Professional Javelin Catching: This is the BOTTOM of Vega

The "Rates Traders" retirement village is certainly filled with those who have tried to call the **bottom of volatility** over the past few years. As highlighted by our first chart below, there have been quite a few locations that seemed to be great "buy opportunities". These brilliant purchases soon ended in tears as Implied Volatility sliced through perceived support to ever-lower levels. In the next few pages, we are going to lay out our case that the market for volatility has finally reached the bottom and that strategic purchases are warranted. We will be using 3y-10y for our analysis. It is both liquid and transparent. Moreover, it is also the largest "Vega Bucket" for the MBS market. However, we also like 3y-5y, 5y-5y and 5y-10y. As such, they are also strong candidates for purchase and maybe a portfolio of these four is the best idea.

Current Market levels:

3y- 5y: 393bp;   76.1 Nvol
3y-10y: 666bp;   73.0 Nvol
5y- 5y: 459bp;   76.4 Nvol
5y-10y: 771bp;   72.7 Nvol

Below is the Implied Normalized Volatility (Nvol) for 3 year into 10 year Swaptions. Its closing price recently reached 71.6 Nvol (4.5bp/day) which matched the all-time low last recorded in August 1998. You might recall that this was just after the Asian currency crisis and just before the Russians defaulted on their debt. This was contemporaneous with the collapse of the LTCM hedge fund. This by itself is certainly no reason to buy volatility, but in combination with other factors that we will soon highlight, it is certainly a fine place to start.

Comments:
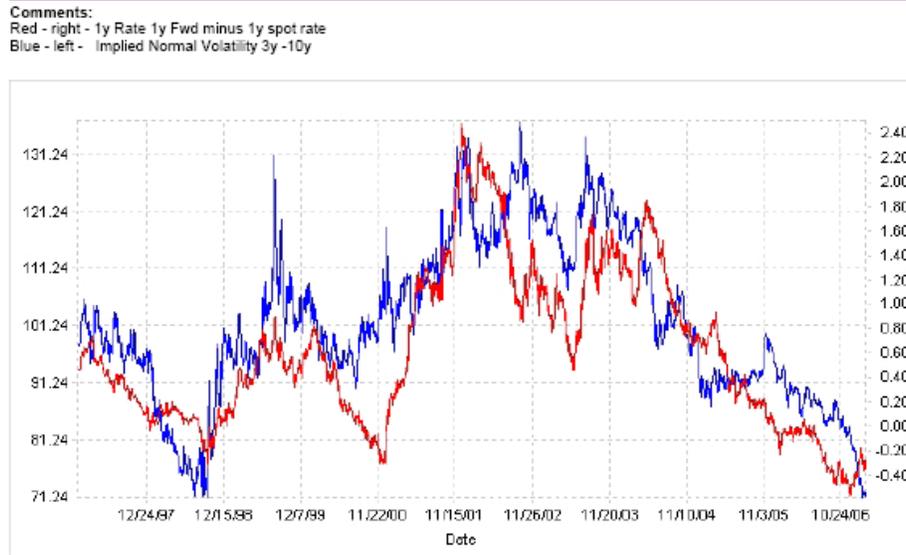Blue - Implied Normal Volatility for 3y - 10y

A lengthy examination of Volatility finds a strong correlation to the other main risk vectors: Duration and Credit. Whether Volatility is the cause or effect, I will leave to the econometricians.   Nevertheless, Volatility has reached its record lows at precisely the same time that all its contributing risk vectors have reached their apogee or nadir.

