RATELAB

MERRILL LYNCH US RATES STRATEGY

Value Concepts from the BAS/ML Trading Desk
October 27, 2009

# No Bad Bonds, Just Bad Prices

George Lazenby as James Bond, "On Her Majesties Secret Service", 1969

The title of today's RateLab is one of our favorite macro comments. We invoked it frequently this year when the credit markets priced in likely outcomes slightly worse than Armageddon. However, today we intend to twist this notion on its head and propose that sometimes there is a price at which even a great bond (or derivative product) is too rich. Presently, this seems to be the case with respect to the cost for insurance against vastly higher Interest Rates, as represented by the "skew" for deep out-of-the-money long-dated cap/payer options. **Although we remain committed to a higher rate world as the FED's printing presses will (sooner than you think) create Inflation**, we also believe that you can be both bearish on the market and a seller of ultra-high rate Insurance.

## Our "Best Recommendation" Doubles Your Money

Almost one year ago, on October 31, 2008, we published two RateLabs, titled ***"The Positive Carry Hedge"*** and ***"The Positive Carry Hedge 2"*****.** Both detailed the anomalous situation where one could be both *short the market* and *long Convexity* while earning positive carry. The –purple table- below is taken from the front page of the latter RateLab. As shown in column 8, a 10yr – 10yr payer swaption struck at 6.0% would roll up in mid-market price from 209bps to 265bps over three years, all else equal. Since being short while the curve is steep and being long options are both hugely negative carry positions, this situation was truly extraordinary. Over the next few months, we implored all who would listen to buy these options.

Where is the trade now ? Although the spot Sw10yr rate has DECLINED nearly 60bps (from 4.33% to 3.73%), a 9yr into 10yr payer swaption with a 6.0% strike would mark on your books at about 475bps, well over double the purchase price !

| 1<br>Expiry | 2<br>ATM Vol | 3<br>OTM Vol | 4<br>Fwd Rate | 5<br>Strike Yield | 6<br>Put Price | 7<br>Strike Yield | 8<br>Put Price |
|---|---|---|---|---|---|---|---|
| *5yr* | 108 | 105 | 4.82% | 6.58% | *202bp* | 6.00% | *297bp* |
| *7yr* | 96 | 94 | 4.63% | 6.38% | *210bp* | 6.00% | *265bp* |
| *10yr* | 82 | 82 | 4.33% | 6.08% | *198bp* | 6.00% | *209bp* |

Notes:
*Spot =* 4.33%
Mid-Market Levels

**All charts, unless otherwise noted, are sourced from BAC/MER data**

While we at the RateLab were not the only ones promoting this idea, we are happy with the result. However, even a good idea can become expensive. Over the past year, many "Macro" bond investors as well as "Long Only" and "RV" Equity managers have desired to buy protection against the much higher rates that will be the inevitable consequence of the FED's monetary expansion. The massive demand for this insurance has driven both the absolute and relative price of this protection much higher.

The –indigo table- below is from our original RateLab analysis. At that time, we were exploring the higher 7.25% (column 7) strike before we settled upon our 6.0% strike recommendation. We reproduce it here because it details the full scope of the Implied Volatility surface at the time. [Notice the "positive carry" price roll up in column 8.]

| 1<br>Expiry | 2<br>ATM Vol | 3<br>OTM Vol | 4<br>Fwd Rate | 5<br>Strike Yield | 6<br>Put Price | 7<br>Strike Yield | 8<br>Put Price |
|---|---|---|---|---|---|---|---|
| *2yr* | 130nv | 138nv | 4.88% | 7.88% | *38bp* | 7.25% | *80bp* |
| *3yr* | 125 | 133 | 4.94 | 7.94 | *73* | 7.25 | *137* |
| *4yr* | 117 | 125 | 4.93 | 7.93 | *94* | 7.25 | *161* |
| *5yr* | 110 | 118 | 4.88 | 7.88 | *107* | 7.25 | *171* |
| *6yr* | 104 | 113 | 4.79 | 7.79 | *119* | 7.25 | *174* |
| *7yr* | 98 | 108 | 4.69 | 7.69 | *125* | 7.25 | *168* |
| *8yr* | 93 | 103 | 4.58 | 7.58 | *127* | 7.25 | *158* |
| *9yr* | 88 | 99 | 4.48 | 7.48 | *128* | 7.25 | *149* |
| *10yr* | 83 | 95 | 4.39 | 7.39 | *127* | 7.25 | *139* |

