-correlation environment, its performance may converge towards zero as correlation reaches extreme levels. To illustrate this, we consider a long-short portfolio consisting of two stocks (a pair trade). A long-short manager decides to purchase a stock that he believes will outperform, and sells another that he expects to underperform[7]. In Figure 9 below, we illustrate the possible outcomes under four regimes: low volatility/low correlation, high volatility/low correlation, low volatility/high correlation, and high volatility/high correlation. If the volatility

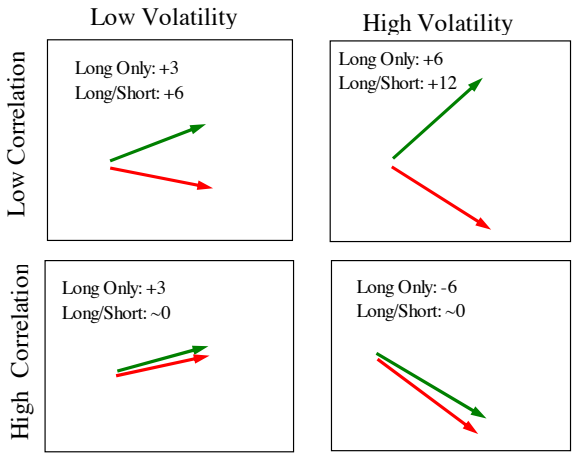
[6] A notable exception is the CBOE S&P 500 BXM Index. Please see our previous issue of Global Derivatives Themes.

[7] We assume that the manager can correctly predict each stock's direction and that the stocks move in proportion with overall market volatility.

environment is such that stocks move by 3% per week, we would expect a long-short pair to yield 6% (each stock moving 3% in opposite directions). Similarly, in a low-correlation, high-volatility environment where each stock may move by 6%, a long/short pair would return 12%. In a high-correlation environment, regardless of the volatility level, a long-short portfolio would return close to zero as the performance of the long position would be offset by the performance of the short position[8].

Due to this implicit exposure to market correlation, trading correlation would be a natural hedge for long-short investors. In a low-correlation environment, a long-short manager would hedge by buying correlation, and in a high-correlation environment, a long-short investor could sell correlation to generate income. While we believe it is easier to anticipate the direction of correlation than the direction of the market (due to the mean-reverting property of correlation), implementing a correlation trade is not as straightforward. A correlation trade is usually implemented by trading and hedging options, or trading volatility swaps or variance swaps. The trade needs to be periodically rebalanced, and the initial setup usually incorporates a view on the correlation level at the trade expiry[9]. For investors that do not have elaborate derivative trading and hedging systems, correlation exposure can be gained in the form of a structured note.

Figure 9: Performance of a Long-Short Pair in Various Correlation and Volatility Regimes



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 10: Percentage of Stock Returns that Can Be Attributed to Market Returns

	Today			5 Years Ago		
	Large	Mid	Small	Large	Mid	Small
Industrials	70	57	50	33	27	23
Financials	67	62	52	34	28	30
Energy	61	53	52	16	15	19
Materials	58	60	50	34	31	26
C. Discretion	56	44	41	25	20	19
Utilities	55	59	57	28	30	30
Technology	53	49	42	19	18	15
C. Staples	42	29	32	21	19	16
Health Care	41	36	33	16	11	15
Telecomms	40	54	34	25	11	12
Top 100	58	54	51	30	20	22
Top 200	58	54	50	30	19	23
Top 300	58	53	49	30	21	24

Source: J.P. Morgan Equity Derivatives Strategy.

High levels of correlation also have a significant effect on the forecasts of equity research analysts such as price targets and "buy/hold/sell" recommendations[10]. In a low-correlation environment, it is possible to formulate these forecasts without regard for the market level. However, in a high-correlation environment, the largest portion of a stock's price move may be caused by the market move and hence it is difficult to define a target or a "buy/hold/sell" recommendation without a reference to the market level.

[8] Mathematically, performance of a long-short pair is proportional to the tracking error between the two stocks. If the two stocks have approximately the same volatility σ and the correlation between them is ρ, the performance of a long-short pair will be proportional to $\sim 2\sigma \cdot \sqrt{1-\rho}$. At the same time, a long-only portfolio (holding one of the stocks in the pair) will return $\sim \sigma$.

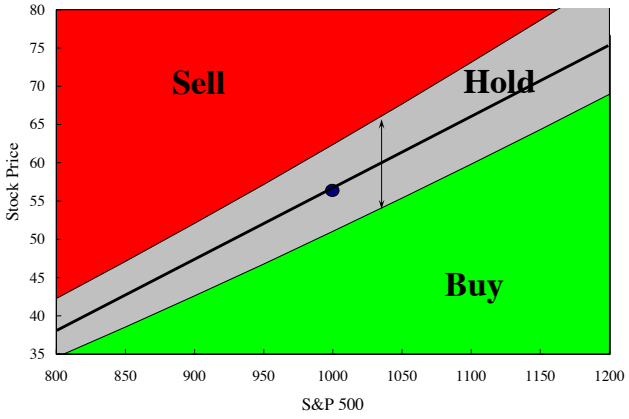
[9] For more information on the trade implementation, please see our earlier reports on Correlation trading.

[10] Please note that J.P. Morgan's fundamental equity research rating system is based on the analyst's view of a stock's average total return relative to the stocks in the analyst's universe; please see Important Disclosures at the end of this report for more details.

Figure 10 shows the percentage of stock returns that can be attributed to market moves for different sectors and capitalization segments of the U.S. market[11]. While five years ago market returns were responsible for less than 30% of stock price returns, currently market returns are responsible for the majority (~60%) of stock price action. For instance, 70% of the price performance of an average S&P 500 Industrials company is caused by the S&P 500 return, and only 30% of performance is stock- or even sector-specific.

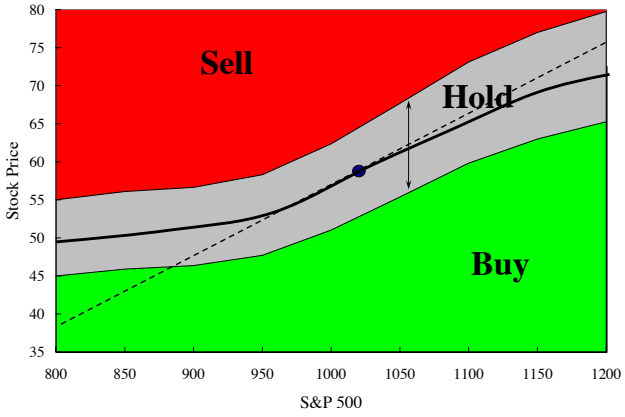
As price targets and recommendations may be less effective without reference to market levels, in a high-correlation environment, analysts could express targets and recommendations conditional on the S&P 500 level. Combining a view on out/underperformance (alpha) with a stock's market exposure (beta) could provide price target and recommendation scenarios relative to the market level as depicted in Figure 11. Stock return is assumed to be proportional to market return (beta), to which analysts could add an expected stock-specific out/underperformance (alpha). This would create a 'base-line' price target, i.e., a price target that changes with the S&P 500 level. If the stock price is within a certain distance from the 'base-line' price target, the analyst's recommendation on the stock would be 'hold' (range could be, for example, one standard deviation away from 'base-line' price target). If the stock price is significantly above the 'base-line' price target, the recommendation on the stock would be 'sell', and if the stock price is significantly below the 'base-line' price target, it would be 'buy'.

Figure 11: Sample Price Target/Recommendation for a Stock with Constant Beta



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 12: Sample Price Target/Recommendation for a Stock with Asymmetrical Beta



Source: J.P. Morgan Equity Derivatives Strategy.

Not all stocks have constant market exposure. Recent analysis of market exposure of S&P 500 stocks shows that 33% of stocks have upside market exposure (upside beta) higher than downside market exposure (downside beta), and 21% have upside beta lower than downside beta. In other words, some stocks follow the market more closely on the upside, and others follow the market more closely on the downside. An analyst could modify the price target/recommendation to incorporate stock- and industry-specific views on a stock's performance in different market scenarios. For instance, a certain defensive stock may outperform the market on the downside (have lower downside beta), while still have a strong upside market participation. In such a case, an analyst could modify the price target/recommendation as shown in Figure 12.

[11] Large-cap stocks are based on the S&P 500, mid-cap stocks on the S&P 400, and small-cap stocks on the S&P 600. The percentage of stock return that can be explained by the market move is calculated as the R-squared of a six-month daily regression.

