



## **Building a Superior Volatility Mousetrap**

Our most recent editions of RateLab have described why we believe the overall level of Implied Volatility has bottomed (February 16, 2007) and an interesting manner to invest in Volatility as an Asset Class via Volatility Bonds (March 15, 2007). To remind you, Merrill Lynch Volatility Bonds allow you to invest in Volatility without having to manage Delta, Gamma, Theta or Skew. These Bonds have a coupon linked to the Realized Volatility of any point on the Yield Curve or between any two points on the Yield Curve (i.e., Slope of the Curve). Moreover, these Bonds can be sold before maturity to capture a mark-to-market profit generated by higher Implied Volatility.

*Some customers indicated a desire for an even purer investment in Implied Volatility as an Asset Class; one that had no payout linked to Realized Volatility and only returned value based upon transparent market-based Implied Volatility.*

Ask and ye shall receive.....

We are pleased to introduce the ML Implied Volatility Swap or Structured Bond.

The Volatility Swap/Bond creates a purer investment in Volatility as an Asset Class with absolutely no Delta, Gamma, Theta or Skew management. Moreover, there is no reliance on Realized Volatility to create a profit. If the price of an ATM straddle on your chosen tenor/tail increases for any reason, your coupon increases and the mark-to-market value will rise. This is the ideal product for a potentially quiet summer where the market bides its time waiting for the FED to make its next move yet Implied Volatility rises in anticipation. This is the perfect product for MBS Servicers, Banks, Insurance Cos., Emerging Markets investors and others who may who have significant adverse exposure to an increase in Implied Volatility. Finally, although ML absolutely cannot provide accounting advice, we believe this product in Bond form, slightly modified, may qualify for AFS accounting.

## The Trade:

This product could not be more simple or transparent. Although any final maturity and tail/tenor combination can be created, for this RateLab discussion, we will examine a ten-year non-callable Swap/Bond based upon a 5year into 5year swaption.

Recently, an at-the-money spot starting 5yr-5yr swaption straddle closed at 481bps or an Implied Volatility of roughly 80 NVol. At that time, we would have "Fixed" a ten-year non-callable Volatility Swap at 477bps.

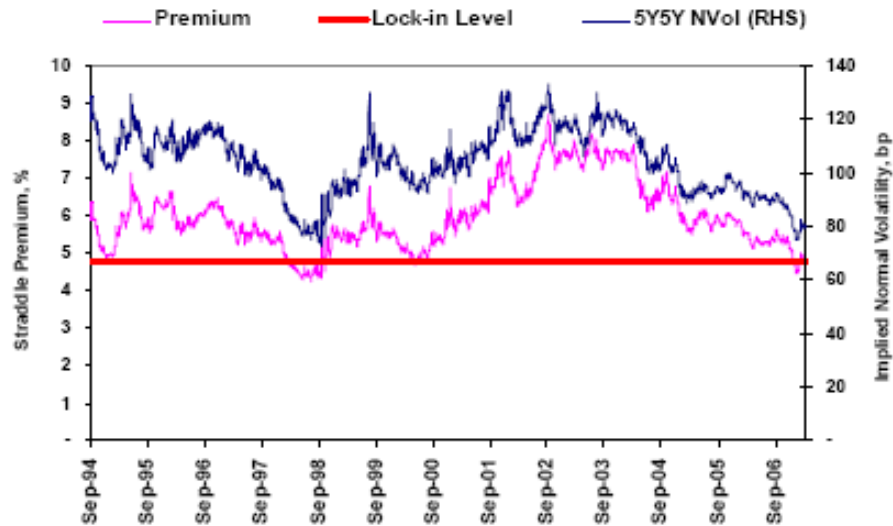
*In Swap form:* This is a pure fixed for floating swap where the only twist is that the floating leg is no longer Libor, but instead is the market observed mid-market dollar price of the a-t-m swaption straddle of your choice. Every six months, cashflows are exchanged based upon the differential between the "Fixed" rate, set on trade date (477bps in this example), and the floating rate. ML will pay the buyer the annualized difference if the current market price is greater than the "Fixed" rate; conversely, the buyer will pay ML the annualized difference if the market price is below the "Fixed" rate. So, using our above example, if the 5yr-5yr a-t-m straddle price six months hence is still 481bps, ML will pay the buyer 4bps (481 minus 477) annualized times the notional. In this case, ML would pay the buyer 2bps or \$20,000 per \$100mm notional. Effectively, this is a purchase of a series of a-t-m Forward Starting 5yr-5yr straddles at a fixed-price of 477bps.

*In Bond form:* Priced at par, a ML&Co ten year non-callable note with the semi-annual coupon equal to the market observed 5yr-5yr straddle price + 60bps. In this case, a semi-annual 481bps observation would create a coupon of 5.41%. **This could be a powerful investment tool for many customers since it combines a long Implied Volatility exposure with Positive Carry.** (To create the possibility for this bond to be AFS eligible, we would slightly increase the spread and cap the coupon near 11% to address FAS 155 limitations. Obviously, you must rely on your accountant to issue an opinion.)

Both of these transactions offer a clean and transparent purchase of Volatility as an Asset Class. At inception, the Vega exposure per \$100mm notional of the Swap or \$100mm face of the Bond is equal to about \$720mm 5yr-5yr straddles.

