THE CURVE ADVISOR

CURVATURE TRADING APPLICATIONS
Application #2: RANGE TRADING

By Joseph Choi
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Curvature trading is one of the least-discussed tools in a trader's arsenal. It has valuable applications in: (1) directional trading, (2) range trading, (3) options trading, and (4) market-making. Over the four issues in this series, I will highlight how an understanding of curvature in Eurodollar futures can be used to improve returns in each of these areas.

Attempting to pick lows and highs in a market has been around since the early days of trading. If you are going to "buy low and sell high," you first need to have an idea where the "lows" and "highs" are. People naturally turn to historicals to help them determine those levels. "Range trading" generally refers to one of two things: (1) trading around support and resistance, and (2) trading a structure whose value moves within a reasonably tight range. In this paper, I will discuss why curvature structures can be superior vehicles for range trading.

RANGE TRADING AND NONLINEARITY

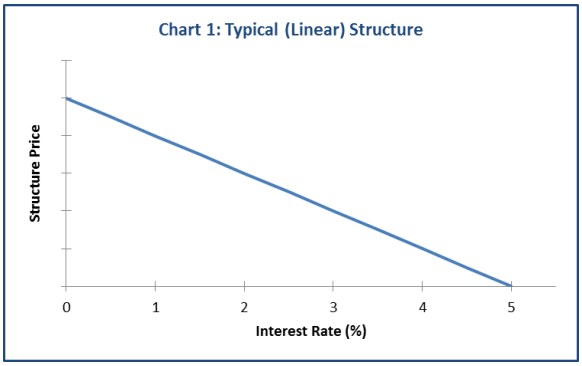
People naturally gravitate towards historical lows and highs to determine what is cheap and rich. If you see that a structure has had a problem going below a certain level, you buy at that level. If it goes through that level and meets whatever your confirmation criteria are, you admit defeat, stop out and move on to the next trade. That's a "standard" way of trading for many people.

But if you take a step back, here are some ways the "standard" could be improved upon:

- It would be nice if the probability of a further move down is lower than a probability of a move up. In addition to getting historical cues to a local price bottom, having some fundamental reasons for the structure to remain supported would be ideal.
- It would be nice if a dip below the support level didn't mean we were wrong, but instead made the case for the trade even stronger. There is always a time to admit you are wrong and stop out. But how much conviction can you possibly have in a trade when you have to do a 180 after a minimal incursion?

Consider the following two structures and their price levels as rates change:

In Chart 1, we have a structure with linear pricing - for example, a single Eurodollar contract. As rates move higher, prices go lower.



In Chart 2, we have a hypothetical structure with non-linear pricing - for example, a Eurodollar butterfly ("fly") position that has the benefit of nonlinearity. Nonlinearity occurs when the change in the price of a structure is not linear with the change in rates. I discussed the importance of nonlinearity in Part 1 of this

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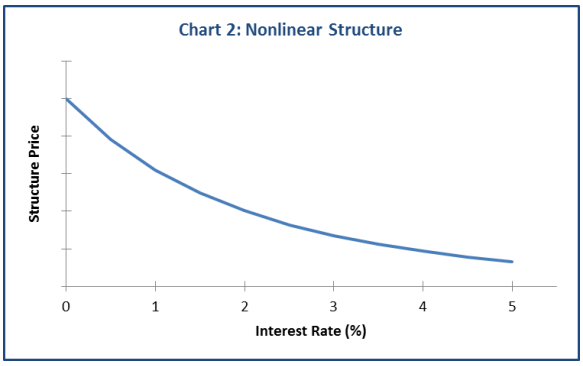
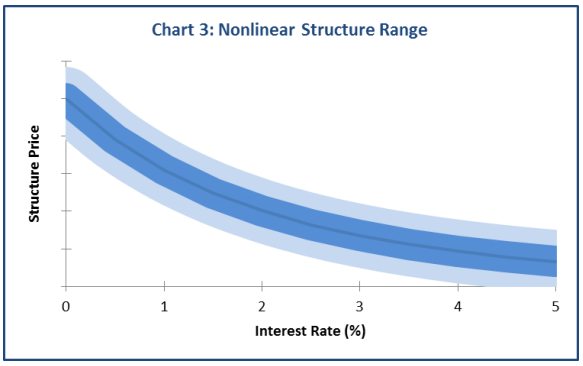
series. As rates move higher, prices go lower, but at some point the price of the structure starts leveling off. The price of certain butterfly structures could even start heading back up!



If you had to select a structure to pick a support level on, which of the above two structures would you choose? All other things being equal, the answer is clearly the structure in Chart 2. You gain when rates go down, and you lose less when rates go up.