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Regional Ideas

Europe: Dispersion Trading Opportunities

European intra-index correlations are currently elevated by historical standards, similar to those in the U.S. and Asia. These elevated levels are at least in part a reflection of the increased macro focus and decreased focus on fundamentals by equity investors, as we argue in the first section of this report. Although we don't see any immediate drivers for a normalization of the correlation levels in the very short term, we believe that correlation should decline in the medium term and favor the idea of selling correlation over the medium term through dispersion trades.

In this section, we highlight what we believe are the most interesting dispersion opportunities in Europe at the moment. Vanilla and volatility swap dispersion for Dec-11 expiry on the **SMI top 11** names and on the **FTSE top 17** names are priced attractively, in our view. In this piece we also discuss the advantages and disadvantages of implementing correlation trades via volatility swaps and vanilla dispersion packages. Finally, we look at **enhanced dispersion baskets on the Euro STOXX 50**, and introduce a new methodology to create tracking-error-controlled, volatility-optimized dispersion baskets. We propose two Euro STOXX 50 enhanced dispersion baskets for Dec-11 expiry, but these are just examples of a methodology which is flexible and can be customized to fit specific risk profile needs.

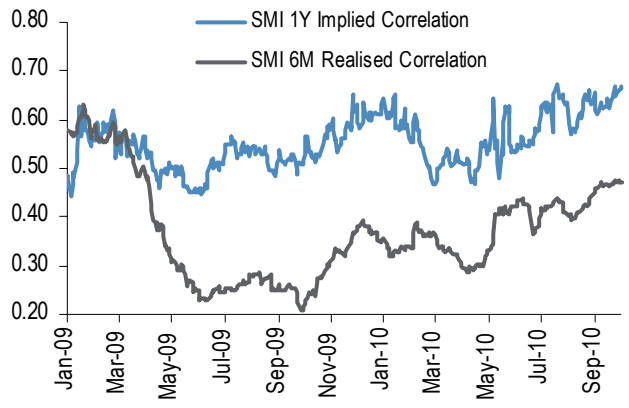
Sell SMI and FTSE Correlation

SMI and FTSE implied correlations are currently trading at historically high levels and close to the highest levels in our records, which were recorded during the May market correction. Meanwhile, SMI and FTSE realised correlations remain well below current implied correlation levels (Figure 13 and Figure 14), despite strongly rising due to the current top-down, macro-driven market environment which, as we argued earlier, is the main cause for the current high levels of correlation.

1Y implied correlation is in the 98th percentile for the SMI and in the 95th percentile for the FTSE relative to the last five years of historical data. Furthermore, 1Y implied correlation for both indices is higher than 6M realised correlation has been at any time over the last ten years. This level is undoubtedly dislocated from a historical perspective, but this fact alone is not sufficient to make the spread attractive. As we argue in the first section of this report, there are fundamental reasons for the current high equity index correlation levels, but some of these forces could revert in the next 1-2 years.

Figure 13: SMI Implied Correlation Remains Elevated and Is Well Above Realised Correlation

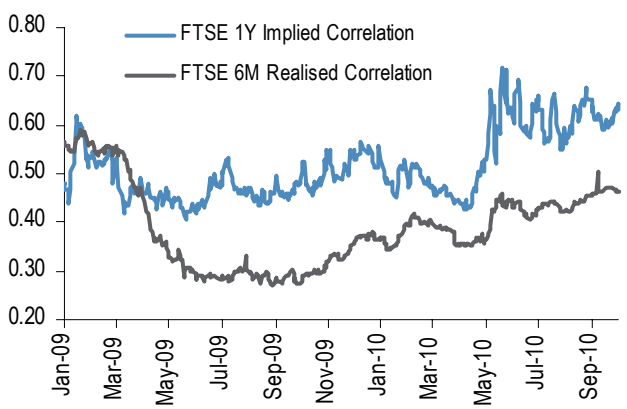
Correlation



Source: J.P. Morgan Equity Derivatives Strategy.
Implied correlation based on mid-level ATM implied volatilities.

Figure 14: The Picture Is Similar for FTSE Implied Correlation, Although the FTSE Levels Have Declined Since May

Correlation



Source: J.P. Morgan Equity Derivatives Strategy.
Implied correlation based on mid-level ATM implied volatilities.

Implementation – Volatility Swap vs. Delta-Hedged Straddle Dispersion

Investors can monetize the high correlation levels by selling volatility swaps on the indices and buying volatility swaps on the **top 11 constituents for the SMI excluding Transocean or the top 17 constituents for the FTSE excluding BG Group, Diageo, Reckitt Benckiser, and SAB Miller**. An alternative to volatility swap dispersion is trading delta-hedged straddles on the index versus the top constituents. There are pros and cons to consider when deciding on which implementation to use.

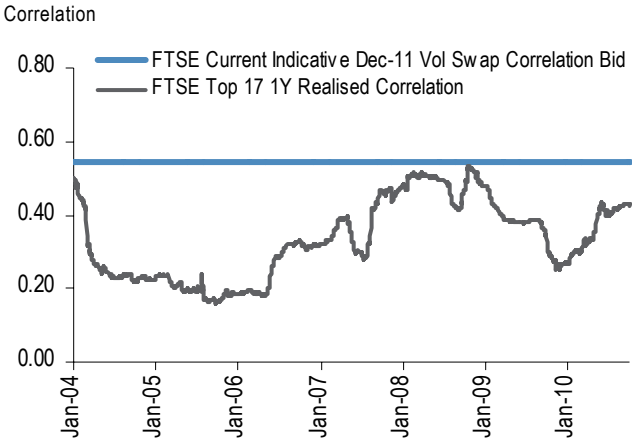
Volatility swap dispersion has the advantage of having no path-dependency and offering a neater exposure to correlation when taken to expiry, but has the disadvantage of being more expensive in terms of volatility bid-ask spread and presenting difficulties if one wants to close the position prior to expiry (see our Volatility Swap Product Note for more information).

Delta-hedged vanilla dispersion offers a lower volatility bid-ask spread and more liquidity, but the P/L of the trade is path-dependent and requires continuous managing of the delta-hedge on all options positions. Investors who favor this implementation but do not want to/cannot manage the delta-hedges of the stock positions themselves can buy 'packaged' versions of the vanilla dispersion trade, in which the delta-hedging is outsourced to the seller of the structure for a fee[12].

Below we highlight a Dec-11 volatility swap dispersion trade; investors who expect the dislocation in correlation to take longer than 15 months to correct should consider selling longer-dated implied correlation (Dec-12) through delta-hedged straddles.

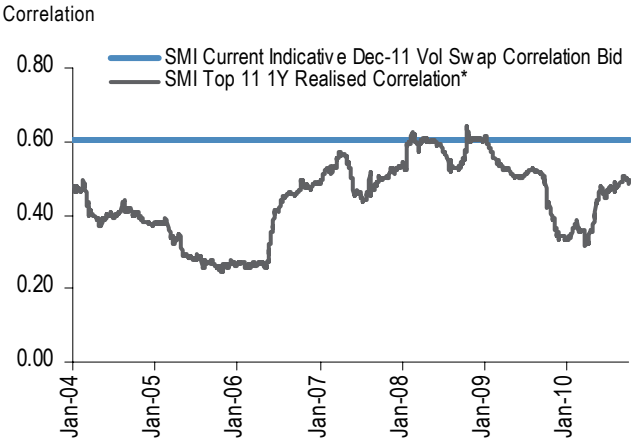
For volatility swap dispersion on the top 11 constituents for the SMI excluding Transocean, the Dec-11 average single-stock to index volatility swap spread is indicatively 4.9%, corresponding to an implied correlation level[13] of 60.1%. For volatility swap dispersion on the top 17 constituents for the FTSE excluding BG Group, Diageo, Reckitt Benckiser, and SAB Miller, the Dec-11 single-stock to index vol swap spread is currently 7.55%, equivalent to a correlation level of 55.9%. Both levels are attractive when compared to the historical realised correlation levels (Figure 15 and Figure 16).

Figure 15: FTSE Top 17 Volatility Swap Correlation Bid Is Greater than the Correlation Realized by This Basket at Any Time over the Last 6+ Years



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 16: The Current Indicative SMI Top 11 Volatility Swap Correlation Bid Is Greater than the Correlation Realized by This Basket at Any Time over the Last 6+ Years, Except Two Instances in 2008



Source: J.P. Morgan Equity Derivatives Strategy.

[12] Please contact us for more information about structured solutions for trading correlation.

