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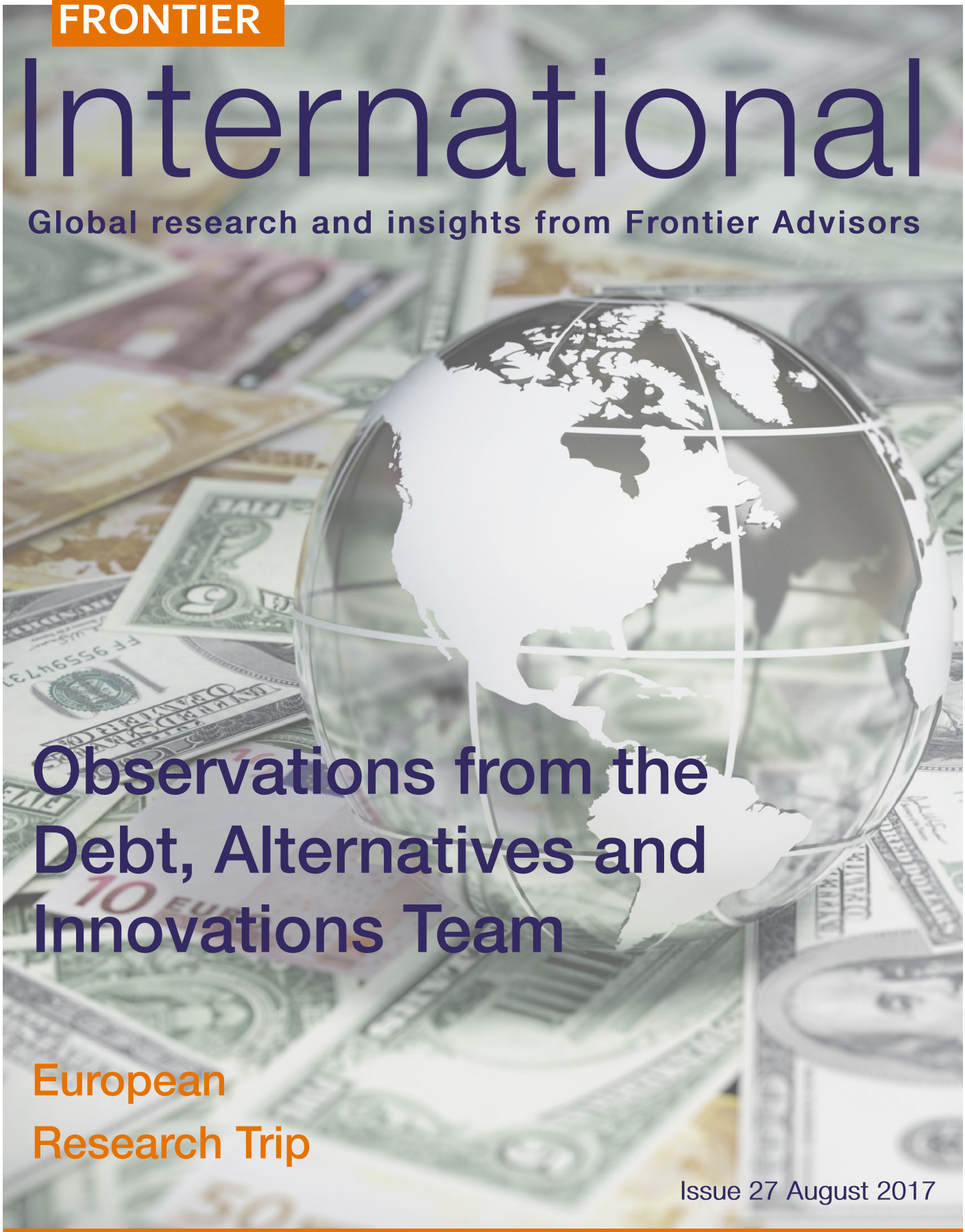

Observations from the Debt, Alternatives and Innovations Team

European Research Trip

Issue 27 August 2017

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Frontier regularly conducts international research trips to observe and understand more about international trends, and to meet and evaluate first hand a range of fund managers and products.