We need to factor in that butterfly trades exhibit "P&L noise" - a butterfly price can vary for a given level of rates. So rather than an exact price, we have a distribution of possible outcomes for a given rate. However, P&L noise can be in your favor if you choose an entry point that is extended relative to its historical and fundamental norms. Even if we were to replace the curve in Chart 2 with a distribution band as in Chart 3, the butterfly structure still looks more attractive. You can always wait until the structure gets near the bottom of the distribution to initiate the trade. From there the "P&L noise" is more likely to be in your favor.



The other feature I like about trading butterfly ranges is that when we go below the support level, we are not necessarily wrong. In fact, depending on the butterfly, we may want to add rather than stop out. This is because the reasons for initiating the trade may have had a stronger fundamental rationale, rather than just the historicals. **It is this fundamental rationale that may have caused the structure to exhibit the nonlinear price action in the first place.**

THE FINE PRINT

Eurodollar butterflies may provide a more stable platform to trade ranges than a single contract. However, sometimes it may be just a coincidence that a structure traded in a tight range over a particular historical period. Care needs to be taken that you are not just mining for coincidental tight relationships in the data. What may look good over one time horizon may look completely different over another. The key to successful curvature range trading is understanding what the conditions are that cause a butterfly structure to have particular historical support or resistance points, and understanding what change in conditions could cause that historical relationship to break.

You also need to consider a number of factors including: the current fundamentals, the current curve shape, the relevant comparison period, the direction and magnitude of the error skew, and the carry considerations. But once considered, curvature trading can be a powerful tool in your arsenal. We will discuss some of these factors in the following examples.

CURVE ADVISOR EXAMPLE 1
Trading Support (or Resistance)

Consider the following structure: buy the EDU5-H6-U6 6mo fly and sell 2x as many of the H6-U6-H7 6mo fly. The U5 6mo fly was -8, while just 6 months away the H6 6mo fly was +9. It is highly unusual for two nearby 6 month flies to be so diametrically opposed. The four year scatter plot in Chart 4 shows that the structure had been higher on both a rally and a selloff.

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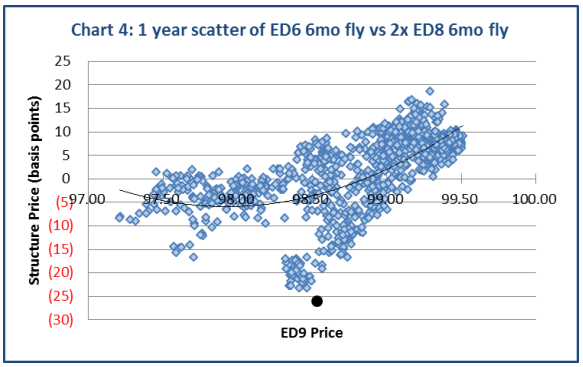


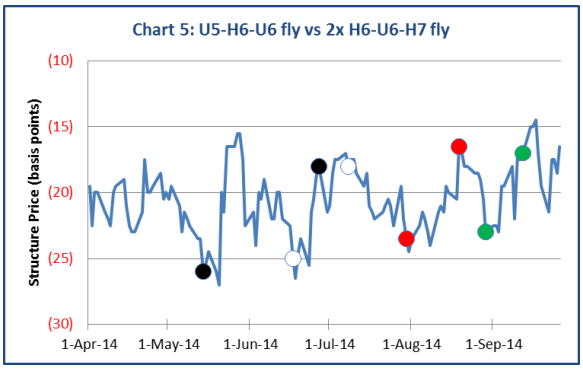
During April 2014, it seemed to have bottomed around -23. In a "standard" buy-the-support method of trading, you would buy the -23s since that is where the support was, and stop out a few basis points lower. However, there was an unusual market dynamic at the time. The H6 contract was aggressively bid because of massive purchases in the reds by certain market participants. The U6 contract was aggressively offered because of the large short positioning in futures and put buying in options. Because of these strong opposing flows, there seemed to be a high probability of a dip in the structure, and the trade would be that much more attractive then. Note that when we eventually dipped below the previous April support level of -23, that was not necessarily a bad sign for the trade. The fundamentals of the trade were even stronger, so we were able to put the trade on with more conviction.

Reasons to like the trade included:

- this was the new 4 year low,
- there was 26bps of positive roll in 6 months (1bp per week),
- on a big selloff, the U5 6mo fly had much more room to rally than the H6 6mo fly, and
- on a big rally, being short 2x as many of the H6 6mo fly would allow the trade to outperform.