[13] Looking at these trades as volatility spreads rather than pure correlation trades is theoretically more accurate; we still report the equivalent correlation levels, as they are still quite helpful in highlighting the current pricing dislocation.

Enhanced Dispersion Trades

Dispersion trades are constructed by selling index volatility and buying volatility on all the index constituents, and aim to capture the 'correlation premium' that makes index volatility on average rich in comparison to single-stock volatility. However, profits from full index dispersion trades can be diminished because not all single-stock volatility is 'cheap'. In other words, buying the volatility of every stock in an index takes no account of the relative cheapness of some stock volatility over others. **Enhanced dispersion trades** seek to improve returns of classic dispersion trades by selectively buying cheap-volatility stocks.

In order to construct an enhanced dispersion trade we follow the below procedure:

1. **Screen for cheap single-stock volatilities** – also potentially consider stocks outside the index. We use our proprietary measure, the Relative Value (RV) score, which offers an effective method for finding stocks with cheap and rich volatility. In the next section we give a brief review of methodology and historical effectiveness.

2. **Construct a risk-controlled enhanced basket** using an optimization process to strike an optimal balance between using cheap-volatility stocks and limiting the tracking error of the basket to the index. The basket needs to resemble the original index in order for the trade to behave similarly to a classic dispersion trade. We present various optimised solutions with different 'volatility alphas' and tracking errors, and discuss their merits.

The RV Score – Finding Cheap Volatility for Trading Dispersion

We use our proprietary RV score to identify attractive single-stock volatilities to hold. The model uses a combination of fundamental and technical factors to produce a rich/cheap volatility score, which we call the ***RV Score***. Factors used include credit spreads, stock performance, dividend yield, and realised volatility. The RV Score itself arises as a combination of two subsidiary metrics: a Volatility Score and a Fundamental Score (see our primer Relative Value Single Stock Volatility, 01 October 2007).

In our October 2007 note we provided an extensive backtest which shows how the RV Score successfully differentiated between rich and cheap volatility stocks over the prior seven years, choosing stocks from a universe of 100 names. The RV Score performed consistently well according to different performance measures and across different volatility regimes.

We also looked at the more recent performance of the score since October 2007. Table 1 summarises the performance of some volatility strategies using the RV Score. Both long and short strategies have been profitable and consistently beaten their respective benchmarks of being long or short average single-stock variance swaps. Figure 17 illustrates the predictive power of ranking stock volatilities according to their RV Score. It shows **a strong correlation between the RV rank of a stock and the average subsequent return from a long six-month volatility position**. On average, long volatility positions on the bottom ten ranked stocks outperformed the top ten ranked stocks by an average of 4.8 vegas over the period or 5.1 vegas for the top 20 long/short.

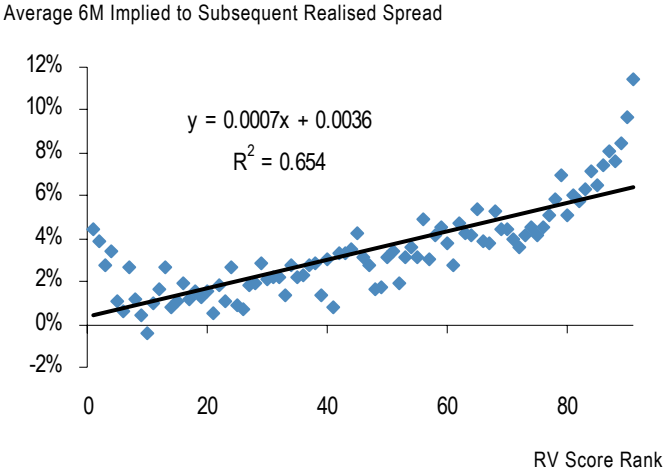
RV rankings are produced each day in our **European Single Stock Variance Relative Value Report**. The RV Score is the metric we use to rank cheap-volatility stocks as candidates for inclusion in our enhanced dispersion basket.

Table 1: RV Score Performance Since October 2007 (from September 2007 to August 2010)

	Long	Short	Long	Long / Short	
	Cheap 10	Rich 10	All SS	10	20
Avg. P&L	7.8%	-3.0%	3.4%	4.8%	5.1%
Median	0.2%	1.0%	3.2%	3.8%	3.1%
Max	61.2%	18.9%	11.4%	27.9%	26.6%
Min	-16.1%	-46.9%	-0.4%	-7.2%	-6.2%
Stdev	18.9%	16.4%	2.2%	6.4%	6.6%
Down-Stdev	4.8%	15.5%	NA	1.8%	1.5%
I.R.	0.6	-0.3	2.2	1.1	1.1
Sortino	2.3	-0.3	NA	3.8	4.8

Source: J.P. Morgan Equity Derivatives Strategy.

Figure 17: The Rank of RV Score Is Strongly Correlated with Subsequent Implied-to-Realised Volatility Spread



Source: J.P. Morgan Equity Derivatives Strategy.

The Trade-Off Between 'Volatility Alpha' and Tracking Error – How Risk-Averse Are You?

Identifying cheap single-stock volatilities is only half of the problem when considering an enhanced dispersion trade. Using cheap volatilities provides an expected outperformance compared to the full dispersion trade, but this 'alpha' comes at the cost of using a basket of stocks that resembles the index less, leading to tracking error. As an extreme example, one could trade the cheapest single-stock volatility in isolation against the index, therefore maximizing the expected 'volatility alpha', but likely leading to a significantly volatile position, as the tracking error of the single stock to the index could be elevated.

To successfully generate an enhanced dispersion trade, one needs to **strike a balance between tracking error and the 'expected alpha' due to cheap volatility**. Below we describe how one can use portfolio optimization, for example, Barra Aegis – a widely used portfolio optimization application, to generate enhanced dispersion baskets with an optimal balance between tracking error risk and expected alpha.

Barra Aegis[14] uses a multi-factor approach to portfolio construction, using a set of common risk factors to describe risk in a given portfolio, taking into account the correlation structure. Barra Aegis has an optimization engine linked to the multi-factor model, which allows one to determine the optimal constituents and weights of a basket tracking a given benchmark, where the 'optimal basket' is the one that provides minimum expected tracking error to the benchmark based on the multi-factor model.

A set of 'expected alphas' can be introduced as an input in the optimization process, for example, to reflect a fund manager's views on the stocks and his/her expectation of future excess returns. Running the optimization process returns a portfolio where the constituents and weights have the highest expected alpha for a given tracking error to the benchmark. It is possible to change the target level of tracking error by adjusting the risk-aversion parameter – another input to the optimization that measures an investor's willingness to take on additional tracking error in order to increase the expected alpha. **By optimizing with decreasing risk-aversion levels it is possible to obtain a set of increasingly risky portfolios optimized to maximize the expected alpha.**

[14] More information on Barra Aegis and the optimization process can be obtained at http://www.mscibarra.com/.

Enhancing Euro STOXX 50 dispersion

We use our RV score as a measure of 'volatility alpha' and run a series of optimizations to identify enhanced dispersion baskets for the Euro STOXX 50. We test the following baskets:

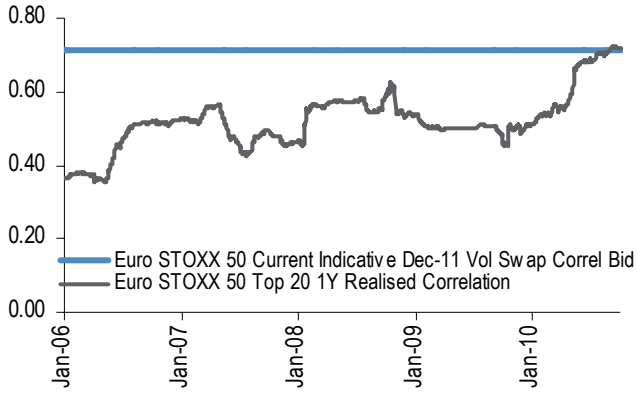
1. **Top 20 names in the index by weight.**
2. **Optimal 20 Euro STOXX 50 constituents** – optimized to deliver annualized tracking errors between 2.3% and 4.0% to the benchmark.
3. **Optimal 20 single names from a broad pan-European universe** – optimized to deliver tracking errors between 2.3% and 5.5% to the benchmark.

Top 20 Constituents in the Index

A basket of the top 20 names in the Euro STOXX 50 index pro-rated according to their weights in the index has a predicted tracking error of 2.4%. The tracking error can be slightly reduced (to 2.25%) by using the optimizer to select the stocks. The improvement is modest and the resulting basket cannot really be regarded as 'enhanced' as it is picked without considering the richness/cheapness of the constituents' volatilities. The main role of this basket is to act as a benchmark for the optimized baskets. Figure 18 shows the current implied vs. historical realized correlation for the basket.

