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A Commentary by Harley Bassman:

The Convexity Maven

Value Concepts from the Credit Suisse Trading Desk
July 17, 2012

"The Positive Carry Insurance Policy"

Almost by definition, a "Hedge" is supposed to cost you some sort of value. The cost can be measured in Dollars, Total Return, Net Interest Carry, or Credit Quality, but it is expected that one will give up something for the hedge benefit. So it is quite interesting that presently one can acquire both "negative duration" (in a steep curve) and "positive convexity" for what seems to be positive carry.

Let me detail those two risks before we go any further. As we have written about in the past, there are three main risk vectors available in the Debt Markets: Duration, Credit, and Convexity. Duration is a bond's price risk given a change in rates. In a steep Yield Curve, bonds with longer Durations yield more than bonds with shorter Durations. As such, these bonds exhibit "positive carry" when one owns them. One earns the extra yield in exchange for being exposed to the risk that interest rates may increase. Conversely, one would have to pay via "negative carry" to benefit if rates go higher. This is usually transacted by being short bonds. Thus, we can say that being short the market is "Negative Duration". And the steeper the curve, the greater the cost via negative carry.

Mathematically, Convexity is the second derivative of some risk vector. But practically, we identify Convexity as some sort of unbalanced return. So if some asset or investment venture earns 10% under one set of circumstances and loses only 5% in a similarly opposite situation, we would call this "Positive Convexity". If some other venture created a 15% return in one direction but lost 25% in the other, we would say this is "Negative Convexity". In short hand, we say Positive Convexity is "long options" and Negative Convexity is "short options". This is because a long option position can only lose the fee paid while the profit potential is unlimited – consequently, this is the ultimate in Positive Convexity. Of course there is a cost associated with Positive Convexity. In a vanilla options example, that cost is the time decay, also known as Theta.

Placing both of these concepts together, one could logically deduce that the most "expensive" asset in an environment where the Yield Curve is steep and Implied Volatility is high would be a put (payer) option on interest rates. Since a put option exhibits both Negative Duration (it profits if interest rates rise) and Positive Convexity (limited loss versus unlimited gain), markets should charge a high cost to own this risk profile. And usually such is the case. This cost tends to be born via exceedingly large time decay, as measured by the option's reduced value over time. However, for reasons to be detailed below, we have found an investment that provides both Negative Duration and Positive Convexity, all the while producing a small positive return in the early years.

A Discounted Present Value, Not a Prediction

The derivatives rates market operates under the principles of Arbitrage-Free conditions and Discounted Present Value. As such, a Forward Rate is NOT the market's best guess (prediction) of the future but rather the DPV of the Spot Rate Curve. Similarly, Forward Implied Volatility is NOT by itself a prediction of how calm or risky the markets will be in the future, but instead is a function of the various Spot market supply::demand components. Currently in Europe, there are overwhelming market forces that are twisting and flexing to extremes

both the EUR Swap Rate Curve and the EUR Volatility Surface. This is the source of the opportunity.

For those of you who have not yet been turned away by the prospect of dealing in European Rate Derivatives, our discussion continues with reference to the –lavender table- below. Yes, there are a lot of numbers here, but let's take it one column at a time. Each column in the table is an input to calculate the value of a put option (Payer Swaption) on a Fifteen-year tail. Column (1) identifies the time to expiry of the option; they range in rows from two years to fifteen years. Column (2) is the mid-market At-the-Money Implied Normalized Volatility for a so constructed vanilla straddle. Column (3) is the Implied Nvol for an Out-of-the-Money payer swaption struck at 4.00%, noted in Column (5). Column (4) is the Forward 15yr swap rate. Column (6) is the mid-market option price using the inputs of the previous columns. This grid is produced directly from the Credit Suisse unified pricing system.

1 Expiry	2 ATM Vol	3 OTM Vol	4 Fwd Rate	5 Strike Yield	6 Put Price
2y	82nv	95nv	2.39%	4.00%	96nv
3y	81	93	2.51%	4.00%	190
4y	80	91	2.59%	4.00%	274
5y	78	88	2.63%	4.00%	339
6y	76	86	2.65%	4.00%	385
7y	74	83	2.65%	4.00%	418
8y	72	81	2.64%	4.00%	439
9y	70	79	2.61%	4.00%	452
10y	68	78	2.57%	4.00%	455
11y	67	76	2.53%	4.00%	457
12y	66	75	2.47%	4.00%	454
13y	64	74	2.42%	4.00%	449
14y	63	72	2.37%	4.00%	443
15y	61	71	2.34%	4.00%	437

Spot EUR Sw10yr = 1.77%

Source: Credit Suisse Data

Funny Rates

In a world with a steep spot Yield Curve, the Forward Rates produced tend to be higher than Spot Rates. This differential is the Net Present Value of the Carry not earned by owning the spot instrument. However, notice the Forward rates in Column (4) for the years seven to fifteen; these rates actually decline. The reason for this is the anomaly that the slope of the Yield Curve from years ten to thirty is not proportionally as steep as the slope from years zero to ten. This exists because the investment demands of long liability managers have been heavily influenced by regulation and accounting strictures. (A symptom of this in the USD market is the positive swap spread of 13bps in the ten-year sector versus a negative swap spread of 25bps in the thirty-years sector.)

But regardless of the reason, the end result is that one is "paid" to own negative duration in forward space, at least when measured via the Wall Street standard of static "roll-down".

Funny Volatilities

One should not be surprised that the peak of the Implied Volatility surface usually occurs near the two to three-year expiry point. This is fundamentally reasonable since not only do most corporate liabilities circle around this horizon date, but also this point most closely matches the risk inherent in the USD MBS market. What is surprising to those not deeply involved in the EUR derivatives market is the steep negative slope for ATM options from the three-year to the fifteen-year expiry point. (See Column (2)) This is especially anomalous to those who traffic mainly in Equity and FX options where a positively sloped Volatility Term Structure is the norm.

