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A Commentary by Harley Bassman:

The Convexity Maven

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Value Concepts from the Credit Suisse Trading Desk
September 6, 2012

“Building a Better Volatility Mousetrap”



If you are a participant in the fixed-income markets, you only have three levers to pull to manage or gain exposure to risk: **Duration, Credit and Convexity**. Ignoring the small details of bid/offer, liquidity, mark-to-market, etc., after these three risk vectors have been removed, all one is left with is overnight cash.

Broadly speaking, Duration measures **when** you receive your money back, Credit is a measure of **if** you will receive your money back, and Convexity is all about **the path** taken to reach the date when your money may be returned.

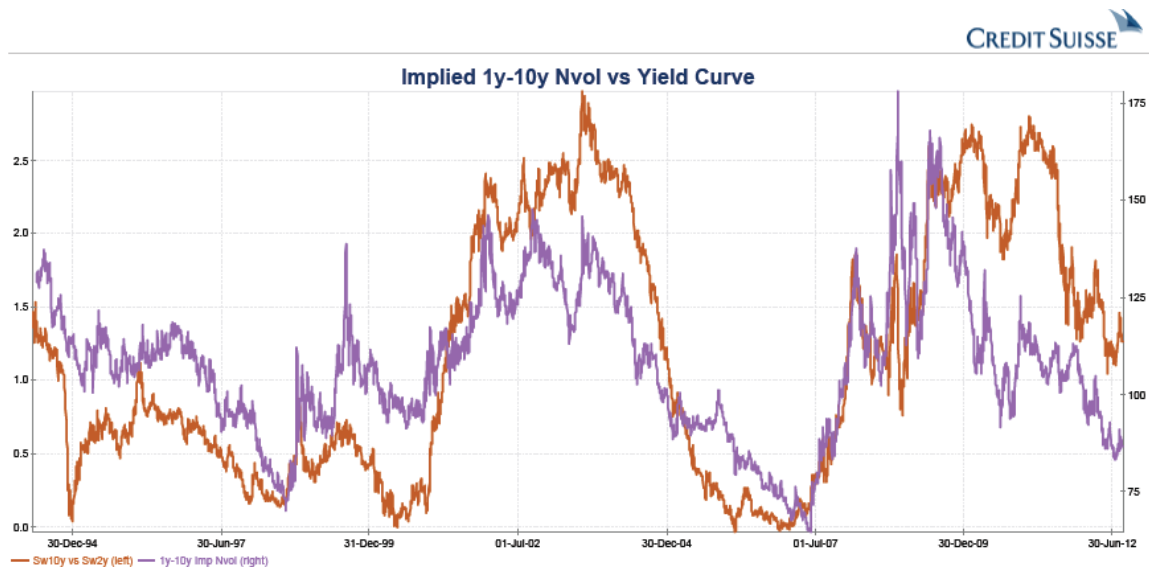
Duration is the easiest risk vector to access, usually involving a straight up buy or sell of a relatively safe security, future or forward agreement. A twist can be added to such investments (pun intended) by executing maturity switches to create Yield Curve exposure. Nonetheless, these trades tend to be rather vanilla in nature and require little management.

Trading in **Credit** risk can be a bit less direct since buying corporate bonds tends to involve taking on Duration risk. However, for those who can transact in vanilla derivatives, an asset swap via a matched-maturity forward can easily isolate the Credit component. Alternatively, those with more rope can trade Credit Index Swaps to structure a pure play on the Credit risk vector.

However, gaining pure exposure to **Convexity** can be a rather messy business. Almost by definition, Convexity is an unstable asset class since the greater the Convexity, the less linear the profile. The most direct manner to transact in Convexity is to either buy or sell an option. Unfortunately, Theta, Delta-decay and Skew conspire to overwhelm most vanilla option constructions designed to isolate Convexity and tend to absorb all profits. This is what creates the conundrum for those who desire to trade *Volatility as an Asset Class*.

Convexity: The Third Leg

The most effective portfolio manager might be the one who looks across all asset classes, breaks down each into its component risks of Duration, Credit and Convexity, and then allocates capital along such a defined efficient frontier. This is not as difficult as it might seem once one looks across the wide forest instead of the isolated trees.