Figure 18: We Use the Euro STOXX 50 Top 20 Basket as a Benchmark – The Indicative Level for Volatility Swap Spread Is 5.1%, Corresponding to a Correlation Bid of 70.6%

Correlation



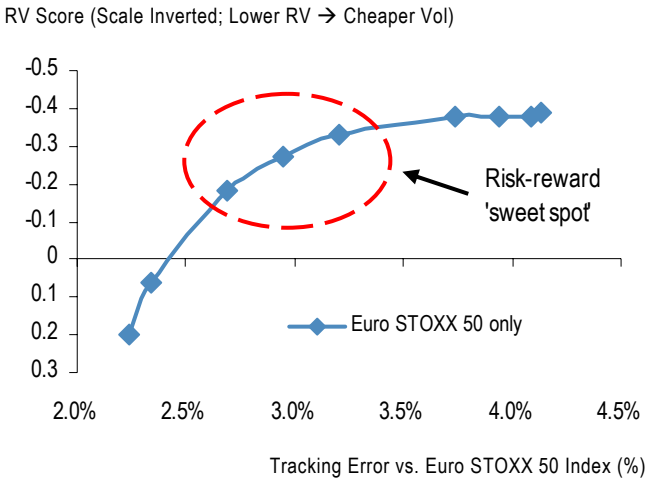
Source: J.P. Morgan Equity Derivatives Strategy.

Enhanced Dispersion Baskets of 20 Index Euro STOXX 50 Constituents

We use the Euro STOXX 50 constituents, after screening out three less liquid names where options/volatility swap trading is not practical in size. We run a set of optimizations[15] for portfolios with increasing 'volatility alpha' and tracking errors. Figure 19 displays the tracking error and weighted average RV score obtained for the set of enhanced baskets. The lowest tracking error portfolio resembles the 'benchmark' top 20 names portfolio almost perfectly and has a slightly positive aggregate RV score, indicating that the single-stock volatilities are on average slightly 'expensive'. As the tracking error is allowed to increase the RV score initially improves (i.e., becomes more negative) very quickly, declining to -0.18 from 0.2 for an increase of just 45bps in tracking error. As the tracking error continues to increase the improvement in the RV score starts to become slower, as the RV score gets closer to its asymptotical value. The choice of which optimized portfolio to prefer should clearly be driven by an investor's risk aversion. This said, **when using only Euro STOXX 50 constituents we prefer the enhanced dispersion basket with a tracking error of around 3% (Table 2)**, as this provides an optimal compromise between improving the 'volatility alpha' and limiting risk, in our view.

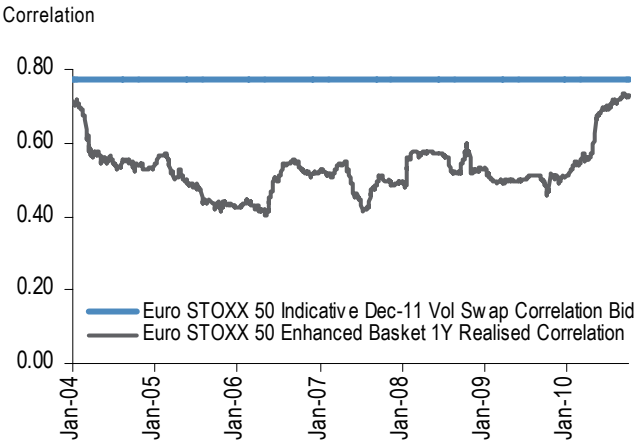
[15] In order to improve stability in the optimization process, the weight of each constituent in the enhanced dispersion basket is limited to its original weight in the Euro STOXX 50 plus 7%.

Figure 19: The 'Volatility Alpha' Improves as the Tracking Error Increases, but the Curve Flattens Out at Around 4% Tracking Error when Using Only Index Members



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 20: The Enhanced Dispersion Basket Constructed Using Only Index Constituents Has an Improved Implied Correlation Bid of 77.4%, but Realizes Correlation Levels Comparable with the Benchmark Basket



Source: J.P. Morgan Equity Derivatives Strategy.

Enhanced Dispersion Baskets of 20 Stocks from a Broad Pan-European Universe

We now start from a broader pan-European universe of stocks where options and volatility swaps can be traded with relative ease. The universe comprises just over 70 stocks and includes most of the Euro STOXX 50 names and the top names of the FTSE, DAX, and SMI indices. We follow the same procedure we described in the previous paragraph and generate a set of optimal portfolios with increasing 'volatility alpha' and tracking errors.

Figure 21 shows how using the broader universe allows achieving a larger 'volatility alpha' as measured from the average RV score of the basket, while keeping the tracking error in check. For low tracking errors (up to 2.6%) the enhanced baskets obtained starting from the Euro STOXX 50 constituents only and the broad universe are identical, as the optimal portfolio does not contain any non-Euro STOXX 50 names. As the tracking error is allowed to increase, the enhanced basket generated from the broad pan-European universe start outperforming the equivalent baskets selected from Euro STOXX 50 constituents only – that is, having a better weighted average RV score per unit of tracking error to the index. Further to this, the 'volatility alpha' keeps improving even at tracking errors for which there was almost no improvement when using only Euro STOXX 50 constituents. In other words, broadening the starting universe has increased the asymptotical values for the RV score.

We believe that the risk-reward sweet spot for enhanced baskets generated starting from a broad pan-European universe is around the 4%-4.5% tracking error mark. In fact, while better RV scores could be obtained for higher tracking errors, the fraction of non-Euro STOXX 50 constituents in the enhanced basket would become too high, leading to an excessive currency and country risk, in our view.

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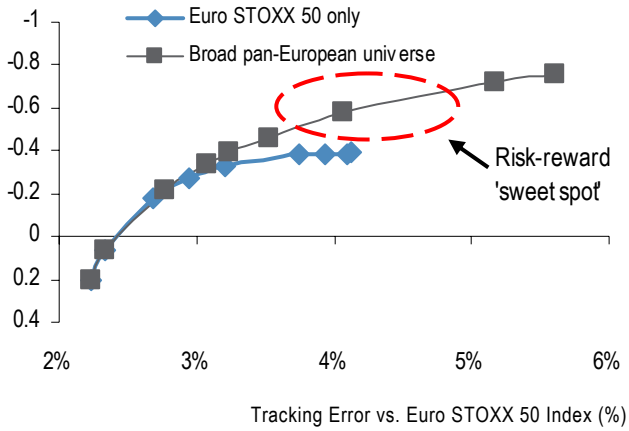
Figure 21: Enhanced Baskets Generated Using a Broader Universe Substantially Outperform Euro STOXX 50-Based Baskets at Higher TE

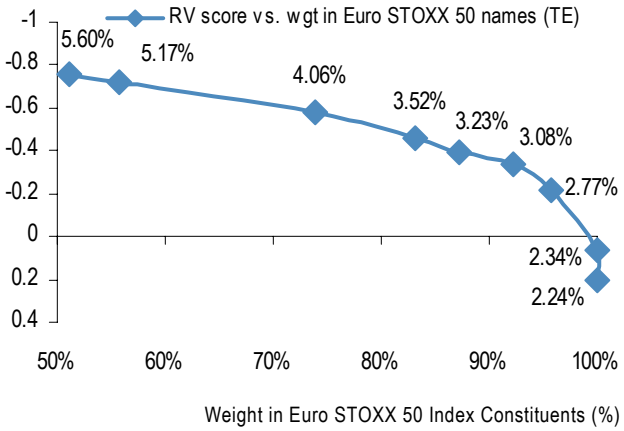
RV Score (Scale Inverted; Lower RV → Cheaper Vol)



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 22: Increasing the Weight of Euro STOXX 50 Components of the Basket Decreases Both the Volatility Alpha and Tracking Error

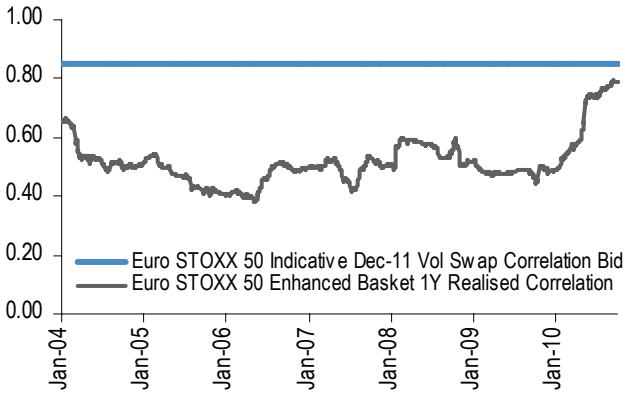
RV Score (Scale Inverted; Lower RV → Cheaper Vol)



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 23: The Correlation Bid of the Enhanced Basket Constructed from a Broad Pan-European Universe Is High at 84.7%, but the Historical Realized Correlation Is Also Higher than for the Benchmark

Correlation



Source: J.P. Morgan Equity Derivatives Strategy.