The reason for this is the large supply of long-dated options created by the issuance of Callable Bonds. The beauty of these bonds, from the standpoint of a taxable US issuer, is that while the coupon payment is treated like Debt and is tax deductible, the principal proceeds can be treated as Equity Capital. This bifurcation of treatment is a powerful incentive for many financial institutions and rationalizes their effective sale of fifteen-year options at a 25% discount to three-year options (61Nvol versus 81Nvol). The incongruous result is that Forward Volatility calculates lower than Spot Volatility, a result that is totally unexpected in an environment dominated by Financial Repression.

The Positive Carry Hedge

Buy EUR 15yr into 15yr 4.00% Payer swaption @ 437bps [EUR collateral]

As noted at the outset, Rate derivatives are the Discounted Present Value of the Spot Yield Curve and Volatility Surfaces. So with no tricks or crazy conditions, the vanilla prices in Column (6) are produced. Using the standard Wall Street analysis of pure "roll down", the expected heavy time decay occurs in all options with expiries inside of seven years. For example, the four-year to three-year "roll down" cost is 84bp (274bp to 190bp) or nearly 31% of the value of the option. But notice the cost profile of a fifteen-year swaption. Its initial mid-market value of 437bps actually rises over the first four years.

Now I will stipulate that fully unchanged markets for four years are beyond a fairy tale. Nonetheless, one has to start the analysis someplace and pure "roll down" is not the worst. This trade carries at a positive 20bps over its first four years in a static analysis while having the properties of both Negative Duration

and Positive Convexity. Contrast this to most positive carry trades that almost uniformly include selling options or trading against the forwards. This trade is NOT magic; in fact you will certainly pay a princely bid/offer to enter it. This trade is solely available because the Spot Yield Curve is slightly twisted and the Swaption Surface is so completely inverted.

The Exit Strategy

Long-time readers know that we are supremely bearish on long USD, EUR, and JPY interest rates. We know that inflation is the ONLY solution to a debt crisis and this will eventually crush the value of long-dated bonds. However, we do not need to wait the full fifteen years to profit on this trade; the Yield Curve and the Volatility Surface can do the heavy lifting for us.

1) There will be little time decay during the first few years of the trade. As such, there is plenty of time for our idea to work;
2) An inverted swap spread curve (EUR: 50bp for 10s versus 8bp for 30s; USD: +13bp for 10s versus -25bp for 30s) is levering up the "Forward Effect". Spread normalization will move distant Forward Rates higher;
3) Regulatory changes may dampen the ability to issue long-dated Callables; this would reduce the "inversion" of the EUR Volatility Surface;
4) FED and ECB monetary stimulation (QE, not Twist) will pressure long rates higher;
5) **Most Important** – Our Credit Suisse strategy team postulates that Solvency II European pension reform will steepen the EUR10s versus EUR30s Curve by 40bps. This will magnificently increase the value of long-dated payers on long-dated rates. (See our excellent FIR July 2, 2012 publication: "*Drivers of the EUR long end*")

I expect this trade to coast along for two to three years and then kick in hard in 2014 or 2015.....at least that's the plan.

The Risks

1) Let's be clear, these are NOT cash tens that trade like water. There is a fair bid::offer that must be paid at inception;
2) You are long Vega. However, Implied Volatility for this type of option is at the lower end of its two year range. Granted it has been much lower in years past, but that was before Greece decided to consider leaving the European Union;
3) If the "Cassandra" pundits are correct and Europe becomes Japan – Well, losing your small option premium will be the least of your worries!
4) This is NOT a "relative value" trade; it is a Macro investment with a two to five year horizon.

A Twist for the Parsimonious

If paying a bit more than four points up front is too much for you, then may we suggest an alternative: [See Commentary – *"Buying the Top",* Feb 1, 2012]

Sell	EUR	100mm	3yr	into 15yr	3.50%	payers }	
Buy	EUR	100mm	10yr	into 15yr	4.00%	payers }	Net pay 160bps

1) Positive carry of 121bps over the first year;
2) Effective purchase of 3yr Forward 7yr into 15yr ATM Vol at 57.5nv;
3) Recognizes Financial Repression by monetizing the FED's interregnum;
4) Fewer dollars at risk in "Japan" scenario;
5) While short "mathematical gamma", you are NOT short "notionally".

We repeat: Since inflation is the ONLY solution (unless you forecast robust nominal GDP growth), inflation will be the solution. The FED has been abundantly clear that this is their plan; and I can assure you that it will be none too soon before the ECB follows suit, albeit not as openly. It is only a matter of time.

While one could infer from this Commentary that waiting a few years before entering these trades would be fine, that would be a false conclusion. The entire point here is that it is extremely difficult to "time the market". Said the CEO of Citibank shortly before the financial crisis, "As long as the music is playing, you've got to get up and dance." Chuck Prince was quite certain he could find a chair once the band packed up for the night….he was clearly mistaken.

The critical concept here is finding a way to gain exposure to this risk vector without paying a heavy cost or risking a short-term "stop out". The NASDAQ bubble was identified in 1996 but did not burst until a few years later. Similarly, many Mortgage specialists saw a housing bubble as early as 2004, but those early bets against the real estate market were almost all stopped out by 2006.

The market will not "Ring the Bell at the Top"; the key value here is that both of these structures allow you to gain exposure now yet be patient for the eventual result. Take advantage of today's twisted risk Vectors to protect your portfolio.

Harley S. Bassman
Credit Suisse US Rates Trading
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