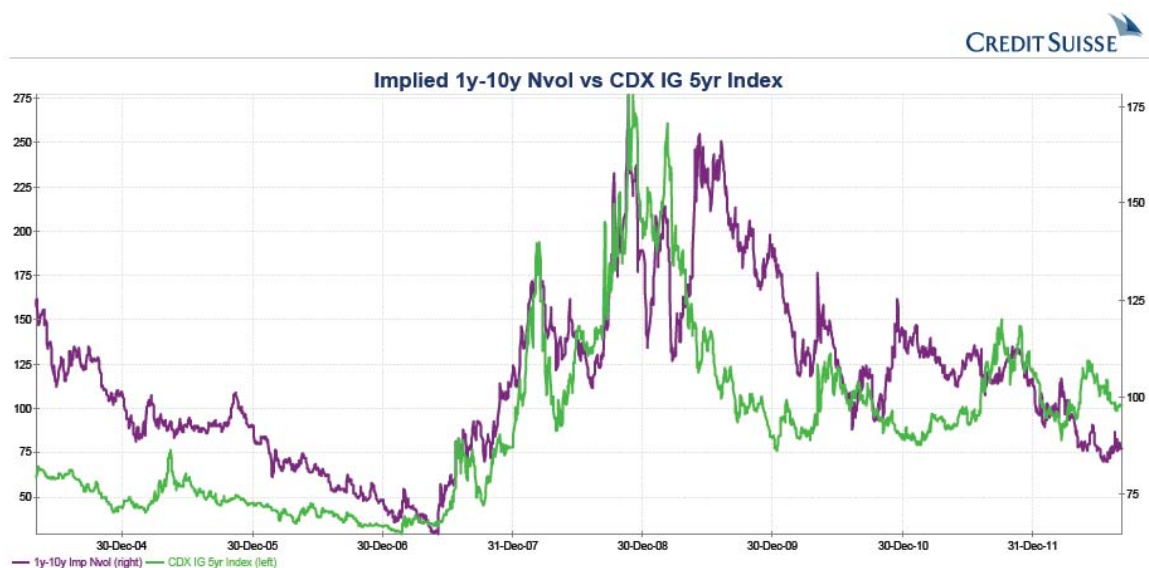


In an efficient market, funds should flow from one asset class to another as the risk/return profile shifts. As the economic future is revealed, it becomes more certain as to which investments will benefit the most. So as dominos that fall over in a line, financial risk will often rise and fall in unison.

Periods of great uncertainty tend to have sharply sloped Yield Curves, wide Credit spreads, and elevated Implied Volatilities. Similarly, in times of quiescent economics, Yield Curves are flat, Credit spreads are tight, and the cost of Convexity is minimal.

In the chart on the previous page, the **-cinnamon line-** is the shape of the Yield Curve, as represented by the Sw10yr rate minus the Sw2yr rate. The **-lilac line-** is the Implied Normal Volatility of a standard 1yr into 10yr swaption. Going back nearly twenty years, while a bit bumpy at times, these two risk vectors track each other nicely. Why you wonder? The more "shape" the Yield Curve exhibits, the greater the difference between the Spot Rate and the Forward Rate. Since the Spot Rate must converge to the Forward Rate (or vice versa), the greater the difference, the larger the uncertainty of resolution is embedded in the Yield Curve. As such, the cost of the risk (Implied Volatility) must rise (and fall) with the shape of the Yield Curve.

A well-defined financial thesis must work well across asset classes. In the chart below, the **-merlot line-** is Implied Volatility compared to the **-kiwi line-** of Credit, specifically, the benchmark CDX IG 5yr Index. While not particularly a pairing that could be weighted easily, clearly they follow each other by theme.