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Table 2: Constituents and Weight of the Euro STOXX 50 Top 20 Names Basket and the Two Enhanced Dispersion Baskets

Ticker	Name	RV Score	Top 20 Names	Enhanced Dispersion Basket Index Constituents Only (TE 2.95%)	Enhanced Dispersion Basket Broad Universe (TE 4.06%)
SAN SQ	Banco Santander	2.18	6.5%	-	-
BBVA SQ	BBVA	1.82	3.9%	-	-
UCG IM	Unicredit SPA	1.78	3.6%	-	-
NOK1V FH	Nokia Oyj	1.72	3.0%	-	-
BAYN GY	Bayer	0.89	4.5%	-	-
SU FP	Schneider Electric	0.67	4.0%	-	-
BNP FP	Bnp Paribas	0.62	4.5%	4.0%	-
GSZ FP	Gdf Suez	0.61	4.6%	-	-
SAN FP	Sanofi-Aventis	0.34	5.7%	4.1%	-
GLE FP	Societe Generale	0.21	3.2%	3.5%	-
CA FP	Carrefour	-0.03	-	3.6%	-
AI FP	Air Liquide	-0.08	4.9%	3.9%	-
UNA NA	Unilever	-0.10	5.6%	4.5%	-
SIE GY	Siemens	-0.12	7.3%	6.8%	5.3%
ENEL IM	Enel	-0.17	-	3.3%	-
FP FP	Total	-0.17	8.0%	7.5%	6.7%
DBK GY	Deutsche Bank	-0.30	3.7%	4.2%	3.4%
TEF SQ	Telefonica	-0.33	7.6%	9.0%	9.4%
ENI IM	Eni	-0.41	5.0%	5.1%	4.9%
DAI GY	Daimler	-0.42	4.0%	4.5%	4.1%
IBE SQ	Iberdrola	-0.44	-	5.2%	5.6%
ACA FP	Credit Agricole	-0.46	-	3.4%	3.5%
INGA NA	Ing Groep	-0.47	-	3.8%	3.4%
ALV GY	Allianz	-0.51	5.3%	6.8%	7.0%
TIT IM	Telecom Italia	-0.58	-	3.7%	4.2%
MC FP	LVMH	-0.64	-	6.4%	8.4%
DPW GY	Deutsche Post	-0.66	-	-	4.5%
NOVN VX	Novartis	-0.68	-	-	3.8%
EOAN GY	E.On	-0.76	5.1%	6.8%	7.9%
ZURN VX	Zurich Financial	-0.94	-	-	5.3%
SYNN VX	Syngenta	-1.03	-	-	3.3%
HOLN VX	Holcim	-1.04	-	-	3.0%
RUKN VX	Swiss Reinsurance	-1.15	-	-	2.8%
BP/ LN	BP	-1.35	-	-	3.5%

Source: J.P. Morgan Equity Derivatives Strategy.

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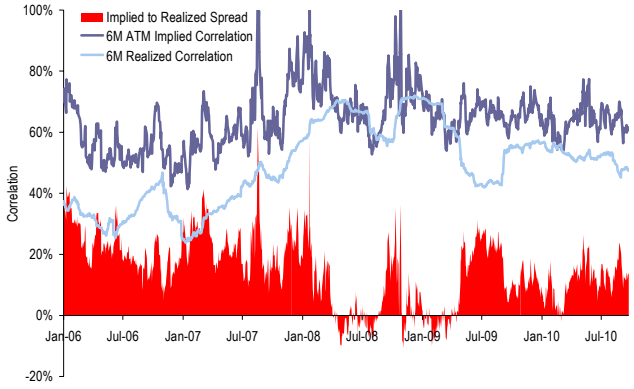
Asia-Pacific: Dispersion Trading Opportunities

Current environment: Similar to the rest of the world, Asia also currently finds itself in an environment of moderate volatility and high correlation. Influenced more by investors' "risk-on" and "risk-off" sentiment as well as the aforementioned correlation drivers rather than underlying fundamentals, many Asian equity markets, both on a cross-market level and within each market itself, continue to move in a highly correlated fashion. In general, during periods of falling markets when macro uncertainty tends to dominate, stocks become more volatile and more highly correlated at the same time. On the other hand, an environment of low correlation and low stock volatility tends to coincide with steadily rising markets where underlying fundamentals become the main driver and macro risk factors are relatively lacking.

However, this has not been the case over the past quarter. The sharp market sell-offs in May on the back of signs of further Eurozone stress led to the surge in volatility and correlation. At the time, we observed a number of dispersion trades being put on by market participants to take advantage of the rich risk premium. As equity markets rebounded and recovered from their earlier losses, volatility in Asia has also collapsed and now trades close to multi-year lows. While implied correlation has also come off from its peak, it still remains stubbornly elevated on both a historical and relative basis for some Asian markets.

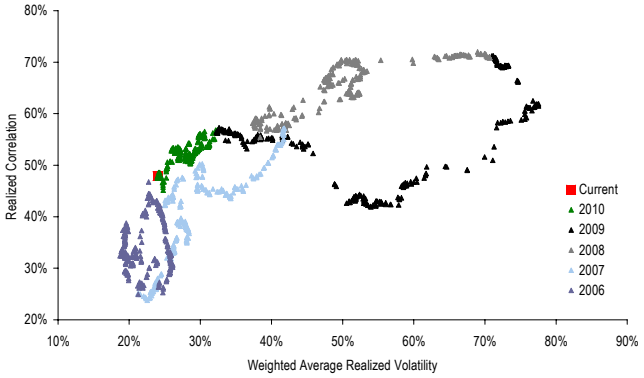
The following charts illustrate the implied and realized correlation history for the Hang Seng, TOPIX, and ASX 200, as well as the breakdown of volatility into stock volatility and correlation components since 2006.

Figure 24: 6M Implied and Realized Correlation for Hang Seng*



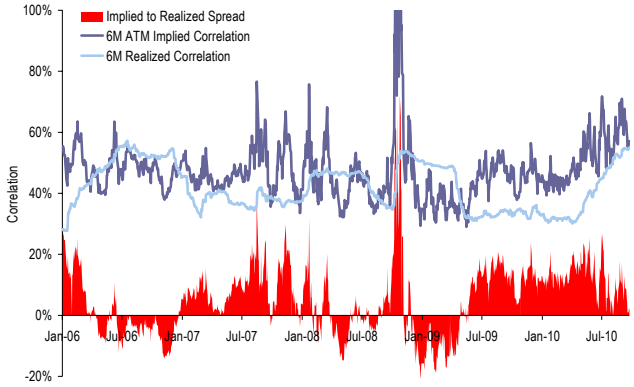
Source: J.P. Morgan Equity Derivatives Strategy.
*Based on top 15 components and weightings as of Sep-10.

Figure 25: 6M Realized Correlation vs. Weighted Avg. Stock Realized Vol*



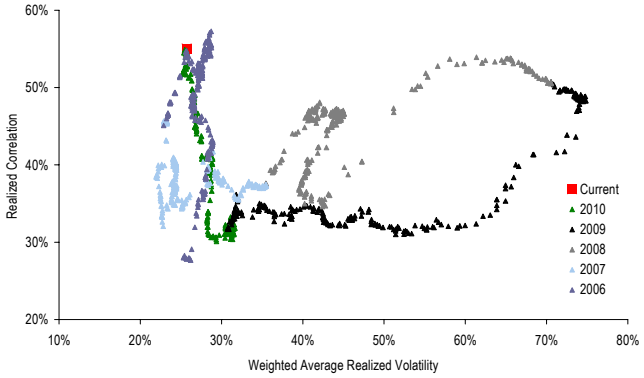
Source: J.P. Morgan Equity Derivatives Strategy.
*Based on top 15 components and weightings as of Sep-10.