In conjunction with insights we share with our Global Investment Research Alliance partners, these observations feed into our extensive international research library.

This report provides a high level assessment on the key areas and observations unearthed during this recent Debt, Alternatives and Innovations trip. We would be pleased to meet with you in person to provide further detail on these observations.

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Justine O'Connell joined Frontier as an Associate in 2005 before relocating to London in 2008 where she worked for Watson Wyatt as an Investment Consultant. On her return to Melbourne in 2010, she re-joined Frontier as a Consultant before being promoted again to Principal Consultant in 2014. Justine leads the Debt, Alternatives and Innovation research area at Frontier and is also a member of the firm's Investment Committee. Justine's responsibilities at Watson Wyatt included assisting large UK corporate clients in developing scheme structures and advising on strategic asset allocation and manager structure and selection. Prior to 2005, Justine worked for Goldman Sachs in London for over three years in the bank loan trading area. Justine holds a Bachelor of Commerce with Honours from the University of Melbourne and a Graduate Diploma of Applied Finance and Investments from Finsia. Justine is also a CFA Charterholder.

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Michael Sommers joined Frontier in 2013 as a Senior Consultant before being promoted. His responsibilities include providing risk management and consulting advice to clients, preparing client investment reports and undertaking manager and investment research with a particular focus on absolute return strategies. Prior to joining Frontier, Michael worked in London for seven years in a number of trading floor based senior risk management roles at CIBC, Lloyds and HBOS. His roles involved advising on the risk and performance characteristics of diverse portfolios and investment strategies. He was also involved in regulatory and risk governance related work at a senior level. Prior to working in London, Michael worked in credit risk modelling at ANZ in Melbourne. Michael holds a Bachelor of Commerce with majors in Actuarial Studies and Finance (including First Class Honours in Finance), a Bachelor of Science and a Master of Applied Finance degree from Macquarie University.

Volatility is low but not necessarily cheap

Frontier met with a range of managers on our recent research trip to London and Zurich. These included tail risk hedging overlay managers, relative-value multi asset (what we term "liquid diversified strategies"), CTAs and opportunistic and long only credit managers. We also met with several investment banks to understand their offerings to global pension funds and what could be of interest to our client base.

Two key areas we have chosen to write about for this note are our thoughts gained from discussions with market participants on why volatility is so low and potential implications of a breakout in volatility and also the increasing use by pension funds globally of alternative risk premia implemented via investment bank swaps.

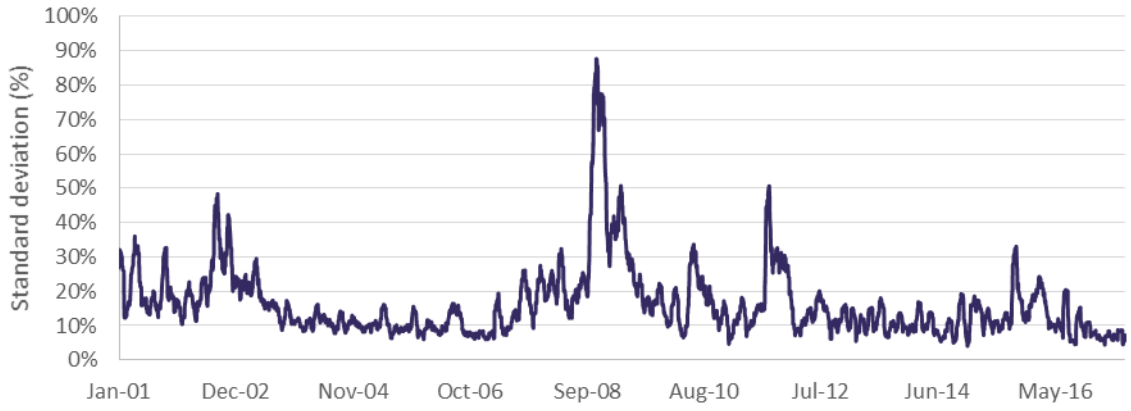
Why is volatility low?