Every MBA knows that one can construct a credit bond as a series of options. As such, there should be some sort of grand correlation of Credit Spreads to Volatility. The chart below shows the net yield spread of Investment Grade and High Yield indices over the Treasury market. In broad strokes, you can see that the peaks and troughs of Credit Spreads match those of Volatility.
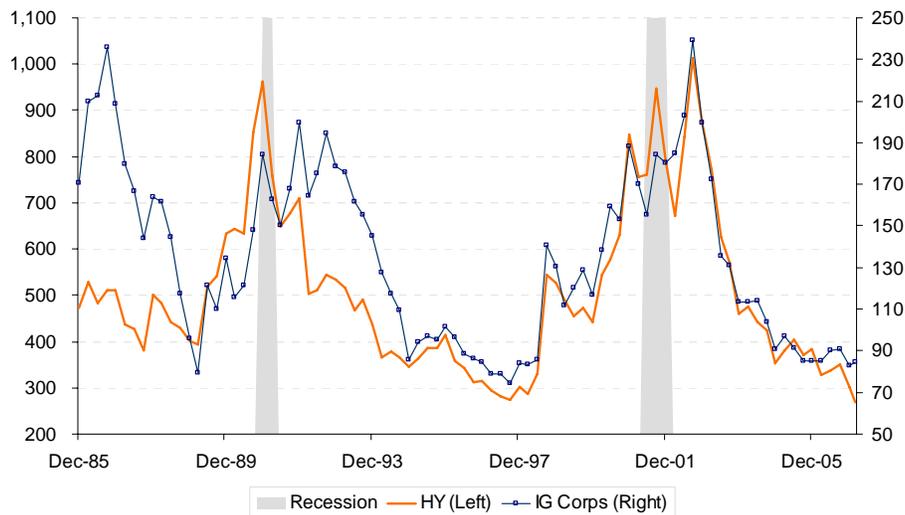
There is also an extraordinarily tight correlation of Volatility to the shape of the yield curve. Our favorite -the Red Line- measures the difference between the 1year swap rate one year forward and the spot 1year rate. The Blue line- is the Nvol of 3y-10y.

Comments:
Red - right - 1y Rate 1y Fwd minus 1y spot rate
Blue - left - Implied Normal Volatility 3y -10y

Some of you may comment that using the slope of the front-end of the swaps curve is not apples-to-apples since we are analyzing the volatility of long-dated expiries on long-dated tails. The chart below shows -the Red line- of the 10year swap rate five years forward versus the spot 10yr rate. The Blue line- once again is the Nvol of 3y-10y.

Comments:
Red - right - 10y rate 5y Fwd minus 10yr spot rate
Blue - left - Implied Normal Volatility 3y -10y

A third risk vector is Correlation within the yield curve. When stability abounds with the FED on hold, all rates tend to move synchronously. However, as the FED becomes active, or as concern of event risk increases, this correlation breaks down. As noted by -the Blue line- which is the realized correlation of the 2yr swap rate versus the 10yr swap rate, correlations are nearing the all-time highs. You may also note that, in broad strokes, Volatility tracks Correlation.
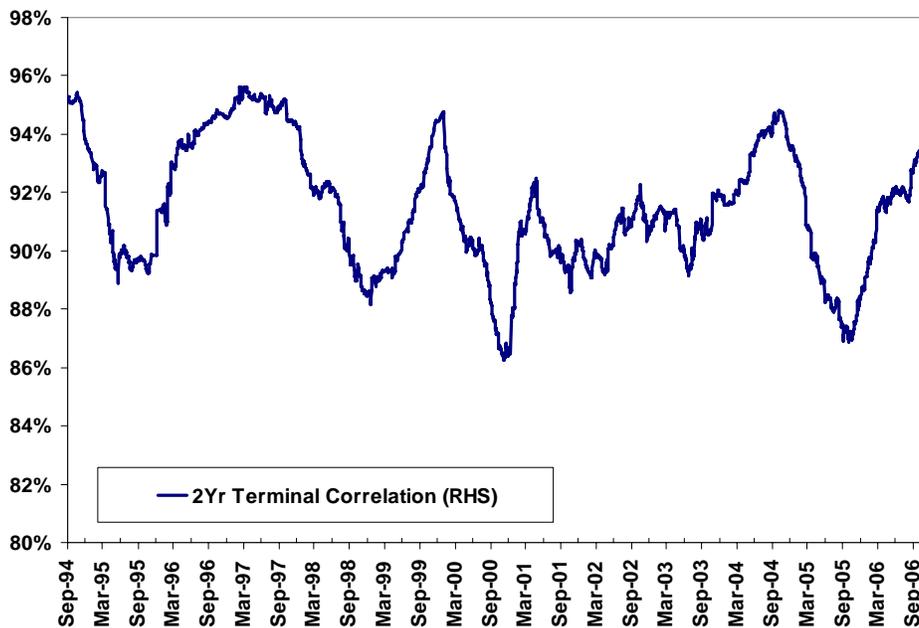
Many of you have heard my lengthy diatribes about how the key driver of Implied Volatility is Realized Volatility. As highlighted in the chart below, this relationship held up fairly well until early 2005. The divergence started soon after the enactment of FASB 156, which affected how MBS Servicers accounted for their hedges. We propose that the massive buying that accompanied this accounting change richened "belly volatility" relative to other expiries and tenors. [We define "belly volatility" to be 2yr to 5yr expiries on 5yr to 10y tails.] It took over a year for the MBS Servicers to optimize their hedges to the new accounting rules, but once complete, the belly volatility Implied versus Actual ratio began normalizing. In the charts below, the Blue line is 3y-10y Implied Nvol, the Red line is 6m Actual 3y-10y Nvol, and the Green line is the ratio of Implied divided by Actual.

