RATELAB

MERRILL LYNCH US RATES STRATEGY

Value Concepts from the ML Trading Desk

"Well, here's a another nice mess you've gotten me into"

Oliver Hardy - 1930

The Rate and Curve movements over the past few days have sent market participants to the history books to find the last time such large changes occurred. It turns out that the USD 2yr versus USD 30yr swap spread has never moved by 32bps in a single day (at least as far back as we have data) and that using recent historical measures, it was a theoretical nine standard deviation event. As per the pure rate movement of the USTsy 2yr, only five times in the database has the single day rate rise exceeded 32bps. So what was the antecedent to this ….. below we give you our best guess.

As no good deed goes unpunished, it seems that the efforts of the Structured Note issuers in Europe to create a High Yield security with negligible credit risk is the locus for all the market's troubles.

Blue - EUR 30yr rate minus EUR 2yr rate
Orange - EUR 30yr rate minus EUR 2yr rate 3 years forward

The Background

During the periods of April - June 2007 and November 2007 – February 2008 European Structured Note desks were huge sellers of Daily Accrual Inversion Notes. These bonds, issued by Ultra-High Grade entities, paid a large coupon with seemingly little Credit risk. Typical of these deals, the customer would pay Par for a Ten year security whose 7% coupon would accrue everyday that the EUR 30CMS rate minus the EUR 2CMS rate was positive, i.e., not inverted. On days where this spread was negative (inverted), the coupon would be zero. Each quarter, the arithmetic average of all the day's accrued coupons was paid to the owner of the note. So, for example, if the Curve were inverted for seven days out of the 91 days in the quarter, the bondholder would receive a coupon of about 6.46%. The maximum rate would be 7% and the minimum rate would be zero. These notes were quite appealing to customers. They generated an above market coupon with virtually no credit risk. Moreover, the risk the buyer was assuming seemed relatively mild since curve inversions are quite rare, at least until recently. Above, the -blue line- is the spot spread of EUR 30CMS minus EUR 2CMS. The –orange line- is the same spread using three year Forward rates. (This will be an important consideration later.)

We estimate that during this issuance cycle, between eu13bn and eu20bn notional notes were created.

The Bond Math

Although some rather sophisticated Monte Carlo models are required to value and hedge these Notes, they are actually rather straight forward in many respects. The buyer is simply selling a ten year series of Digital Options starting at the issue date and embedding the Option premium into the Coupon of the Note. Most dealer models can now easily find the arbitrage free forward rate as well the Convexity-Adjusted CMS spread. Apply an Implied Spread Volatility and the value nicely pops out of the back end of the model. The reason the dealer can create such a High Coupon Note is that the flexing shape of the Spot Curve creates a valuable Digital option in Forward space. The dealer is thus willing to embed a high coupon into the note to own this option and still retain a small but meaningful profit.

Once the Note is issued, the dealer tries to "hedge up" his risk to lock in the theoretical Model profit. Since he is paying an above market coupon, he needs to either sell out the Digital options he purchased or "net sell" a portfolio of Vanilla options. The latter is the most common and occurs most frequently.

So what does the Hedge look like ?

Using the Rate structure and Volatility surface of earlier this year, when most of the issuance occurred, a 100mm 7% Note would create a long position of 700mm Digital options. To fully hedge this position, the dealer would need to:

Buy/Receive 450mm 10yrs versus Sell/Pay 150mm 30yrs

Sell 400mm 4yr into 2yr straddles versus Buy 75mm 4yr into 30yr straddles.

As long as the Realized Spread Volatility is proportional to the ratio of Implied Volatility of the Vanilla options and the Digital does NOT go into the money, this portfolio will be rather stable and the dealer will earn his "model profit" over time.

Digital Options, the Tutti Fruitti Derivatives

A Vanilla option is so named for the obvious reason; it is rather simple and straight forward. As such, the owner of a Vanilla option is always long Convexity and Vega. This is not the case with a Digital (or Binary) option.

A Vanilla option, no matter how far In- or Out-of-the Money, always exhibits the property of unlimited gain and limited loss. This is not the case with a Digital. Since the payoff on a Digital is either zero or one, once the option goes In-to-the-Money, the option becomes negatively Convex. You can now no longer make anymore money than the one point you are likely to receive, yet you can loss it all if the market reverses and the option goes Out-of-the-Money. You can now lose more than you can make, this is the definition of negative Convexity.