Monetary policy environment

A common theme discussed in our meetings was why both realised and implied volatilities have been trending down (see Chart 1 and Chart 2); this has been a consistent theme across asset classes. To put this in perspective, the VIX (widely used as a measure of the market's view of future volatility) recently fell to 24-year lows. This low-volatility regime has occurred despite short-lived bouts of volatility in recent times (e.g. Brexit, Trump's election, the close UK Election). We have held a positive view on downside protection via the use of equity put options for several years now with a key reason for this in recent times being the low cost of purchasing protection. This characteristic of markets is therefore important, not only to explain the current regime of lower versus average prices for protection but what this may mean for option prices over the next year or so. And, importantly what might be a trigger for reversing the low volatility trend.

Several managers mentioned the impact of loose central bank monetary policy on dampening realised volatility. The common view was that loose monetary policy had led market participants to become complacent about the future. This is sometimes referred to as the "Central Bank Put", whereby the central banks would always step in to markets to stem any bouts of volatility. This may make sense over a medium-term but doesn't completely explain why shorter-term bouts of volatility have receded very quickly. Frontier's Capital Markets team also analyses this in the latest Quarterly Market Outlook – September 2017 and form a similar conclusion although also suggest that the lack of volatility in macroeconomic data has been a factor driving the low volatility environment.

Chart 1: Rolling 30 day realised volatility for the S&P500



Source: Bloomberg, Frontier

Chart 2: Time Series of VIX

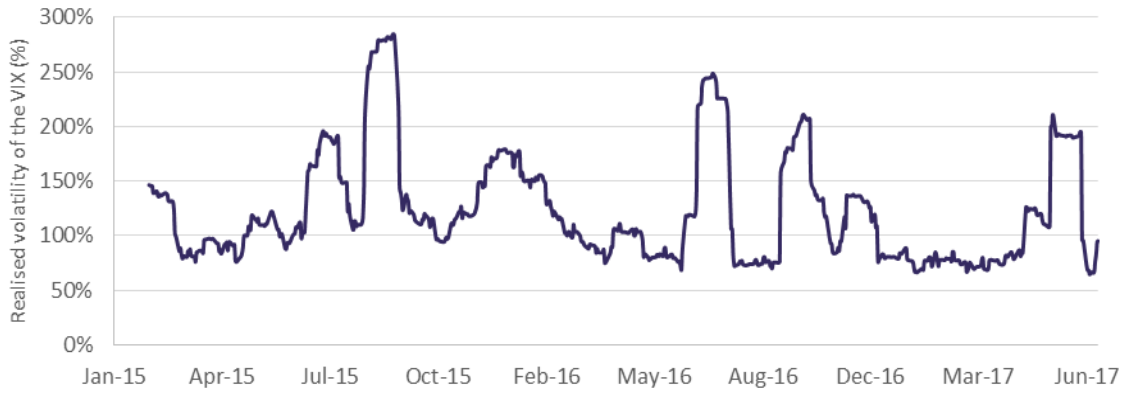
Source: Bloomberg, Frontier

Volatility spikes have, in recent times, been very short-lived. Except for a recent period when the VIX spiked, the volatility of the VIX has been relatively stable during 2017 and lower than observed in 2015 and 2016 (see Chart 3).

There have been several periods where intraday volatility has been high only for this volatility spike to settle down (e.g. Brexit, Trump, UK election). Chart 4 includes the 60-day moving averages for the percentage ratio of intraday highs to intraday lows (brown line), percentage ratio of the closing price to the open price (green line) and then the difference between these two ratios (red line).