Comments:
Blue - right - Implied Normal Vol 3y - 10y
Red - right - 6 month delivered vol 3y -10y
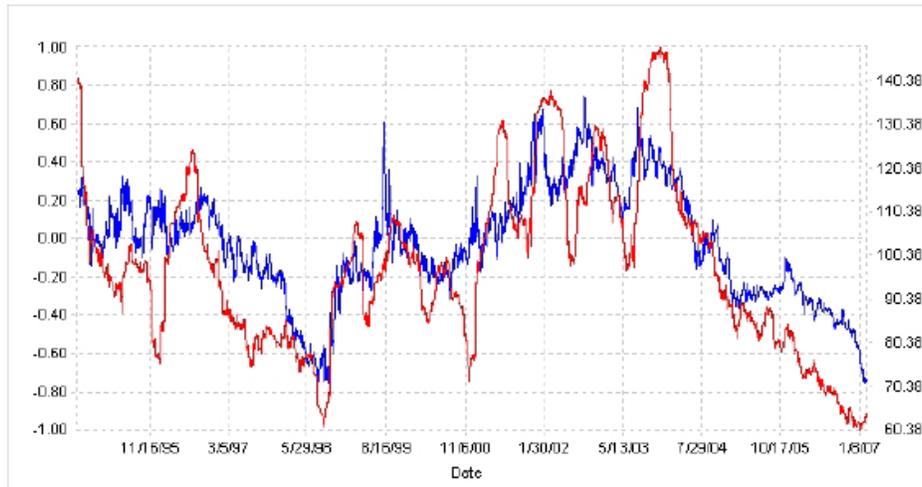
Comments:
Green - right - Ratio of Implied Vol to Delivered Vol for 3y -10y
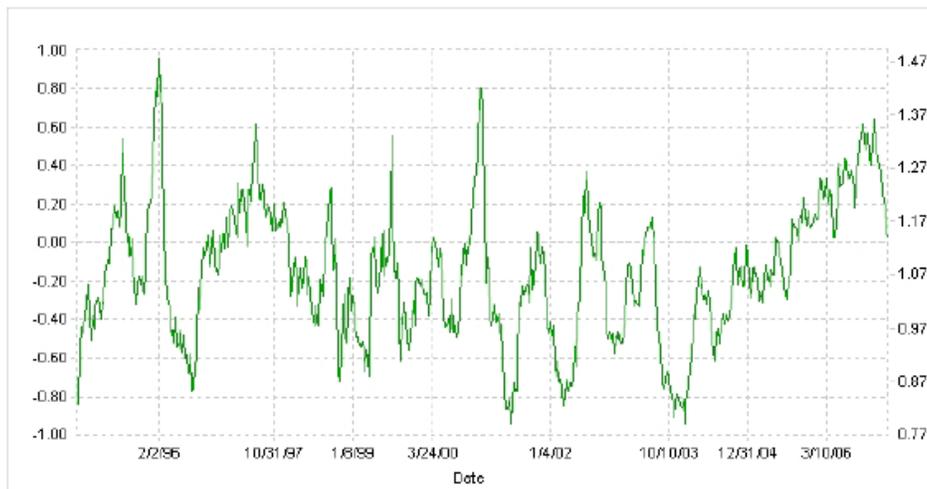
A popular notion in financial markets is called "Regression Towards the Mean" (RTM). Some uses of this concept are valuable for modeling and contingent claims analysis, others, such as how many times a coin can come up heads without a tails, will lead to gamblers ruin. The yield curve tends to exhibit RTM. One tends to see spot short-rates pivot around long-dated forward rates. Thusly, the curve inverts when rates are above this perceived "fair value" rate and steepens when rates fall below. This concept appears in the Volatility markets also. Short-dated Volatility dips below long-dated Volatility when the entire surface declines below the perceived terminal fair value level. Similarly, short-dates