Serendipitously, the ten year rate fives years forward (5yr – 10yr) in column 4 at 4.88% last year is nearly identical to the current 5yr – 10yr forward rate of 4.87%. As such, the –teal table- below is similar to the table above except that we have updated the Rate and Volatility inputs to current levels. While your first instinct certainly is to look at the option prices in column 8, instead, please direct your attention to the Implied Volatilities detailed in Columns 2 and 3.

| 1<br>Expiry | 2<br>ATM Vol | 3<br>OTM Vol | 4<br>Fwd Rate | 5<br>Strike Yield | 6<br>Put Price | 7<br>Strike Yield | 8<br>Put Price |
|---|---|---|---|---|---|---|---|
| *2yr* | 138nv | 185nv | 4.47% | 7.43% | *121bp* | 7.25% | *137bp* |
| *3yr* | 132 | 176 | 4.67 | 7.67 | *185* | 7.25 | *216* |
| *4yr* | 127 | 167 | 4.79 | 7.79 | *227* | 7.25 | *270* |
| *5yr* | 122 | 159 | 4.87 | 7.87 | *252* | 7.25 | *304* |
| *6yr* | 117 | 150 | 4.90 | 7.90 | *262* | 7.25 | *317* |
| *7yr* | 111 | 142 | 4.92 | 7.92 | *265* | 7.25 | *320* |
| *8yr* | 105 | 135 | 4.92 | 7.92 | *259* | 7.25 | *312* |
| *9yr* | 100 | 127 | 4.92 | 7.92 | *248* | 7.25 | *298* |
| *10yr* | 95 | 120 | 4.89 | 7.89 | *233* | 7.25 | *279* |

Notice that although the at-the-money Implied Volatilities in column 2 are about 11% higher, the +300bps out-of-the-money Implied Vols in column 3 are about 33% higher. This is strange in many ways, not the least of which is that "skews" tend to compress as Implied Vols rise. Not surprisingly, this exaggeration of the "smile" is even more impactful upon the further OTM options.

The –green table- below shows the change in the payer skews over the past year along the 5y into 10yr axis. Although we do not have long dated records of such data, institutional memory indicates that the slope of the skew is extreme given the high absolute level of Implied Volatility.

**Five year into Ten year Payer Swaptions**

| | ATM | +100bp | +200bp | +300bp | +400bp | +500bp |
|---|---|---|---|---|---|---|
| October 2008 | *110nv* | *110nv* | *114nv* | *118nv* | *123nv* | *128nv* |
| October 2009 | *122nv* | *133nv* | *145nv* | *159nv* | *173nv* | *187nv* |
| | +11% | +21% | +27% | +35% | +41% | +46% |

## Why Are Skews Expanding ?

The initial buyers of the long-dated OTM puts were sophisticated bond investors who were familiar with the details of fixed income derivatives. As time passed, Equity investors become interested in hedging the risk of much higher rates. But instead of asking for an offer on some generic swaption, they formulated their request by asking: "How do I make $50 million if rates rise to 8% ?" There was no easy answer for this question because there is convexity embedded in a fixed rate bond/swap. The terminal payout for a bond or swap option is the rate difference between the market level and the strike at expiry times the Dvo1 of the underlying instrument. Since the Dv01 changes as rates move, the final cash payout is therefore uncertain. In the –orange table- below, we show how the Dv01 of a theoretical cash Ten Year Treasury changes as both the Coupon and the Rate level are varied.

| | | *RATE LEVEL* | | | | |
|---|---|---|---|---|---|---|
| | | 2% | 4% | 6% | 8% | 10% |
| | 4% | *9.93* | *8.17* | *6.75* | *5.59* | *4.64* |
| *Bond Coupon* | 6% | *10.84* | *8.96* | *7.43* | *6.19* | *5.17* |
| | 8% | *11.74* | *9.75* | *8.12* | *6.79* | *5.71* |

Critically, the Dv01 declines as rates rise. As such, the payout function declines as rates increase. Try explaining this to a priced based Stock Jockey. What these customers demanded was a product that paid a fixed value per change in rate, such as $100,000 per basis point as soon as rates rose above 6.0%. Fortunately, this product already existed as a single look CMS (Constant Maturity Swap) Rate Cap.