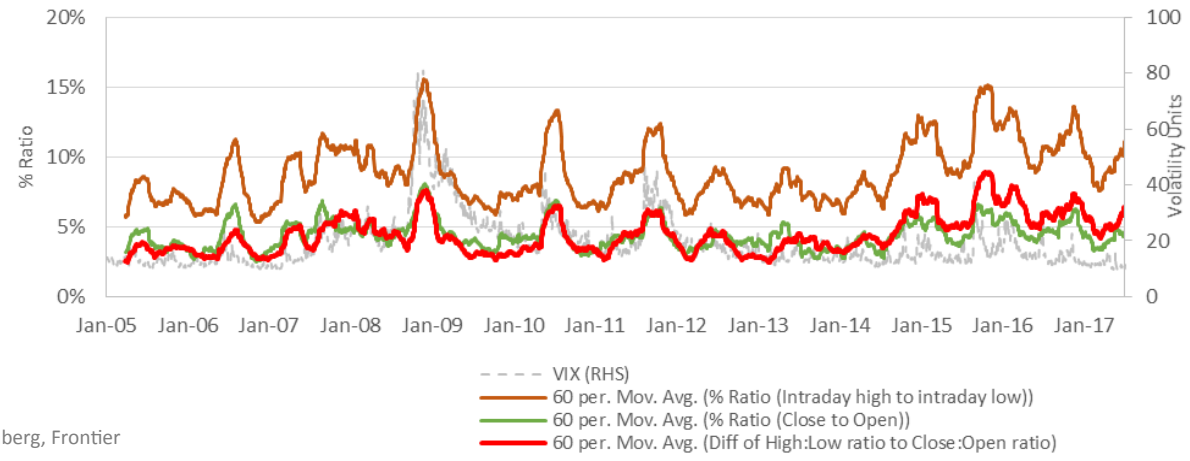
The recent years have seen intraday volatility in the VIX which is similar to previous periods (perhaps even higher at times) while the end-of-day volatility of the VIX (i.e. ratio of close to open) has also been slightly higher in recent years relative to more serene past periods (e.g. 2012 to 2014). However, the difference between the two has been increasing suggesting a lack of persistence in intraday volatility. This persistence of volatility (or lack thereof) reflects increased calm by market participants willing to ride-out any short-term mark-to-market losses from volatility spiking.

Chart 3: Rolling 30 day realised volatility of the VIX



Source: Bloomberg, Frontier

Chart 4: Intraday moves in the VIX over time



Source: Bloomberg, Frontier

Proliferation of Short Volatility Strategies

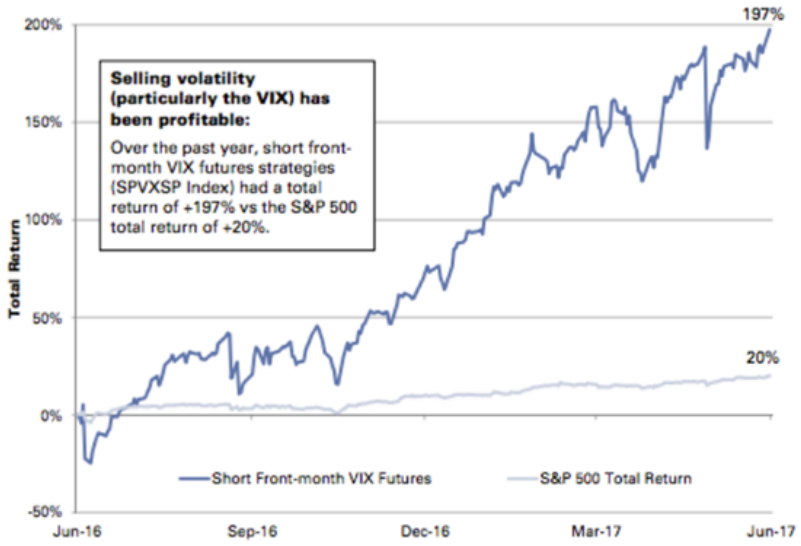
Quite a number of managers also mentioned the proliferation of short volatility strategies. These have become popular products for investment banks (discussed later in this piece) but short VIX exchange traded funds (ETFs) have also increased in popularity (see Figure 1).

As background, a short VIX ETF is a security which rises in value when the VIX falls while the opposite is also true. This strategy has proven to be very profitable in recent times (see Figure 2).