## How Timely is the Idea.....?

How timely is this opportunity? The chart below shows the **-Pink Line-** on the left as the dollar price of a 5yr-5yr a-t-m swaption since 1994. The **-Red Line-** also left, is the current market "Fixed" rate of 477bps. You can simply eyeball how few times this straddle price has been below the current "Fixed" rate level. The **-Blue Line-** right, is the Implied Nvol, also since 1994. We will discuss this further below.



If your eyesight is too weak to appreciate how few times the price of a 5yr-5yr straddle has been lower than 477bps, we direct your attention to the table below. Over the past thirteen years, the closing dollar price has been below the current "Fixed" rate of 477bps only 6.3% of the time. This means that the swap, as presented, would have had positive returns for 93.7% of all observation periods.

5Y5Y ATM Swaption Implied Volatility and Premium		
	ATM Nvol	Premium
Lock-in Level	80.9	4.77
Historic %le	5.2%	6.3%
Spot Straddle	79.9	4.83
Nvol/Premium Correlation	91.6%	

## A Little More Detail.....?

This table shows the full range of payout observations since 1994. The average price has been almost 600bps with a range of 872bp to 424bp.

Historic Distribution, Sep 94 to Present		
	ATM Nvol	Premium
Max	133.1	8.72
95th %ile	121.9	7.72
84th %ile	116.9	7.05
Average	103.9	5.99
16th %ile	91.8	5.21
5th %ile	80.8	4.68
Min	72.2	4.24

## Where is the Magic.....?

At some point, you will raise your hand to ask how it is possible to lock-in an Implied Volatility linked price of 477bp for a 5yr-5yr when the current market price is 481bp. The answer can be found in the shape of the Volatility Surface. Specifically, the Implied Volatility surface from five-year expiries to ten-year expiries is inverted. Now this by itself is not unusual. All the major "risk vectors" (Duration, Credit, and Volatility) have inverted from time to time. However, it is wholly anomalous for the Volatility Slope to be inverted at the all-time lows in Volatility! Think about the Rate curve. It theoretically inverts only when Rates have reached their peak and are about to head lower. It does NOT invert with rates at their nadir. Another view of the same portrait: The Rate curve inverts at higher Rates (and steepens at lower Rates) to keep distant Forward Rates in a tight long-term "regression-to-the-mean" range. The current inverted configuration can only reasonably exist (and continue) if long-dated Implied Volatility is expected to be lower in the intermediate future; a prospect we have already opined upon to the contrary.

There are various reasons why the back-end of the Volatility surface is currently inverted including the supply/demand of long-dated callables, tax/accounting issues, and dealer hedging activity. Nonetheless, it strikes us as a rarity creating a significant opportunity to lock-in ultra low Implied Volatility for an extended period with no Delta, Gamma, Theta or Skew management.

## What Price Structure....?

Let us be upfront. This trade recommendation is NOT a Merrill Lynch "axe" to sell volatility. Nor are we working for "free". There is a reasonable hedging expense embedded into the pricing to cover ten years of risk management. Nonetheless, the final cost of this package is substantially lower than your cost to re-create it. Since *theoretical replication of the above transaction would require a minimum of sixty (60) legs*, even a small bid/offer incurred on each of these legs would substantially inflate the cost. [We will ignore the transaction costs involved in managing this sixty-legged "spider" over ten years.]

Moreover, there is significant leverage in these trades that further reduces your transaction costs. Since \$100mm of either the Swap or the Bond creates exposure to about \$720mm of 5yr-5yr Vega, your notional bid/offer is greatly reduced.

However, this begs the question; can this package truly be created at home or be completely hedged by ML? The answer is an unequivocal NO - it cannot be precisely re-created by any combination of vanilla options. *Unlike Forward Rates that require merely a simple closed-form calculation, Forward Volatilities require assumed Forward Yield Curve correlations that cannot be "bought back" in the market.* One can propose a PhD's thesis of assumptions, but the cold reality is that this risk cannot be directly created by anyone. However, Merrill Lynch, as one of the largest dealers in derivatives can replicate this risk at the lowest possible cost and, as such, can offer it at a price lower than what you can do yourself.

### Important Insight:

You will notice that we did NOT promote this idea as a way to lock-in a low Implied Normal Volatility but rather a manner to lock-in a low a-t-m straddle price. This is not a serious issue since converting a Price-based Swap/Bond to a Volatility based Swap/Bond merely entails paying fixed on a 2.75 Dvo1 per notional. This dynamic has to do with the embedded convexity of a fixed-rate cash flow. For more information on this topic, please call your Merrill Lynch representative.

## A Final Comment:

In the domestic USD market, structured transactions have had a reputation for being a more costly and less transparent manner to gain exposure to a specific risk profile. We urge you to withhold your prejudice until after you have thoroughly examined this product and our commitment to this space. The Merrill Lynch Volatility Swap/Bond was created specifically to address these issues. Not only does it offer a risk profile that cannot be exactly recreated via standard vanilla options, but also the net cost is surely less than your cost to reasonably replicate. Furthermore, as with all structured notes, ML is committed to making a reasonable and active secondary market for these Bonds so as to provide both **transparency** for daily mark-to-market and **liquidity** to exit these trades should you care to so before maturity.

We look forward to discussing this timely concept with you in more detail soon.

## ML US Rates Strategy April 10, 2007

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