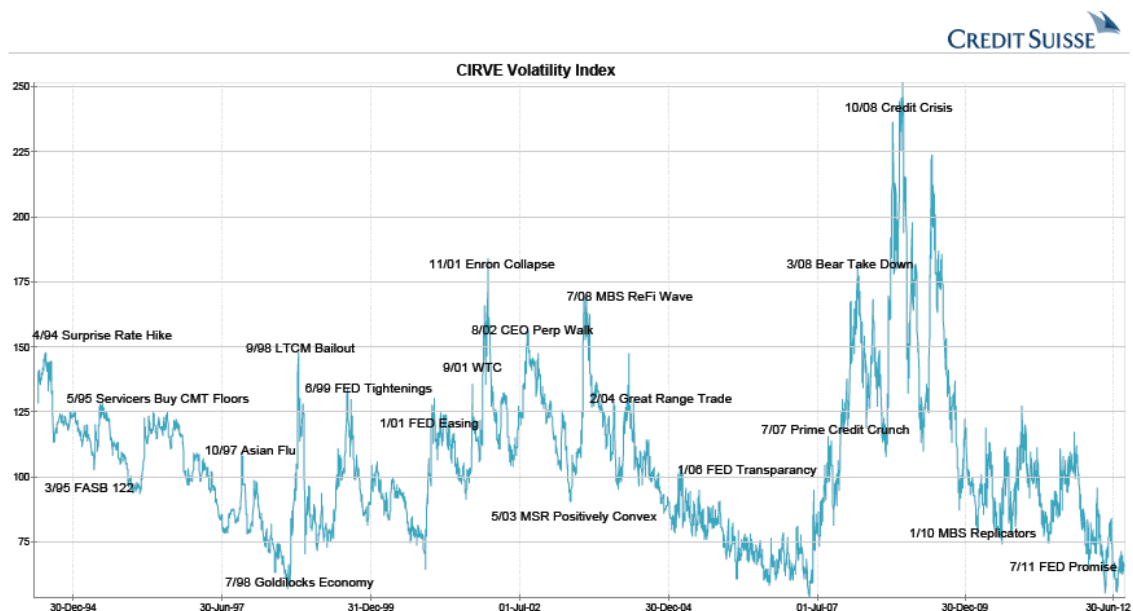
It is the longitudinal correlation for the "price of risk" that feeds demand for products that will allow for investing in *Volatility as an Asset Class*.

Financial Engineering

It was an unfortunate series of events that led a senior Master of the Universe to suggest that we do “G-d’s work” here on Wall Street. We do not. The fact that we neither grow food nor build cars has always made “bring daddy to school day” a bit of a challenge. People with well-manicured hands rarely draw sympathy.

These small facts notwithstanding, Wall Street does perform a vital function to society: We act as the transmission system for Capital and Financial risk.

In the chart below, the [-turquoise line-](#) is the Credit Suisse Implied Volatility Estimate, found on Bloomberg as the CIRVE. Think of it as the VIX for bonds.



For as long as we have been trading options, investors have clamored for a manner to buy or sell pure Volatility in anticipation of changing financial conditions. This was a vexing problem for many years.

The notion of buying (or selling) the level of Volatility for some future time is extraordinarily difficult if you can only transact in vanilla instruments. This is because fixed-strike options are incredibly unstable (convex). One might think it would be easy to buy exposure to six-month expiry Volatility six months in the future. Why not just buy a one-year straddle and sell a six-month straddle?

In both the Rate and Credit vectors, one can capture most of the forward risk exposure with similar two point trades. The difference in Convexity space is that all of those pesky “greeks” (delta, gamma, vega, etc.) change at different rates

over time and location. As such, not only do vanilla “calendar spreads” require significant management over time, it is quite likely that one can be completely correct in his investment premise yet lose money.

Let’s explore a simple (imaginary) example. In late June, investors began to consider how the rollout of the K-Phone 5 would impact Kumquat Inc. If an investor thought that a September introduction might lead to increased Volatility in Kumquat stock around that time, he might be interested in buying three-month straddles three months forward. So if Kumquat stock was at 550 in June, he could sell the September 550 straddle for 66 points versus a purchase of the December 550 straddle at 94 points, a 28 point spread. This calculates to a flat IVol of 30%. Seemingly, he would own the three-month straddle three months forward at 28 points, a terrific purchase. But consider the result if Kumquat stock quickly runs up to 675 by the third week of September. The Sep straddle would be worth the intrinsic value of 125 while the Dec straddle would mark at 132 (30% IVol) for a spread of 7 points (yikes). Even if our speculator was correct and Implied Volatility rose by 20%, the Dec options would value at 139, a spread of only 14 points, half of his investment cost.