Figure 1: Increase in interest in short VIX ETFs

Source: RBC

Figure 2: Total return of short front-month VIX Futures vs S&P500



Source: Bloomberg; Heisenberg Report "Are volatility selling strategies crowded"

Delta hedging by banks

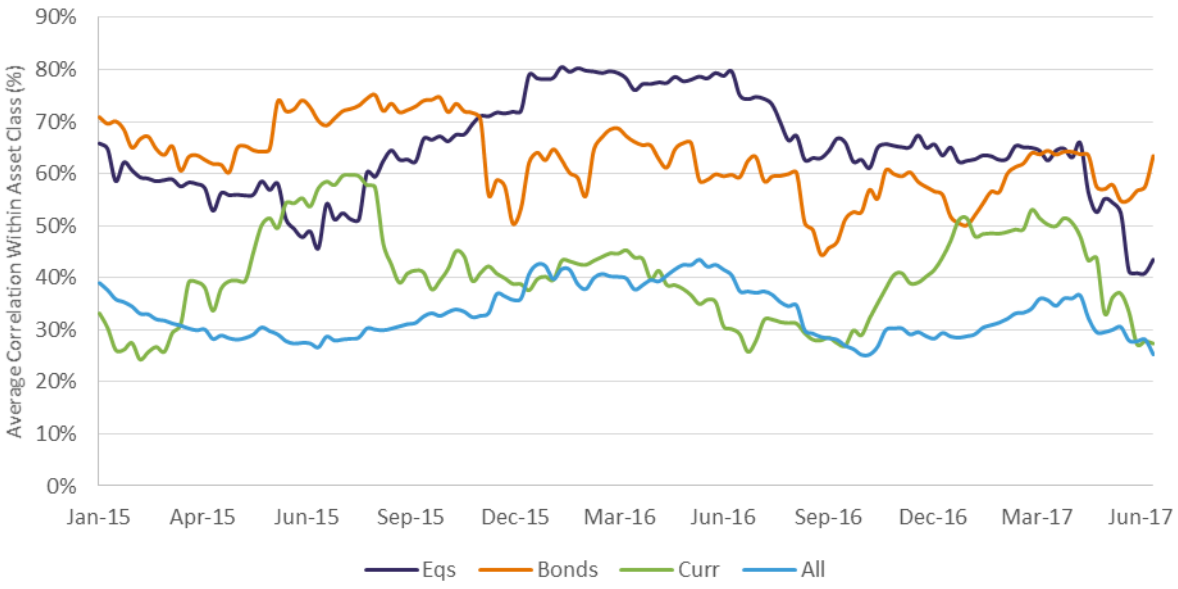
One manager provided an eloquent way of describing the current low realised and implied volatility conditions: "volatility is low…but it's not cheap". Volatility carry is attractive and, until recently, not as crowded as people believe. In early June, the manager observed a flattening of the volatility term structure reflecting increased crowding in the short-volatility trade. Short volatility trades are being seen in all asset classes. Sellers of volatility are predominantly systematic. Interestingly, Scandinavian pension funds are large systematic sellers (more on that below).

This manager explained that banks are long gamma which caps realised market volatility. To explain this, the banks are long gamma because they are taking the other side of the increasingly popular short volatility trades. As background, if a bank is long gamma, it will actively delta hedge the option exposure. In the case of a long call, the bank will sell the underlying to reduce delta as the underlying market rises; this creates selling pressure which reduces the magnitude of the rally for the underlying market. Market falls have the opposite positions being taken: as the market falls, the bank will buy the underlying to reduce the negative delta which creates a floor on the market level fall. Overall, assuming the long gamma positions of the banks are meaningful enough to impact the market, this means that the markets operate in a tight range thereby capping the realised volatility.