leap over long-dates when Volatility is above this fair value level. The chart below shows -the Purple line- as the difference of 3yr-10yr minus 3m-10y. Recently, this difference has decreased from 21Nvol to 7Nvol. What is anomalous is that this has occurred in a declining Volatility environment.
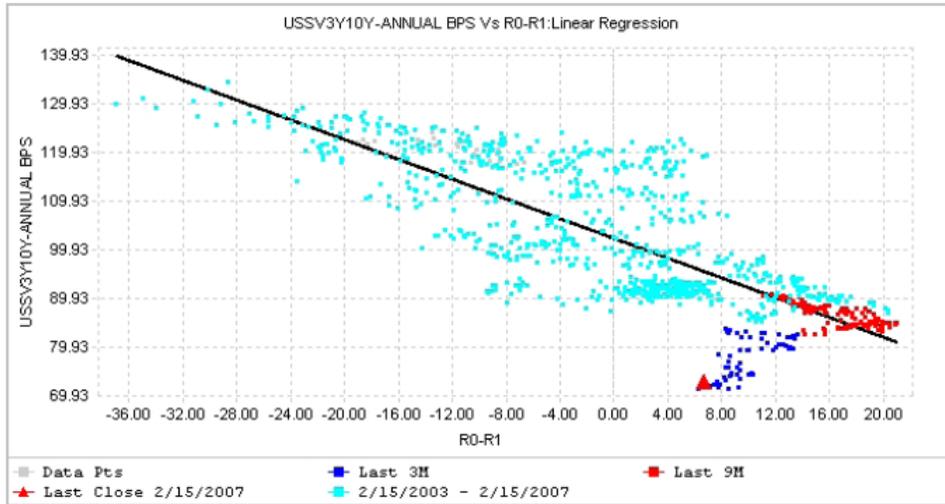
Comments:
Purple - right - Difference: 3y-10y minus 3m-10y
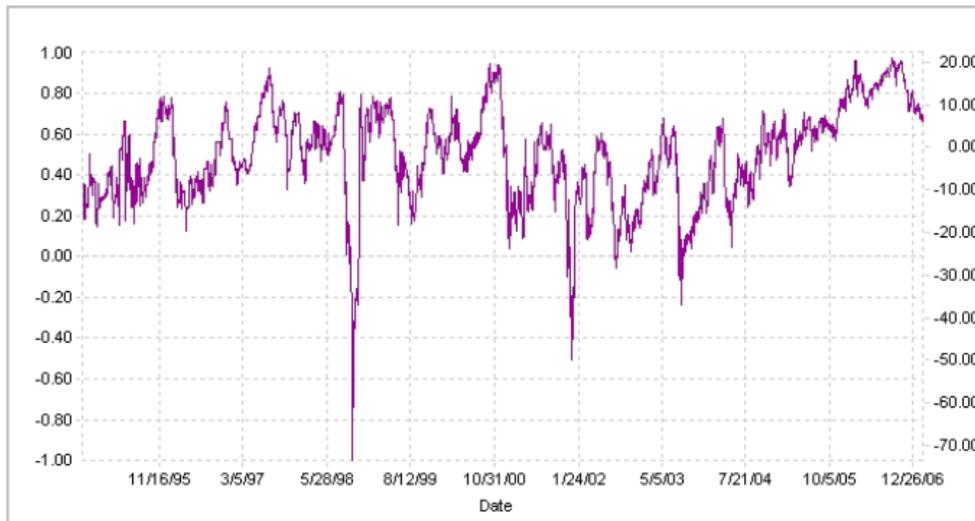
Our next charts highlight how strange this is. Below is a regression of the above-cited difference of 3y-10y minus 3m-10y versus the absolute level of 3y-10y Nvol. Although the R^2 is not stellar, it is certainly clear that this difference is excessively low versus the level of Volatility. The Blue dots are the data points for the past three months, the Red dots are for the past nine months, and the Turquoise dots are for the past three years. The next chart is a rich/cheap analysis using the associated regression data.