In addition, the H6-U6 spread was unusually high relative to the surrounding 6 month spreads (57.5, vs 49.5 for U5-H6 and 48.5 for U6-H7). There was no compelling fundamental reason for this large a difference to persist – in equilibrium, the U5-H6 spread would need to go higher, the H6-U6 spread would need to go lower, and/or the U6-H7 spread would need to go higher *relatively*.

Chart 5 shows that this range trade was profitable FOUR times in the next four months:



1) [Black dots] The leg down that I had been seeking developed on May 14, and the structure went below our -25 entry price. We missed the exit two weeks later, but got another chance to lock in the gain at the end of June.

2) [White dots] In the interim, another opportunity to do the trade presented itself on June 17. At the time, I preferred adding the 1:1 version of the trade (instead of 1:2 version) because a more bearish lean seemed appropriate going into the FOMC meeting. A few weeks later, we locked in the gain.

3) [Red dots] On July 25, a third opportunity presented itself. I pointed out in that issue of the Curve Advisor that the curve was being affected by extreme volumes of puts going through in the 5th, 6th, 9th and 10th contracts. EDU6 would go from a contract with high put demand (ED9), to a contract with low put demand (ED8). Since it was mid-way to the contract roll, it made sense to start being a little more aggressive on the entry. We raised our bid accordingly. This was a great trade for payrolls, and when the structure dipped after payrolls, the trade made more sense fundamentally, so we added. Note that had we waited until our old level of -25, we would not have been filled. We only exited 50% of the trade four weeks later, thinking this had more to go.

4) [Green dots] Unfortunately, the structure went back down, but there was plenty of room to add to the position. Clients reloaded on August 29,

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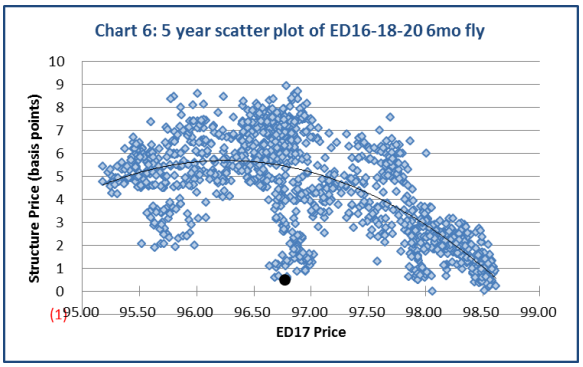
and two weeks later, the entire position was closed out.

It is much easier trading a range when you know you can benefit from the nonlinearity of a structure. A good fundamental story plus good historical back-up results in more robust trading of support and resistance levels.

CURVE ADVISOR EXAMPLE 2
Trading A Defined Range

When there is a hiking cycle ahead of us, it is natural for the curvature at the longer end of the yield curve to be more positive. As explained in Part 1 of this series, one interpretation of curvature is as a function of FOMC landing probabilities. As long as it is possible for the FOMC to stop the hiking around a point, curvature should be positive, all other things being equal. Curvature could go negative if the markets start pricing in an FOMC overshoot in rates, or if there was some kind of very extreme demand scenario. Both of these events are highly unlikely in the current environment.



As you can see from the five year scatter plot of the ED16-18-20 fly in Chart 6, the historicals bear out the fundamental story of positive curvature. Buying this "range-bound" structure near zero makes a lot of sense in the current environment, as there are both bullish and bearish scenarios where this could improve. But this part of the curve is also too far out for the markets to price in any type of aggressive landing probability. Therefore, selling this butterfly near the highs of the range also makes sense.

Note that if we were in an environment where a slow and lengthy hiking cycle was not anticipated, the range may not hold. This is an example of what a robust range trade should look like – something with both a good fundamental story, as well as good historical evidence to back it up.

SUMMARY

Butterflies are an attractive vehicle for range trading, as the nonlinearity of some butterfly structures allows you to take higher probability support and resistance views. Some butterfly structures may have well-defined ranges that can be traded successfully. Curvature positions are especially attractive if there are fundamental factors embedded in the structure which strengthen the case for a lower and/or upper bound in a specific market environment. If you are not trading curvature, you are not making full use of the trading tools available to you.

Joseph Choi was a senior proprietary trader in J.P. Morgan's Global Currencies and Commodities Group. He was consistently profitable in trading Eurodollar butterflies over his seven year trading career. He was one of the largest discretionary users of Eurodollar futures and options, trading well over 10 million contracts a year. Mr. Choi started the Curve Advisor newsletter in 2011 to discuss trade-specific market views on the Eurodollar curve and to help clients explore opportunities in curvature trading.

Go to www.CurveAdvisor.com for newsletter excerpts, a Eurodollar discussion forum, the top curvature trading misconceptions, and other information on trading curvature. Contact Joseph Choi at JChoi@CurveAdvisor.com with any questions or comments.

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