The problem is that 3-month options have a different Convexity (gamma) profile than 6-month options. Active and aggressive “Delta trading” would be required to capture the 20% increase in Volatility, a dirty job that few outside of option market makers care to endeavor.

To investor hosannas, financial engineers have solved this problem.

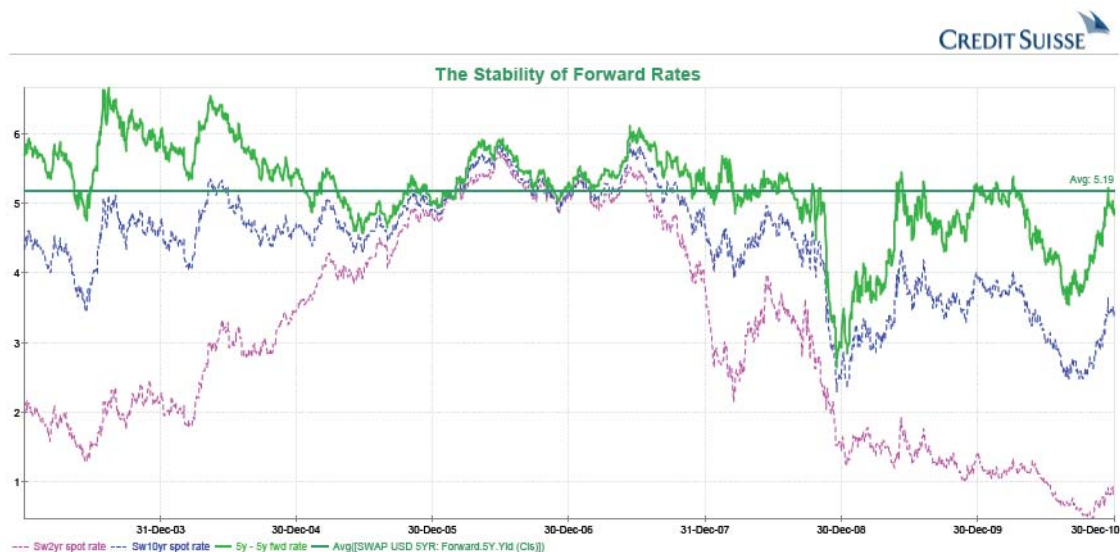
In both the Equity and Rate markets, investors can buy or sell Pure Forward Volatility. Specifically, one can lock in the economics of what will be an at-the-money straddle at some fixed time in the future. In the Equity market, cash settled future contracts trade on the exchange for the VIX Index. These futures allow one to trade the benchmark VIX index of one-month Implied S&P 500 Volatility up to nine months forward. In the Debt market, investors can transact in fixed-price Forward Volatility Agreements (FVA) linked to a wide variety of expiry/tenor straddles that “look” one-month to ten-years forward.

The simple and tidy FVA is specified by a single page ISDA confirm. On the trade date, an investor agrees to buy or sell what will become an ATM straddle for an agreed upon price on the “look” date. On that “look” date, the ATM strike is set at regular 11:00am fixing time and a standard option ticket is written for the agreed upon premium. (Cash settlement is also available.) That’s it, no tricks. There is no delta, gamma, or theta to manage; this is a clean execution that offers pure exposure to the at-the-money cost of Convexity. **This is the only manner that one can trade pure Volatility without the uncertainty, stress and time that active management requires.**

Understanding Forwards

To repeat ad nauseam, Forward prices/rates are NOT the market's best guess of the future; rather it is merely the present value of the Spot risk surface discounted to some future date. That said, the Spot risk vector often tends to rotate in a manner that produces a Forward level that seems like it may be the result of a consensus vote.

Below, the **rose line** is the Spot Sw2yr rate while the **steel blue line** is the Spot Sw10yr rate. Notice that while these two rates vibrated wildly for the better part of the last decade, the **avocado line** of the five year forward Sw5yr rate oscillated in a rather narrow band. Like the 5yr-5yr rate, certain risk vectors tend to exhibit the phenomenon of forward stability; this leads many to conclude that a "regression towards the mean" exists for some risk vectors.