Comments:
Regression of Implied Normal Vol of 3y-10y vs Slope of Vol Surface (3y-10y minus 3m-10y)

Comments:
Rich/Cheap of Regression Above
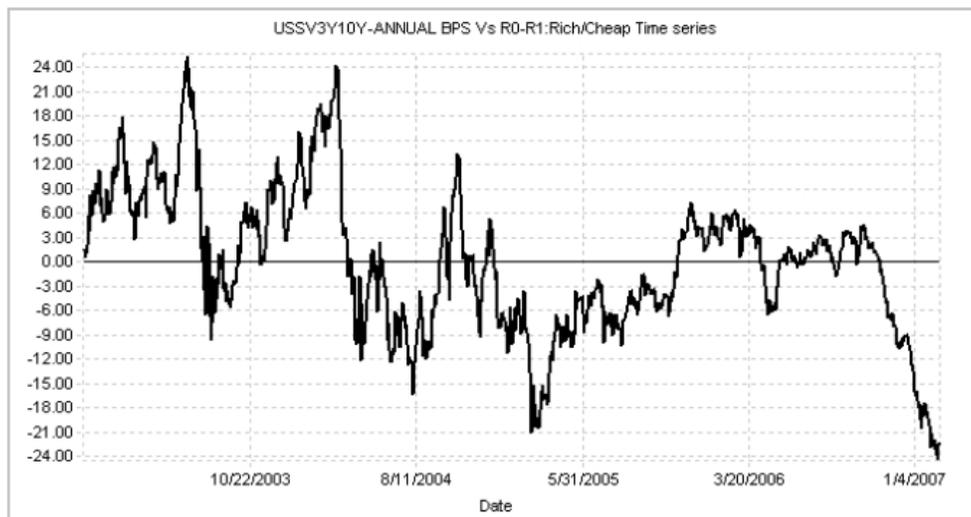
The Grand Summary:

We submit to you that the shape of the yield curve, the level of Credit Spreads, the Correlation of various points on the yield curve and the level of Implied Volatility should all move in tandem since the RISK PREMIUM embedded in the Duration, Credit, and Convexity risk vectors should correlate in some grand manner. *A simpler explanation may be that the "NET CARRY" across risk categories should equilibrate as "alpha seekers" allocate capital across various risky assets in search of excess return.*

In the various charts above, we show how Volatility has declined to record lows just in time to join a pancake flat yield curve and all-time tight Credit Spreads. <u>Since the absolute Curve cannot become less than zero, Correlations cannot rise above 100% and Credit Spreads should not invert through Treasuries (please spare me a discussion of IEM debt), we are nearing the limits of how much more these risk vectors can press volatility lower.</u> Once we have determined that volatility is "fair value" to these risk vectors, then volatility has only one way to go: UP !!! That does not mean it will rise tomorrow, nor does it mean that actual volatility will offset time decay; but it does imply a floor with unbalanced leverage to higher prices.

The Curve has been flat, Credit has been tight, and Correlations have been high for quite awhile; so why are we suddenly so brave as to <u>call the bottom</u> ??

1) The ratio of Implied to Actuals is finally nearing the long-term average of 107%. (This is "risk adjusted" fair value that compensates for the limited gain/unlimited loss nature of short convexity.)
2) The volatility surface, as measured by 3yr-10y to 3m-10y has flattened significantly.
3) The historical timing of a FED pause between rate cycles is nearing maturity.
4) The MBS market has NOT been able to sustain OAS gains as volatility has declined.
5) Volatility rises seasonally during the second quarter.

All of these factors in concert lead us to believe that current Implied Volatility levels properly reflect current conditions in the related risk vectors. **And if all of these risk vectors are near their theoretical lower bound limits, then volatility can only rise from here since the risk vectors can only rise.** To reiterate, this does not mean volatility will rise soon, nor does it imply that volatility cannot dip marginally lower. Finally, it does not mean your purchases will exceed your theta. (I have already told you that 107% is fair value.) What we are saying is that purchases of longer-dated Volatility are substantially biased in your favor if your holding period is at least six months.

Recommended Trades:

1) Outright purchase of 3y-10y, 5y-10y, 3y-5y or 5y-5y

2) Purchase of any of the above combined with a gamma weighted sale of 3m-10y, 6m-10y, 3m-5y or 6m-5y

3) Purchase any of the above six months forward

4) Purchase a ML Structure Note Volatility Bond. (described in additional publication)

ML US Rates Strategy
February 16, 2007