Although relatively straight forward to model, this product does create significant problems for the issuing dealer. Assume a customer buys the CMS cap as described above. The dealer will go into the market and purchase some quantity of vanilla swaptions struck at 6%. But look at what happens as rates rise above 6%. Using the middle line from the above chart (Bond Coupon of 6% at a 6% Rate), the dealer will earn $0.0743 on his swaption hedge as the rate rises from 6.00% to 6.01%. However, each basis point higher, the dealer will earn a little bit less. As the rate crosses 8%, he will only earn $0.0619 per basis point. In contrast, (assuming the proper notional sizes) the CMS cap he sold to the customer will pay $0.0743 per basis point consistently. If rates increase by a lot, this difference will expand greatly. To manage this, the dealer needs to buy a few extra options at 7%, 8%, 9%, etc to collapse this expanding "wedge". So in effect, when a dealer sells a 6% CMS cap, he is actually selling an entire string of options struck from 6% to +20% (and beyond).

What has happened over the past year is that many non-traditional hedgers have demanded monetary protection from vastly higher rates. They are certainly justified since the FED/USGovernment has employed a strategy of massive money printing to cushion the financial crisis. These non-traditional buyers have requested their protection in the form of CMS caps. Since there is no natural seller of deep OTM options (who likes selling low probability disaster insurance aside from AIG ?), the dealer community has no alternative but to keep marking up the skew to compensate for the theoretical risk that rates rise not only greatly but also swiftly.

## Panic Leads to Arbitrage

We are about to recommend selling deep out-of-the-money puts. Please be sure this does not make us bullish on the bond market. But just as the market recently priced credit as if every company in the world would default, and moreover, do it in short order, so have payer skews now entered the land of the ridiculous. Recall that **options trading is about both location and speed**. As such, it is possible for a long options position to be a loser even if the direction is correctly chosen, and vice versa.

To repeat, options trading is about both direction and speed. So what we are about to propose is a strategy where we agree that rates will rise but just NOT as fast as the OTM skews imply. Presently, an ATM 5y into 10yr swaption has an Implied Annual Normal Volatility of 122bp or about 7.6bp a day. This is nearly 25% (or 2 Standard Deviations) above its 15 year average of 98nv. A +300bps 5yr into 10yr payer option has a mid-market Implied Volatility of 159nv. So the market is implicitly saying that ATM Implied Vol will rise substantially from its present level if rates increase by 300bps.

Can Implied Vols rise that much ? A 300bps increase in the Sw10yr rate would take the spot rate to 6.75%. This is fairly close to the 6.95% rate the Sw10yr averaged throughout the entire 1990s. Although we do not have data for 5yr-10yr swaptions for that entire period, we do know that the MOVE index averaged 101nv for that time frame and that the MOVE index in general has been about 6% higher than 5yr-10yr. So for a "delta hedged" seller of +300bps payer options to be a loser, we would not only need the average daily realized volatility to be greater than 159nv, we would also need (what will become) ATM Implied Vol to significantly exceed that level after a 300bp rise.

Let me state upfront, we are not about to recommend a naked short "delta hedged" position in deep OTM puts, especially when 5yr-10y has realized better than 165nv over the past three months. There are much more clever ways to express this view. But first we need to drive home the point as to just how much deep OTM payers have richened over the past twelve months.

**5yr into 10yr Costless Swaption Payer "1 by 2"**

| | | | |
|---|---|---|---|
| October 2008 | Buy 100mm | K = 6.75% | +200bps |
| ATM = 4.75% | Sell 200mm | K = 7.85% | +310bps |

**Terminal Breakeven of 8.95%**

| | | | |
|---|---|---|---|
| October 2009 | Buy 100mm | K = 6.75% | +200bps |
| ATM = 4.75% | Sell 200mm | K = 9.15% | +440bps |

**Terminal Breakeven of 11.35%**

The –maroon display- details a standard "costless one by two", a superior method to of adding some concreteness to a fluffy concept. Since the forward rates have not changed much since last year, we can use a simple fixed-strike example.

Last year, one could buy a +200bps 5yr-10yr payer (K = 6.75%) and costlessly sell twice as many 110bps higher in rate (K = 7.85%). With a 4.75% base rate, this created an 8.95% terminal breakeven package which is a 420bps total range. Presently, with ATM Volatility 11% higher and OTM skew vols 35% higher, a similarly structured "costless" package would have a terminal breakeven of 11.35% for a 660bps total range, fully 57% wider.

As attractive as this trade may look, this is also NOT the trade we are recommending. What this demonstrates is that massive customer demand of a single risk vector has totally overwhelmed the market's ability to supply this risk. With the usual suspects sidelined because of trailing VAR limitations (See previous RateLab), deep OTM payer skews have priced to levels where low risk / high payout structures can be readily created.