Figure 26: 6M Implied and Realized Correlation for TOPIX*



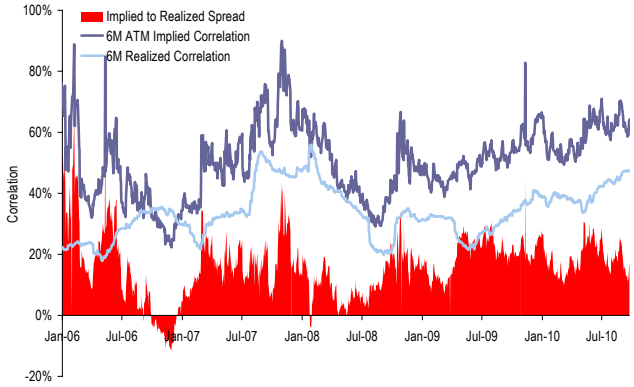
Source: J.P. Morgan Equity Derivatives Strategy.
*Based on top 30 components and weightings as of Sep-10.

Figure 27: 6M Realized Correlation vs. Weighted Avg. Stock Realized Vol*



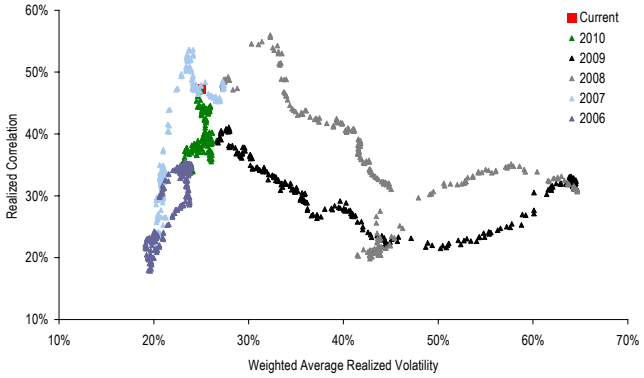
Source: J.P. Morgan Equity Derivatives Strategy.
*Based on top 30 components and weightings as of Sep-10.

Figure 28: 6M Implied and Realized Correlation for ASX 200*



Source: J.P. Morgan Equity Derivatives Strategy.
*Based on top 15 components and weightings as of Sep-10.

Figure 29: 6M Realized Correlation vs. Weighted Avg. Stock Realized Vol*



Source: J.P. Morgan Equity Derivatives Strategy.
*Based on top 15 components and weightings as of Sep-10.

From these charts, we make the following observations:

- During the recent volatility spike in May, implied correlation moved noticeably higher across the three markets. However, as market conditions normalized, the Hang Seng implied and realized correlation dropped to levels near their averages since 2009. On the other hand, although tapering off recently, implied correlation for the TOPIX and ASX 200 remains in an uptrend. Their realized correlations continue to rise further and are even higher than the levels observed back in late 2008 and early 2009.

- In terms of the richness of correlation, with implied correlation declining, the large gap which previously existed between implied and realized correlation has narrowed substantially, making index dispersion trades less attractive. The ASX 200 currently has the widest spread among the three indices and the spread also has been the least volatile recently.

- From the scatter plots, between 2006 and 2007, all three indices were basically in a low-volatility regime with oscillating correlation levels. In late 2008 and early 2009, equity volatility and correlation reached unprecedented levels. Currently, all three indices are back in a moderate-volatility regime. The common trend among the three indices is that while correlation and volatility usually move together, the current level of realized correlation appears high in comparison to the relatively moderate levels of component stocks' volatilities. This observation has led to renewed interest in selling correlation, in particular for markets in which investors can readily put on dispersion trades through straddles/puts/volatility swaps.

Short index correlation through straddle/volatility swap dispersion: Alongside the recent decline in index implied volatility, implied correlation has also fallen. At the current level, index dispersion is much less attractive. For dispersion trades, the absolute level of implied correlation is generally a useful signal for profitability, with higher implied correlation leading to higher expected profit and loss. The importance of the absolute level of implied correlation is partly explained by the fact that correlation has a mean-reverting tendency. Clearly, for any mean-reverting asset, selling when high and buying when low is likely to be profitable. Hence, selling correlation when implied correlation is above a set threshold would be a sensible strategy. Given the equity markets already had a decent rally since the beginning of September, we think investors can wait for the next market pullback as implied volatility and correlation move higher for a better entry level for dispersion trading.

Exploiting Rich Correlation Through Single-Stock vs. Index Volatility Spread Trading

Rich implied correlation levels would suggest a bias to sell volatility through index options and buy volatility through single-stock options. While the absolute level of implied correlation has declined somewhat, investors can still capitalize on cheap single-stock volatility and rich implied correlation by selectively entering into single-stock versus index volatility spread trades. We suggest picking the single stocks with cheap volatility as identified by our proprietary model *Relative Value Score* for this volatility spread trading strategy.

The *Relative Value (RV) Score* is a quantitative framework for screening relative value opportunities in single-stock volatility based on a combination of fundamental and technical factors. The *RV Score* is derived from two simpler metrics: 1) Volatility Z-Score and 2) Fundamental Z-Score. The Volatility Z-Score determines a stock's relative volatility richness/cheapness by comparing the stock's current implied volatility with the history of its realized volatility as well as by comparing the stock's current implied-to-realized spread with those of other stocks in the same universe. On the other hand, the Fundamental Z-Score considers stock fundamental factors (such as stock beta, stock return, dividend yield, and CDS spread) that can help to explain future realized volatility, to determine a stock's relative volatility richness/cheapness. The *RV Score* has proved to be an effective tool for ranking single-stock volatility in Japan, Australia, and Hong Kong[16].

The current *RV Score* rankings and attractive candidates for singe-stock versus index volatility spread trades are summarized in the following tables and charts. The universe includes stocks with a fairly liquid options market – 66 stocks in Japan, 29 stocks in Australia, and 20 stocks in Hong Kong. In Japan, all of the bottom-decile cheapest single-stock volatilities appear attractive for the trade, with their implied volatility spread vs. Nikkei 225 trading below the 5th percentile of the historical realized volatility spread since 2004. There are no trades recommended in Hong Kong at the moment.

[16] For detailed methodology and backtesting results, see "*Relative Value Score for Single Stock Volatility*," Sue Lee, published on May 31, 2010.

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Figure 30: Single-Stock vs. Index Volatility Spread Trades Recommended by the *RV Score* in Japan (Data as of September 28, 2010)

	Ticker	Name	RV Score	Fundamental Z-Score	Volatility Z-Score	6M Implied Vol	6M Realized Vol	6M Implied - Realized	SS - index IV Spread	%-tile vs RV Spread	Trading Signal
1	3402 JT	TORAY INDUSTRIES	-1.31	-1.72	-0.89	26.8%	28.3%	-1.5%	3.0%	3%	Buy SS & Short Index
2	6502 JT	TOSHIBA CORP	-1.29	-2.15	-0.44	29.6%	28.7%	0.9%	5.7%	3%	Buy SS & Short Index
3	8316 JT	SUMITOMO MITSUI	-1.21	-2.01	-0.41	26.9%	25.4%	1.5%	3.0%	0%	Buy SS & Short Index
4	6902 JT	DENSO CORP	-1.04	-1.28	-0.80	29.3%	29.4%	-0.1%	5.5%	3%	Buy SS & Short Index
5	8601 JT	DAIWA SECS GRP	-0.83	-0.72	-0.95	33.3%	30.5%	2.7%	9.4%	0%	Buy SS & Short Index
6	8058 JT	MITSUBISHI CORP	-0.77	-1.07	-0.46	29.8%	30.5%	-0.8%	5.9%	0%	Buy SS & Short Index
7	8604 JT	NOMURA HOLDINGS	-0.76	-0.84	-0.69	32.2%	26.8%	5.4%	8.4%	13%	
8	9501 JT	TOKYO ELEC PWR	-0.61	-0.64	-0.58	18.1%	14.1%	3.9%	-5.8%	18%	
9	6301 JT	KOMATSU LTD	-0.60	-0.65	-0.55	31.3%	30.7%	0.5%	7.4%	0%	
10	8031 JT	MITSUI & CO	-0.60	-0.79	-0.40	32.1%	36.3%	-4.2%	8.2%	0%	
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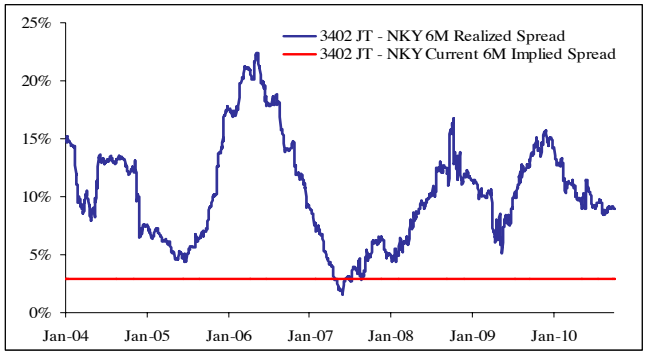