Low correlation

Another explanation offered by managers for low levels of both implied and realised volatilities are the reduced intra-correlation of stocks within and across equity indices. As background, low levels of correlation imply reduced variability at the index level. Chart 5 shows the rolling average correlations within different asset classes. The average correlations across all equity indices has reduced materially in the last three to six months, as has the average correlation across currencies. Bonds have been following a different trend with somewhat increasing correlation across major government bonds. These reduced correlations are perhaps more of an outcome rather than a driver of low realised volatility but it is a useful confirmation of what has been observed across markets. Having a view, though, about divergence of equity markets or the stocks within an equity index logically suggests a view about what future volatility could be.

Chart 5: Rolling 6-month average correlations[1]



Source: Bloomberg, Frontier

1.Correlations in this chart calculated as the average of the absolute pairwise correlations within an asset class (e.g. equities) or across all instruments (denoted by "All" in the chart)

How can this break?

The previous sections discussed what has been observed and highlighted some different reasons given to explain this. Any increase in correlations within equity indices should portend an increase in equity index volatility. However, two different charts suggest that the market is relatively sanguine about the forward-looking environment for market volatility (in this case, the S&P 500). Chart 6 shows the timeseries for the VVIX contract which is a market contract allowing market participants to trade on a view about volatility of the VIX over the next 1 month. This chart suggests that the market is relatively sanguine about the forward-looking environment given the levels are at lows seen since the start of 2015.

Chart 7 shows the market price for trading on observed correlation within the S&P 500 over a future time horizon (in this case, circa one-year). There has been a consistent downward trend of the market's view of future correlation within the S&P 500.

Several managers argued that any break in this low-volatility regime will need to come from an external shock (e.g. major terrorist attack). Both Chart 5 and Chart 6 is consistent with this view since "known-knowns" (as Donald Rumsfeld would put it) don't seem to pose much of a concern to the market. It is possible that should this type of external event occur, the reaction could be swift and larger than observed in recent times. The key question would be whether this shock is short-lived (as we've observed over the last few years) or whether it causes a sustained increase in volatility.

Chart 6: Market's forward-looking view of the volatility of the VIX

Source: Bloomberg, Frontier

Chart 7: Implied average correlation across stocks within S&P 500

Source: Bloomberg, Frontier

Downside protection

The natural extension of the previous discussion regarding a break-out in volatility is how to reduce the impact on a portfolio. Downside protection was a consistent topic discussed with managers.

Most managers were taking advantage of the low prices for protection but were being targeted with the type of protection being used to reduce the cost of buying protection. Those with more equity-sensitivity were using equity options. Credit managers were using credit default swaps which, like equity-options, were relatively cheap. Managers acknowledged that the low prices may well accurately reflect a world with continuing low-volatility but believed these still offered good value should external factors (which by their definition cannot be easily predicted nor factored into option pricing) cause a shock to the system.

Other managers put faith in diversification whether it be within asset classes (e.g. for a credit manager who has exposure to idiosyncratic credit rather than general credit beta) or across asset classes (e.g. CTAs). The latter use of diversification works well when correlations are low (as we've discussed above) but it can be loss-additive should this low-correlation regime change.

Derivative strategies

Background

We met with a number of banks on this trip, each of which offers a suite of risk premia strategies. As background, a Danish pension fund was the first to consider a portfolio of different premia around five years' ago. This pension fund used a combination of three entities to implement this: two managers with specialist alternative beta products and one bank. It was a relatively simple set of premia for this first portfolio. However, since then, investors have become more advanced in how they use premia. One bank mentioned that it has since done over 40 of these transactions with last year having as many transactions as executed in the preceding three years. Across the banks we met with, the total notional of swaps executed has exceeded over U$30 billion. Wilshire estimates bank-sponsored risk premia strategy notionals exceed U$100 billion. A consistent message from the banks were that Scandinavian and US pension funds were the more advanced users of these strategies.