## Our BEST Idea for selling OTM Payer Skew

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Buy | 100mm | 5yr – 10yr | payer | K = 6.25% | 458bps | 138Nvol | 25.0% Yvol |
| Sell | 100mm | 5yr – 10yr | payer | K = 7.75% | 280bps | 157Nvol | 25.5% Yvol |
| Sell | 100mm | 5yr – 10yr | payer | K = 9.50% | 178bps | 181Nvol | 26.4% Yvol |

Zero Cost at a 4.90% Forward Rate

*Delta exposure:* Effectively zero, depends upon model used
*Gamma exposure:* Short 2mm 1yr – 10yr straddles
*Vega exposure:* Short 30mm ATM 5yr – 10yr straddles

*Carry:* Assuming flat roll along all surfaces, this trade marks up $400k in one year.

*Rate risk:* Assuming vols remain unchanged, trade marks down $500k on an instant +200bp rate rise, but mark up a net $600k if that occurs over one year.

*Vega Risk:* The only initial "greek" risk is short Vega. Since the last time we had both high Rates and Implied Volatility was in the 1980's (before the swaps market existed), we need to look to the CBoT for any reasonable options data.

| | Avg T10yr | Avg TY Pvol | Avg Act Nvol | MOVE |
|---|---|---|---|---|
| **1985** | 10.60% | 9.0% | 137nv | |
| **1986** | 7.65% | 11.0% | 167nv | |
| **1987** | 8.40% | 9.0% | 137nv | |
| **1988** | 8.85% | 7.0% | 107nv | |
| **1989** | 8.45% | 6.5% | 100nv | 108nv |
| **1990** | 8.60% | 6.75% | 104nv | 104nv |

Unfortunately, it is difficult to recreate precise Implied Volatility measures for that period because the flat Price Vols used back then did not adjust for day count or Delivery shift. Nonetheless, using some back of the envelope estimates, the -pink table- above is our best approximation of where Volatility traded for three month options on Ten year Treasuries. Except for a four month period in the middle of 1986, Volatility rarely exceeded 180Nvol and for most part, was well under 140Nvol. Since the "risk leg" of this trade is being set at 181Nvol, the risk that Implied Volatility will be substantially above that level if rates reach the strike of 9.50% seems unlikely.

## Conclusion

This trade is not for the faint of heart. In fact, I can almost certainly assure you that you will not "top tic" this idea so you should expect this structure to mark against you early on. Nevertheless, with RV hedge funds sidelined until their VAR limits increase sometime in Q1 next year, the dealer community has had no choice but to press up the skew until a seller is found. We urge you to be that seller. The massive skews here create the anomaly that you can structure a costless package with almost no delta or gamma exposure for even a +200bps shock.

There are many ways to "win" with this concept:

1) If rates stay near this level, you reap a nice "roll up" carry profit from the heavier decay of the higher skew OTM payers. Moreover, Vega should decline over time from a lack of realized Volatility.
2) If rates do rise by 200bps to 300bps, those who purchased the CMS caps will most likely liquidate some portion to harvest their profits. This naked put selling will slow the speed of rising rates as well as knock down Vega.
3) No matter how rates rise (slowly or quickly), a significant increase in rates will totally alter the hedging needs of the MBS market. Their current massive demand for OTM payers will reverse as extension risk becomes contraction risk. They will become huge buyers of OTM receivers as the MBS market becomes a discount bond. In fact, this is the scenario that creates the largest gain. A +200bps move in rates would not only push your 6.25% payer into the money, but also the 9.50% strike would almost certainly invert in skew versus the 6.25%. If rates rose by 200bps over one year and skews rotated to a flat 140nv, this 100mm trade marks up $3.5mm. Recall that the higher rate world of a few years ago had receivers trading well OVER payers because of heavy MBS hedging demand. This will happen at some point after rates rise since the MBS market is the largest user of option products.

How do you lose ? Aside from the obvious further steepening of the skew surface, to become permanently impaired on this type of structure, one would need rates to increase by well over 400bps in less than a year, with no change in the skew surface. It is the improbability of this last caveat that cushions almost any adverse event. If rates rose by 500bps to 10% over two year, this trade would value at costless if the Volatility Surface marked flat at 150Nvol. Any positive skew to the calls will place this trade "in the money".

While we have presented our preferred method of capturing the value concept of selling excessive skew, there are certainly other structures that will also be effective. In general, we prefer ideas that isolate the skew component and do NOT expose you to negative gamma. This does require a longer payout horizon, but most critically, the stability of a flat convexity position will allow you to ride the short term Volatility that the market is sure to experience as the twin FED buy programs end and the notion of an exit strategy becomes more topical.

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