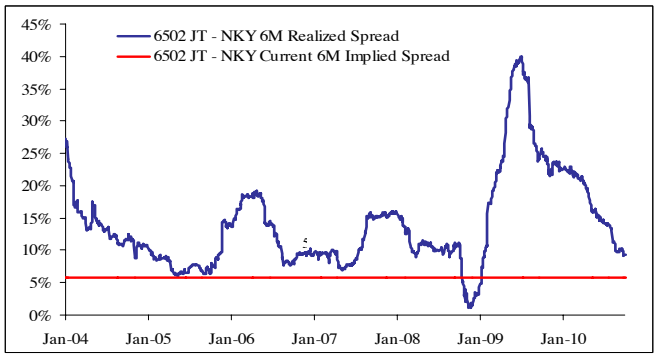

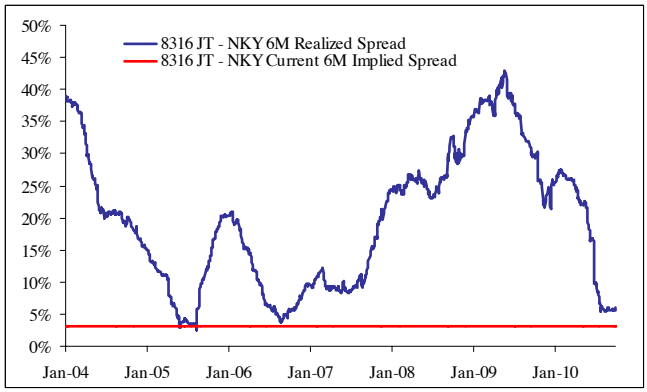

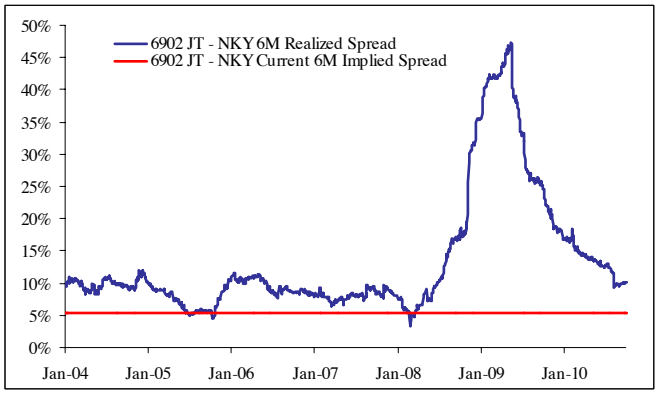

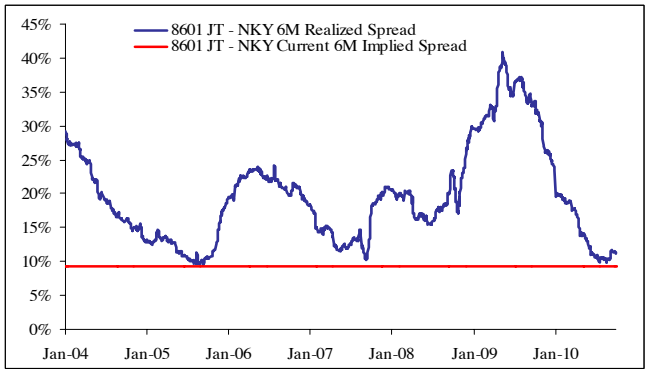

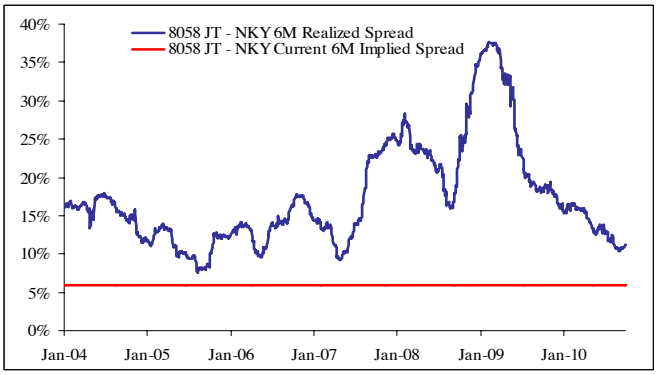

Source: J.P. Morgan Equity Derivatives Strategy.

Figure 31: Single-Stock vs. Index Volatility Spread Trades Recommended by the *RV Score* in Australia (Data as of September 28, 2010)

	Ticker	Name	RV Score	Fundamental Z-Score	Volatility Z-Score	6M Implied Vol	6M Realized Vol	6M Implied Vol - Realized	SS - index implied vol spread	%-tile vs IV Spread	Trading Signal RV Spread
1	NAB AU	NATL AUST BANK	-0.94	-1.09	-0.80	21.9%	26.9%	-5.0%	3.8%	43%	
2	STO AU	SANTOS LTD	-0.94	-0.37	**-1.51**	24.5%	32.8%	-8.3%	6.4%	**1%**	Buy SS & Short Index
3	SUN AU	SUNCORP-METWAY L	-0.82	-0.60	-1.05	22.5%	26.3%	-3.9%	4.4%	14%	
4	WOW AU	WOOLWORTHS LTD	-0.82	-1.29	-0.35	15.2%	13.0%	2.2%	-2.9%	2%	
5	WBC AU	WESTPAC BANKING	-0.82	-0.93	-0.70	22.9%	30.4%	-7.6%	4.8%	38%	
6	WPL AU	WOODSIDE PETRO	-0.65	-1.43	0.13	21.8%	22.0%	-0.2%	3.7%	0%	
7	ANZ AU	AUST AND NZ BANK	-0.61	-0.84	-0.38	22.2%	26.7%	-4.4%	4.1%	35%	
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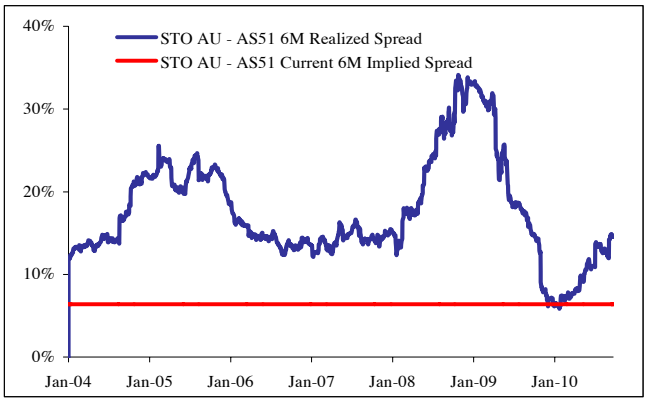

Source: J.P. Morgan Equity Derivatives Strategy.

Figure 32: No Single-Stock vs. Index Volatility Spread Trades Recommended by the *RV Score* in Hong Kong (Data as of September 28, 2010)

	Ticker	Name	RV Score	Fundamental Z-Score	Volatility Z-Score	6M Implied Vol	6M Realized Vol	6M Implied Vol - Realized	SS - index implied vol spread	%-tile vs IV Spread	Trading Signal RV Spread
1	11 HK	HANG SENG BK	-1.12	**-1.69**	-0.55	13.9%	10.8%	3.0%	-7.0%	15%	
2	16 HK	SUN HUNG KAI PRO	-0.77	-1.01	-0.54	26.4%	23.6%	2.8%	5.5%	42%	
3	2318 HK	PING AN INSURA-H	-0.68	-1.36	-0.01	29.5%	27.3%	2.2%	8.6%	9%	
4	1 HK	CHEUNG KONG	-0.66	-0.77	-0.55	24.6%	19.9%	4.7%	3.7%	24%	
5	3328 HK	BANK OF COMMUN-H	-0.50	-1.00	0.00	25.6%	28.0%	-2.4%	4.7%	3%	
6	13 HK	HUTCHISON WHAMPO	-0.35	0.42	-1.12	26.6%	28.2%	-1.6%	5.7%	73%	
:	:	:	:	:	:	:	:	:	:	:	
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Source: J.P. Morgan Equity Derivatives Strategy.