Risk Premia Strategies

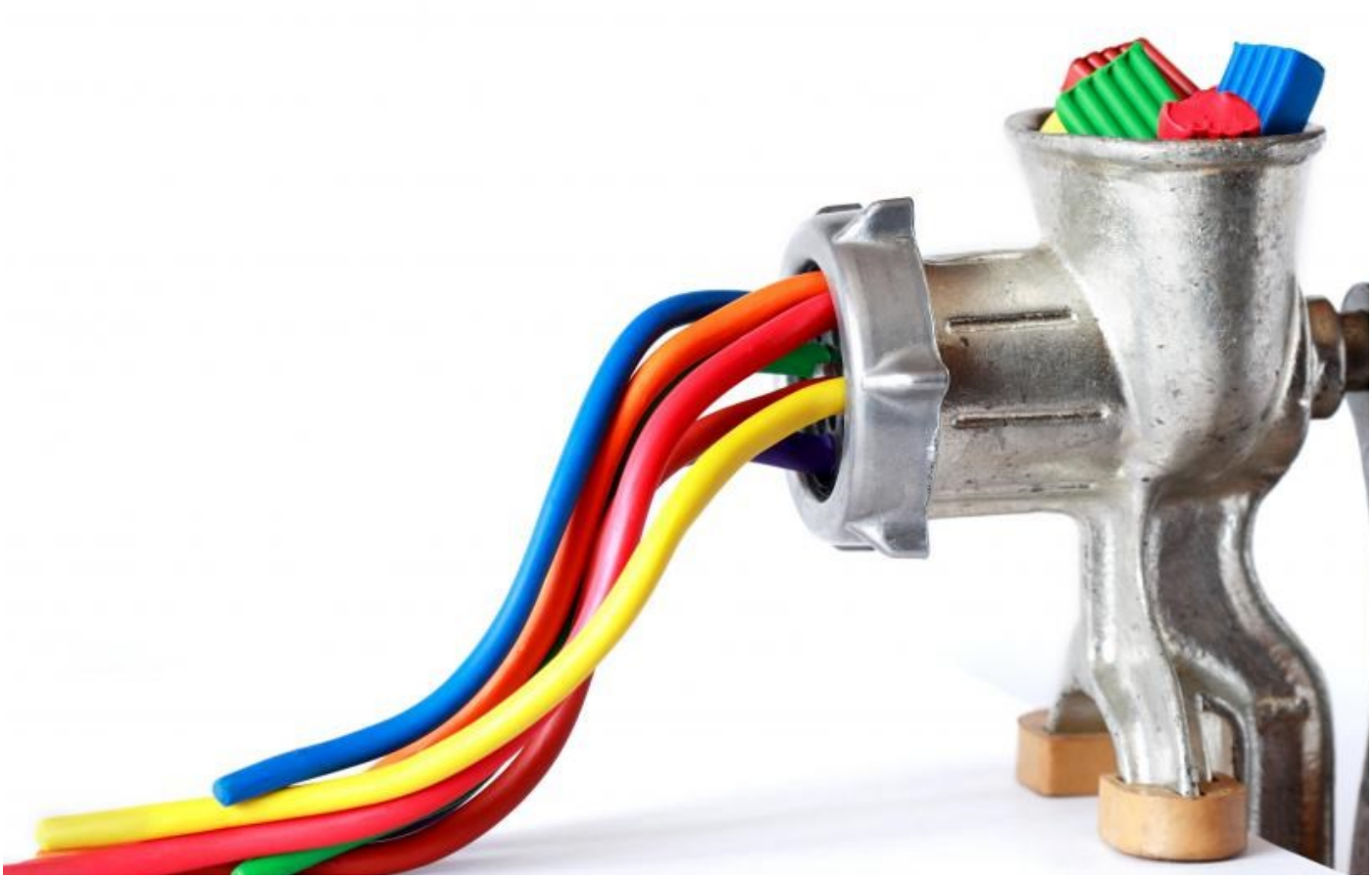
These bank-offered risk premia strategies are usually offered as an excess return swap (excess return over cash) but can also be offered as a derivative whereby the client retains an asset (e.g. an option) to source the desired return profile rather than simply being exposed to the return profile via the swap. The premia offered are standard including value, carry and trend although some other implementations are more advanced.