For the hedging dealer, this creates a grand problem as the risk vector nears strike. For if a strike cross occurs, all the "Greeks" that create the hedges for the option reverse and the hedger must furiously rebalance in the other direction. This is why an exotic option dealer losses sleep whenever his book nears strike.

All the Elephants Through One Small Door

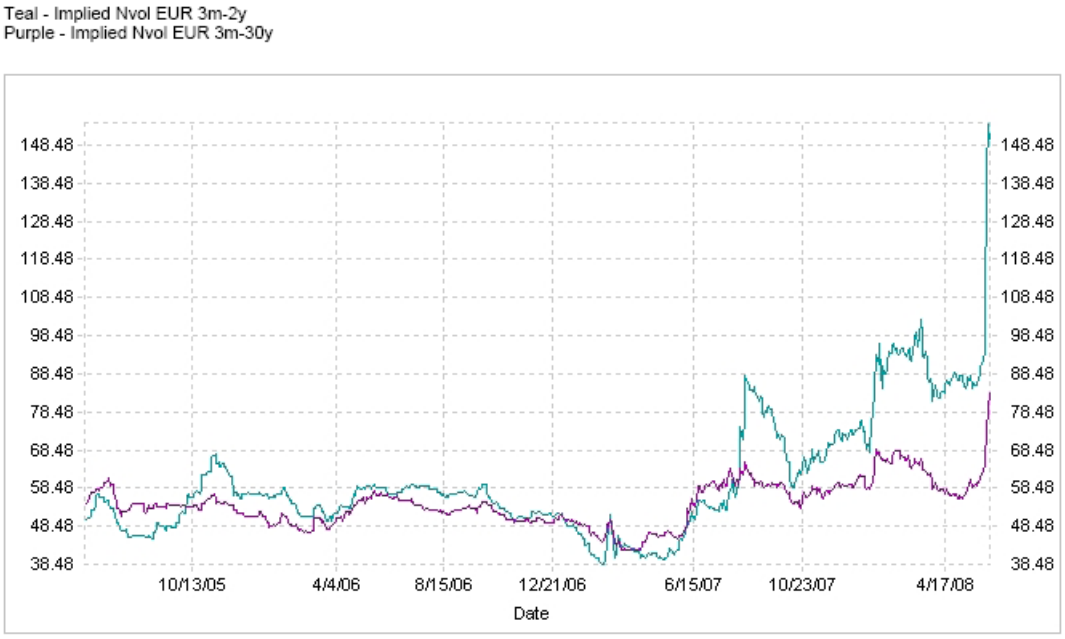
Dealers have many "tricks" to manage this risk, but to a man they all hope that if a "strike cross" does occur, it will be a slow and liquid grind to give him time to rebalance his positions. As you can plainly see from the chart on page one, this is not what occurred last week.

The Euro 2s::30s swap spread was already nearing zero when Trichet commented that he may need to raise rates to combat inflation. The subsequent increase in short rates pushed the curve into inversion on the spot curve. Dealer models required the hedgers to execute Curve flatteners as the Greeks started to reverse. However, since most dealers had exposure to this risk and many customers were already into steepener trades, there was no one to take the other side. As such, each trade pushed the market into further inversion. And as the market further inverted, the longer dated forward market started to invert. As this occurred, more of the Digital options went into the money and "Flipped their Greeks".

Now take a minute to look at the original hedge. It involved selling Volatility on 2 year tails. Consequently, as short rates rose on the back of this hedging, dealers became longer duration in this risk bucket. Also recall that as the longer dated forwards cross strike, all the "Greeks will Flip". That means that not only will the dealer need to pay fixed in short rates, but he will also need to buy back (in this simple example) his 400mm 4yr into 2yr straddle and then he will need to buy an additional 400mm to go net long.