History does indicate that the VIX has a long-term mean of about 21ish. Similarly, the CIRVE rotates around 104ish. In contrast, there is no long-term mean for the S&P 500 Index. Somewhere in between lies the concept of whether there is a long-term level for US interest rates. Referring to the chart above, until the FED dropped the hammer of Financial Repression on the market (omitted for clarity), distant forward rates seemed to rotate around the 5% level. The Yield Curve would steepen and flatten in such a manner that the forward rate remained relatively stable. It is this underlying dynamic frustrates the execution of many great trade notions.

Ordinarily, the Spot risk curve slopes in the direction of the long-term mean. As such, Forward prices already reflect the "key value proposition". To truly profit, one must identify risk vectors that point the "wrong way" in Forward space.

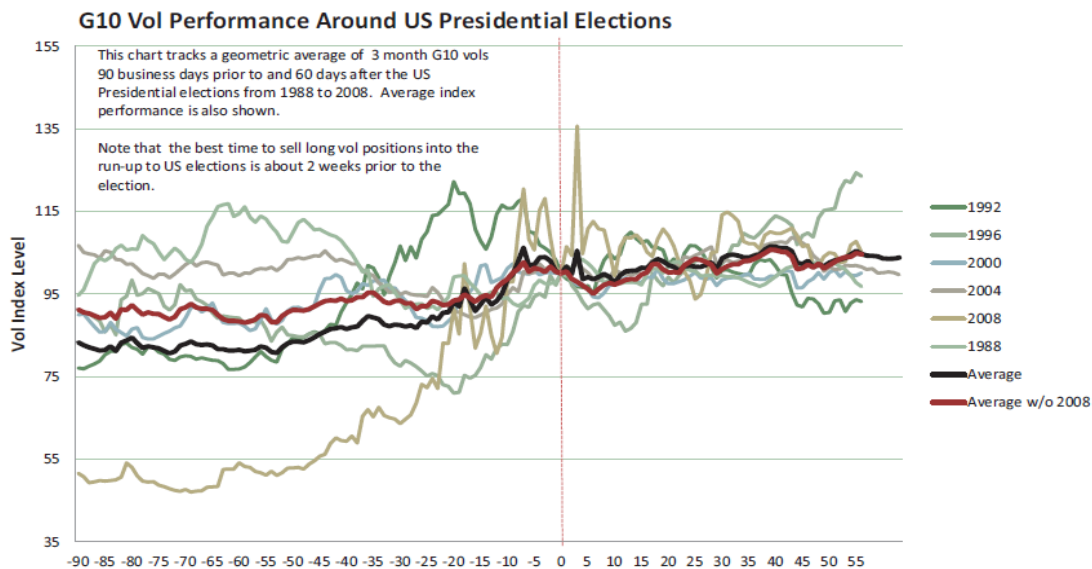
An Opportunity in Forward Volatility

The wonderful chart below shows how Implied Volatility on the G-10 currencies rises about 15% from late August to late October in General US election years. A similar phenomenon has occurred in the USD Rates market where exchange Volatility has risen by 20% to 30% in similar periods. Amazingly, before the George Bush (the elder) vs. Bill Clinton showdown in 1992, the CIRVE Index rose by 60% from late July to late October.

While it is generally ill-advised to bring up the topics of religion or politics in polite company, I will venture into that realm to highlight a point. Elections tend to have a key focal point that speaks to their times. For better or worse, the selection of Sarah Palin stoked the "Culture Wars" (see Pat Buchanan's 1992 convention speech) and raised social issues as the critical fulcrum. Without taking a stand, I am fairly sure that gun control is neither bullish nor bearish for Interest Rates. In contrast, the selection of Paul Ryan most certainly makes economics the critical focus for the election of 2012.

The path of Government fiscal policy will vary greatly depending upon whether we re-elect President Obama or change to Mr. Romney. As such, Equity and Rate values can ricochet wildly before and just after the election. The early 1990s US recession was the frame for the 1992 election. Uncertain forward economics is what drove the *olive line* up 60% into the election. The 2012 election has all the economic ingredients produce a repeat performance.