Using Packaged Dispersion Products to Implement Short Correlation Views

In Asia, the lack of options market liquidity for sector indices makes most sector dispersion trades through options or volatility swaps infeasible. However, a compromise can be achieved through packaged OTC products such as a call versus call (CvC) dispersion as a means of going long the dispersion of stock returns for a sector or a customized basket. This structure is a long dispersion position constructed by selling calls on a basket of single stocks and buying calls on the members. It provides a relatively cheap means of getting low-risk exposure to realized dispersion and appears attractively priced given the current high levels of correlation.

An investor buying a CvC structure will be short a call on a basket of single stocks and long calls (of the same relative strike) on each of the members of the basket. The trade will be weighted such that the total underlying notional on the long and short call legs will be same. Typically the basket will comprise 3-10 stocks, usually equally weighted, though index or market cap weighted trades are also possible.

Investors will make money if, at maturity, the underlyings are well dispersed around the strike of the call options. For example, if an investor buys CvC dispersion by selling an ATM call on a basket and buys ATM calls on the members, then

the optimal outcome would be for some of the stocks to have large positive performance and some to have large negative performance. If all stocks rally, then the payout would be zero – even with high dispersion – since in this case the loss on the basket call would exactly cancel out the gains on the single-stock calls. Similarly, for a CvC trade with strike set at 115%, if no underlyings rally by more than 15% the payout would be zero, regardless of the dispersion. For this reason the view of dispersion at a particular strike level and the choice of this strike can be crucial.

Dispersion tends to be negatively correlated with correlation, but positively correlated with volatility. Therefore, an investor buying CvC (long calls on members, short calls on the basket) will be long volatility but short correlation. However, unlike an index dispersion trade which has unlimited downside, performing particularly poorly in a sudden market sell-off, a (long) CvC trade has downside limited to the net premium paid for the structure. Hence, a CvC trade allows investors to take a long dispersion position without the downside risk of a traditional variance dispersion trade.

Here we highlight two example baskets for various CvC structures and their indicative pricing:

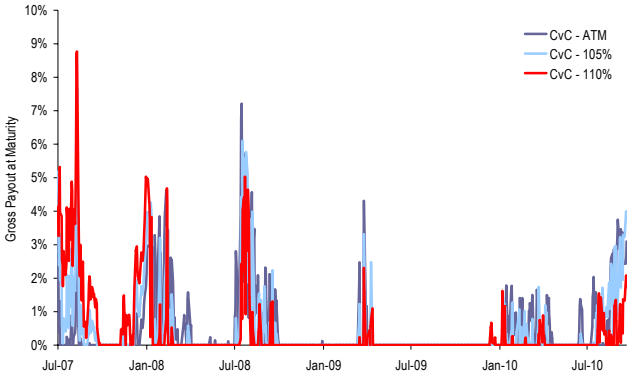
Table 3: CvC Baskets and Indicative Pricings

Basket 1	China Financials	**Basket 2**	Japan Financials
Weighting	Equal	Weighting	Equal
939 HK	CCB	8306 JP	Mitsubishi UFJ
3988 HK	BoC H	8316 JP	Sumitomo Mitsui
1398 HK	ICBC	8411 JP	Mizuho
2628 HK	China Life		
2318 HK	PingAn		
	Option Premium		**Option Premium**
6M CvC ATM	77bps	6M CvC ATM	80bps
6M CvC 105%	79bps	6M CvC 105%	82bps
6M CvC 110%	81bps	6M CvC 110%	85bps
Implied Correl (ATM bid)	75.0%	Implied Correl (ATM bid)	77.5%

Source: J.P. Morgan Equity Derivatives Strategy.

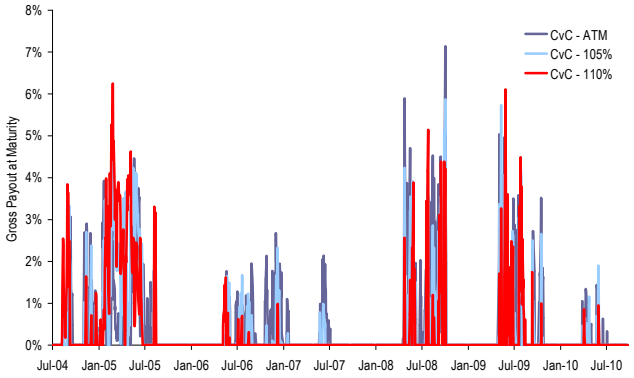
The charts below illustrate the historical gross payout at maturity of the above CvC structures on the two financials baskets. The CvC backtest history of the Chinese financial basket is shorter due to the shorter listing history of the components. While we cannot predict when extreme payouts will occur, we think the backtest is still useful as it can show whether the implied correlation currently priced into the CvC structure can be justified by the historical payout.

Figure 33: CvC Gross Payout at Maturity for Chinese Financials Basket



Source: J.P. Morgan Equity Derivatives Strategy.

Figure 34: CvC Gross Payout at Maturity for Japanese Financials Basket



Source: J.P. Morgan Equity Derivatives Strategy.

Risks of Common Option Strategies

Risks to Strategies: Not all option strategies are suitable for investors; certain strategies may expose investors to significant potential losses. We have summarized the risks of selected derivative strategies. For additional risk information, please call your sales representative for a copy of "Characteristics and Risks of Standardized Options." We advise investors to consult their tax advisors and legal counsel about the tax implications of these strategies. Please also refer to option risk disclosure documents.

Put Sale. Investors who sell put options will own the underlying asset if the asset's price falls below the strike price of the put option. Investors, therefore, will be exposed to any decline in the underlying asset's price below the strike potentially to zero, and they will not participate in any price appreciation in the underlying asset if the option expires unexercised.

Call Sale. Investors who sell uncovered call options have exposure on the upside that is theoretically unlimited.

Call Overwrite or Buywrite. Investors who sell call options against a long position in the underlying asset give up any appreciation in the underlying asset's price above the strike price of the call option, and they remain exposed to the downside of the underlying asset in the return for the receipt of the option premium.

Booster. In a sell-off, the maximum realized downside potential of a double-up booster is the net premium paid. In a rally, option losses are potentially unlimited as the investor is net short a call. When overlaid onto a long position in the underlying asset, upside losses are capped (as for a covered call), but downside losses are not.

Collar. Locks in the amount that can be realized at maturity to a range defined by the put and call strike. If the collar is not costless, investors risk losing 100% of the premium paid. Since investors are selling a call option, they give up any price appreciation in the underlying asset above the strike price of the call option.

Call Purchase. Options are a decaying asset, and investors risk losing 100% of the premium paid if the underlying asset's price is below the strike price of the call option.

Put Purchase. Options are a decaying asset, and investors risk losing 100% of the premium paid if the underlying asset's price is above the strike price of the put option.

Straddle or Strangle. The seller of a straddle or strangle is exposed to increases in the underlying asset's price above the call strike and declines in the underlying asset's price below the put strike. Since exposure on the upside is theoretically unlimited, investors who also own the underlying asset would have limited losses should the underlying asset rally. Covered writers are exposed to declines in the underlying asset position as well as any additional exposure should the underlying asset decline below the strike price of the put option. Having sold a covered call option, the investor gives up all appreciation in the underlying asset above the strike price of the call option.

Put Spread. The buyer of a put spread risks losing 100% of the premium paid. The buyer of higher-ratio put spread has unlimited downside below the lower strike (down to zero), dependent on the number of lower-struck puts sold. The maximum gain is limited to the spread between the two put strikes, when the underlying is at the lower strike. Investors who own the underlying asset will have downside protection between the higher-strike put and the lower-strike put. However, should the underlying asset's price fall below the strike price of the lower-strike put, investors regain exposure to the underlying asset, and this exposure is multiplied by the number of puts sold.

Call Spread. The buyer risks losing 100% of the premium paid. The gain is limited to the spread between the two strike prices. The seller of a call spread risks losing an amount equal to the spread between the two call strikes less the net premium received. By selling a covered call spread, the investor remains exposed to the downside of the underlying asset and gives up the spread between the two call strikes should the underlying asset rally.

Butterfly Spread. A butterfly spread consists of two spreads established simultaneously – one a bull spread and the other a bear spread. The resulting position is neutral, that is, the investor will profit if the underlying is stable. Butterfly spreads are established at a net debit. The maximum profit will occur at the middle strike price; the maximum loss is the net debit.

Pricing Is Illustrative Only: Prices quoted in the above trade ideas are our estimate of current market levels, and are not indicative trading levels.

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