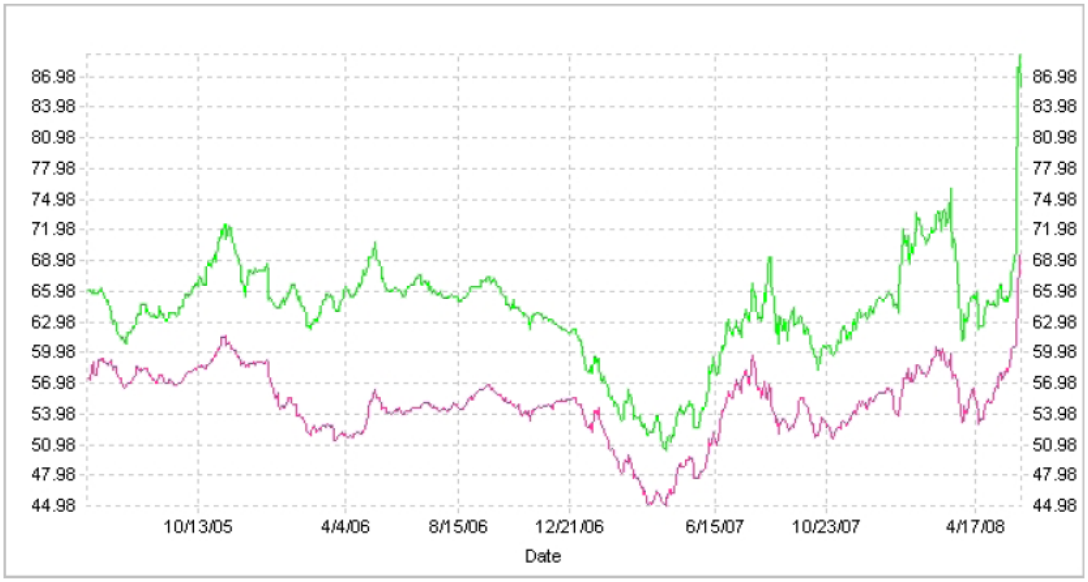
So basically the entire European dealer market needed to sell the Curve and buy short tailed Volatility at the same time. They purchased gamma first to mitigate the curve risk and then reached for Vega to rebalance the overall position. What does total panic look like ?

The chart below will provide a fine answer. The –teal line- is the Implied Nvol for EUR 3m-2yr while the –purple line- is the Implied Nvol for 3m-30yr.



Below, the –green line- is Implied Nvol for EUR 3y-2y while the –magenta line- is Implied Nvol for 3y-30y.

Green - Implied Novl EUR 3y-2y
Pink - Implied Nvol EUR 3y-30y



Across the Pond, A Butterfly Flaps Her Wings

Red - right - US 30s vs 2s minus EUR 30s vs 2s
Blue - left - US Implied Nvol 6m-2y minus EUR Implied Nvol 6m-2y

Although similar exposure exists in the USD market, the shape of the curve has greatly mitigated the impact. Nonetheless, we believe that the events in Europe impacted the USD market.

Last week's 5.5% Unemployment rate combined with the fear of another financial institution in distress steepened the USD Curve. Moreover, Implied USD Swaption Volatility had been relatively stable and well below it's March highs. When the violent EUR Curve and Volatility movements were overlaid on top of the USD Rate and Volatility Surface, some rather obvious Relative Value trades must have registered on Customer screens.

The -red line- above is the net difference between the EUR 2s::30s and the USD 2s::30s. A total spread of 238bps (+161bps in USD and -77bps in EUR) must have seemed unsustainable to large Macro investors. The –blue line- is the difference between the Implied Volatility of USD 6m-2yr and EUR 6m-2yr. With FED now beating the inflation drums and signaling a possible rate hike, a scant 24 Nvol spread must have seemed way to narrow to these same Macro investors.

We propose that although there may be some fundamental framework for the USD curve to flatten and for Volatility to rise, the impetus for the move was a reaction to the dislocations in the EUR market as large Macro traders "boxed" the USD versus EUR Curve and Volatility markets.

Let's Put Pencil to Paper

Let's assume a mid-point sizing of the EUR Inversion Note market of eu15bn.

So the initial hedges would be:

Short 60 billion 4yr into 2yr straddles

Long 11 billion 4yr into 30yr straddles

Long/Receive 67 billion 10 year rates

Short/Pay 22 billion 30 year rates.

If the Convexity Adjusted forward spread fully inverts, all these trade would need to be fully reversed. So for example, dealers would need to buy 120 billion 4yr into 2yr straddles.

Are You Nervous Yet ???

The above assumes that dealers do not do any preliminary hedging along the way which I can promise you is not the case. Nonetheless, there is an additional problem here on top of the massive hedge reversals potentially required. Specifically, if the EUR curve starts to steepen in a substantial manner and the forward curve dis-inverts, all these new trades will have to be unwound. In fact, since most of these Inversion Notes are not callable, this "switch risk" will continue well into the next decade.

We at the RateLab will need to noodle on this a tad longer to determine the trades that can take advantage of this situation, but owing to the current shape of the Curve and Volatility Surface as well as the long maturity of Inversion Notes, we believe there will be plenty of time to act.

ML US Rates Strategy
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