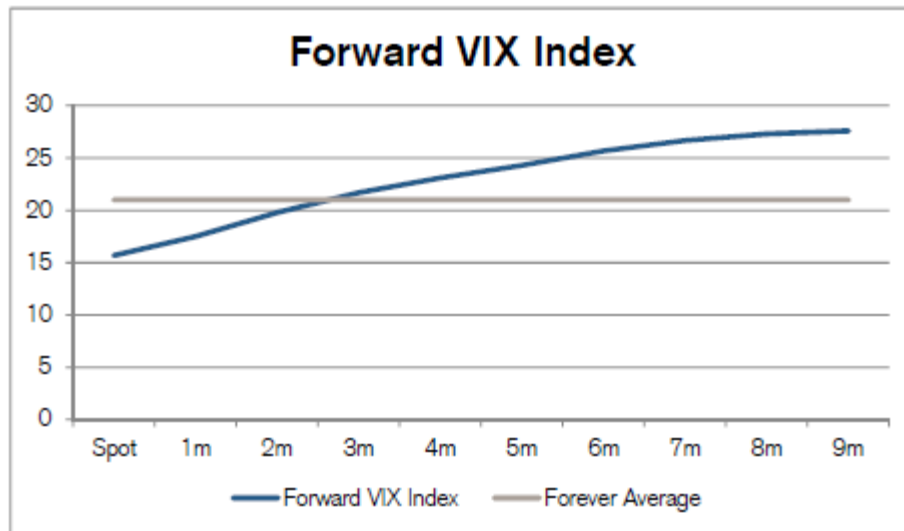
What about the US elections in November?



VIX Forward Volatility: Too Late to Profit ??

Both the DOW and the S&P are at post-Financial Crisis highs. In fact, they are only about 10% away from their all-time peaks. That said, with P/E's of 13ish and 14ish respectively, one could argue they are still cheap. We seem to be at an inflection point that this election may resolve. Too bad traders of the VIX have already figured this out.

For the month of August, the Spot VIX averaged 15.7, well below its long-term average of 21ish, the -grey line- below. The -navy line- is the price of the VIX Index from one-month to nine-months forward. Specifically, one could trade the VIX three months forward VIX at 21.7, about 38% above Spot. Similarly, the six month Forward VIX sports a 63% premium to Spot at 25.7.



Source: Credit Suisse

Theoretically, I like the notion of buying the 3-month VIX at only a 4% premium to its long-term average. But the 38% premium to Spot may likely absorb the entire projected increase. Moreover, since the VIX is highly directional, a stock market rally will leave the VIX well under 21, no matter who wins.

So while there may be no easy outright trade, there is a terrific relative value opportunity for Equity propeller heads. As noted, Spot risk vectors should shape to project Forwards toward the long-term average. In the chart, forward prices rise to and then exceed the long-term average. This seems excessive - the Forward slope is too steep. If I were an Equity trader, I would buy the 3-month forward VIX and sell the 6-month forward VIX (or some other similar package). If the election is a bust, the Forward VIX will decline sharply. If actual Volatility explodes, the Spot VIX will jump up quickly, flattening the Term surface and leading to a compression of Forward Volatility.

Rates Forward Volatility: A Full Menu

A Trade for "Hot Money"

Let us tell you how this game is going to play out. No matter what the reality, the professional punditry will blithely yammer away about how this election will be tightest and most important ever; after all, a blowout does not sell any newspapers. Just after Columbus day (October 8), every risk manager on the planet is going to wake up one morning in a cold sweat wondering how this year's bonus (such as it is) may evaporate if the "other guy wins". He will dial up his buddy on the CBOT and wave in a few thousand straddles, "just in case". Hot money hedgers will not buy Vega, they will buy Gamma, just enough to tide them over the election. As such, while all Implied Volatilities will increase, Volatility on short-dated options will rise the most.