Pension funds have been using these swaps in the following manner:

- as a replacement or complement to hedge fund strategies;
- as a way to target specific risk exposures in a client's portfolio or to introduce a particular return driver into the portfolio;
- as an overlay to a beta in the portfolio: the overlay will be comprised of a mix of risk premia and have low correlation to the portfolio;
- as an equity replacement using short volatility strategies;
- as systematic hedging strategies: these can include actual option purchases by the client from the bank or can be accessed via a swap.

The implementation has evolved over time as users have become more familiar with how these strategies perform in different market conditions. For example, the first to implement short volatility strategies (referred to as volatility risk premia) implemented these using variance swaps. In a variance swap, a bank will pay the user a set value based on the predicted variance over a future period. The user will pay the bank the realised variance over this same period. Variance is the square of standard deviation (or volatility) and so can become very large as the volatility in the underlying market increases. These early adopters experienced unexpected losses on the swap by virtue of this mathematical construct. To ensure these users could still access the volatility risk premia, the banks changed the implementation approach to be based on offering a return profile (still offered as swap) but based on shorting of options. Some downside protection has also been introduced into the implementation whereby a bank may also include some returns from long put options into the swap to reduce losses should markets become stressed.

Interestingly, some Australian superannuation funds have done some trades with one of the banks we met. One trade included receiving the return profile based on the difference between variance swaps and a basket of over-the-counter options. According to the bank, this is quite a complex implementation.



Contrasting with alternative beta products

We have been researching alternative beta products for a number of years now. There are an increasing number of these strategies being offered by fund managers although, given its relative immaturity as an industry, there aren't many with a track record beyond three years. In general, these alternative beta products include all of the industry standard risk premia (e.g. value, carry, momentum) packaged together to create a diversified portfolio. Our preference is for managers who are smarter with the expression of a premium (e.g. momentum expressed using simple price differences versus moving average cross-overs) and also a smarter approach to combining these premia (e.g. an assumption of zero correlations between premia versus using various metrics to adjust correlations and/or allocations to premia that correlate in market stresses).

Investment bank strategies, overall, are mostly backtested and relatively new. Indeed, one manager said that these strategies need to be new because any that are relatively old will have been copied by other banks and so their competitive edge will have been reduced. This is the downside of detailed transparency. We have some sympathy for this argument although the preference is for real-world experience.

In some ways, the methodology to express a premium appears to be far more advanced than those we have observed with alternative beta fund managers. This extra complexity has pros and cons but the lack of real-world experience may reduce their appeal.

It does, however, make it possible to select a specific premium which offers the best fit for a client's portfolio (either as a risk management source or a differentiated return driver).

As an example of how these can be tailored specifically for a client's portfolio, one bank mentioned recent research into an overlay strategy which would be structured to be negatively correlated to a client's specific portfolio. The overlay portfolio's positions will change based on signals offered by some premia models with the idea to reduce the drag that usually applies to overlay portfolios whose objective is to be negatively correlated to a reference portfolio (similar to a tail risk overlay portfolio). Simulated results demonstrated appealing downside reductions but also, at times, material upside drag.

Costs

The fees charged on a swap depend on the complexity and the type of instruments being replicated to offer the desired return profile. A relatively simple swap implementation typically has a standard management fee of circa 0.5% and transaction/admin costs of circa 0.35%, likely lower for scale. The costs for alternative beta products are slightly higher than the investment bank swap although are differentiated versus a bank swap as they are designed to provide exposure to a diversified mix of risk premia constructed to meet a certain return target. There is more work to be done to better understand the cost relativities.

The last words…

The appeal of using an investment bank is the ability to select different premia-offerings thereby tailoring the mix of premia to the client's portfolio's needs. The alternative to this is to invest in an alternative beta product. Our preference for a diversified portfolio is to use a manager/product since the implementation is usually more advanced and an investor can tailor the mix of premia with a manager to suit their portfolio if required (scale permitting). Costs across the two approaches are not too dissimilar, although (and this is important) most strategies offered by banks are mostly backtested rather than having a long, realised return stream.

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