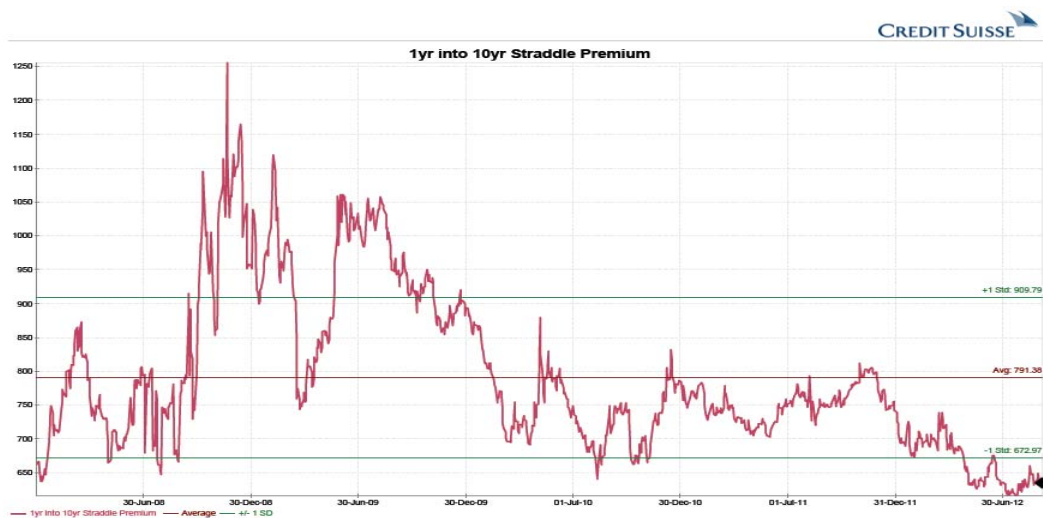
The Trade: *Buy three-month into 10yr straddles, two months forward.*

The "look date" is the end of October, just before the election. [That is the high point on the election chart on page 7.] On that date, you will buy a three-month option (expiry in late February 2013) struck "at-the-money" at the regular 11:00am fixing time. Prices can vary, but we have been trading this structure recently near 320bps. That is only 8% above Spot and more than one standard deviation below the **-orange line-** average 3m-10y straddle price since January 2010. Cash settle or take deliver and trade the gamma into the election result.

A Trade for those with Core Exposure to Rising Volatility.....

While swift profits from a short-lived pop in Volatility may feel good, Mortgage Servicers, Credit Hedge funds, and REITs need to consider structures with not only a longer fuse, but also more bang for the buck. These clients tend to shy away from “dirty” gamma trades that are heavy in time decay and delta management and instead focus upon “belly volatility” with expiries of one to three-years.

Here one will find what may be our “best idea” as it is where the FED’s clammy palm of Financial Repression has distorted the Volatility Surface the most.



The Trade: *Buy one-year into 10yr straddles, six months forward.*

While prices may vary, with the Spot 1yr into 10yr at 637bps, you could recently buy what will be an at-the-money straddle six months forward at 660bps. That 23bps difference is only 3.6% above Spot.

Clients buy “belly Volatility” for a few simple reasons:

- 1) One to two-year expiries have convexity, but decay rather slowly;
- 2) This part of the Volatility Surface tracks “market stress” rather well;
- 3) Liquid and transparent, easy to model on Bloomberg;
- 4) None of the funny technicals that dominate ten-year options;
- 5) Ultra low management, buy it and put it away.

One-year into ten-year straddles are trading near 637bps. That is near the ~~burgundy line's~~ four year low. The issue is that the FED still has a firm grip on the Rates market, so buying options outright can be expensive as the theta clock

ticks. Nonetheless, once the economy starts to gain some traction, both Volatility and Rates will rise swiftly.

So compare this Forward Volatility idea to buying an 18-month straddle at 772bps. Over six months, this straddle will “roll down” decay by 120bps as it slides into becoming a 1yr option. This is nearly 100bps more than the price of FVA. The 18m vanilla option is superior to the FVA only if you believe that rates can move a lot in the next six months; but if that were the case, you should buy three-month gamma options instead. The FVA allows one to buy a lot of Vega exposure near the all-time lows at a small premium with NO management.

A Trade for those who Specialize in Volatility Management.....

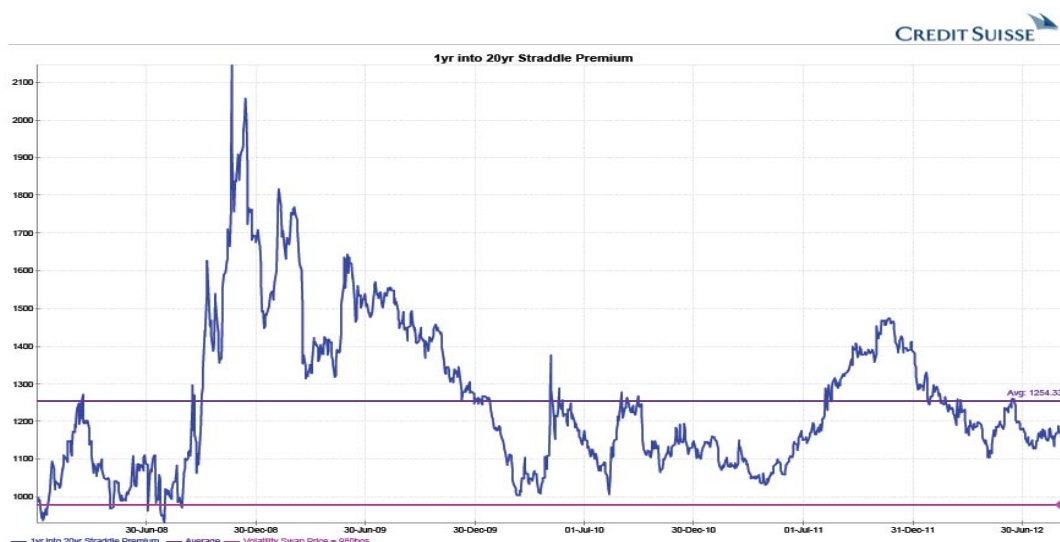
The Insurance industry is the ultimate “risk manager”. They both buy and sell risk on a massive scale. As such, a single “trade” cannot cover their needs.

The Trade: *Buy five-year Volatility Swap based upon the 1yr into 20yr Straddle.*

Credit Suisse agrees to sell the client a series of ten 1yr into 20yr at-the-money straddles at a fixed price. Every six months for the next five years, the client can either take delivery or cash settle. If the former, the strike is set as usual at the 11:00am fixing. If the latter, payments are netted versus the mid-market price.

As of this writing, the Spot price for a 1yr-20yr straddle is 1165bps. Presently, via the CS Volatility Swap, you can purchase a series of ten ATM straddles for the fixed price of 980bps each, fully 16% below the blue line- Spot price.

This is NOT magic, it purely a function of a downward sloping Volatility Surface. This is the most powerful manner to buy Pure Volatility with no management.



A Synthesis of Observations

Implied Interest Rate Volatility is at extremely low levels for a reason: *The FED is fully implementing Financial Repression*. All I can say is – “This too will pass.” What is not clear is why the Volatility Surface is shaped in such a manner that one can buy Forward Volatility at such a small premium to this low Spot level.

The VIX has clearly been given the “heads up” that while risk may be low today, it can be quite uncertain in the future. Nonetheless, there must be some sort of disconnect when the six month forward VIX is 63% above Spot while the six-month forward 1y-10y straddle has a risk premium of only 3.6%.

Forward Volatility Agreements offer a feature that is poorly appreciated. Since the trade converts into a vanilla ATM option on the “look date”, not only is one long maximum vega at that point, but the option strikes at-the-money. **Effectively you own the skew for free.** Dealers have an ace in the hole when they are short vanilla options and the markets gap violently; their vega risk goes away as those options convert into 100% delta pure forward starting swaps. No such luck when short an FVA. When the market gaps, Volatility soon explodes, and you are short what will become an at-the-money option. Take it from a career options market maker, this situation is like Groundhog Day in Hell.

Tying it all together:

- 1) Equity market traders are terrified of a double dip and want a some sort of hedge that does not have an overt negative carry component;
- 2) The FED is heavily repressing Interest Rates, not Equity prices;
- 3) The Rates market has completely capitulated to the FED;
- 4) In a true “Japan Scenario”, Rate options would decline by 30% to 40%;
- 5) The GSE's are gone and the FED does NOT hedge;
- 6) The FVA product is a new concept to all but the inner circle of propeller heads; this will change over time as it is the only way to buy pure Vega.

The FVA may be the best Volatility product ever as it solves the Volatility as an Asset Class problem. A flat Vol surface at the lows is the wrong price: Buy FVA's.

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Credit Suisse US Rates Trading
September 6, 2012



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