Counterparty credit risk uncovered - part one

Terri Duhon, managing partner at B&B Structured Finance and author of 'How the Trading Floor Really Works', discusses counterparty credit risk on interest rate swaps

For as long as derivatives have been around, counterparties have taken contingent credit risk to each other. Originally, the efforts to quantify and manage this risk were relatively simple, but over time they have evolved and become more sophisticated. As well, the derivatives transactions themselves have become more complex and the size and diversity of each counterparty's positions have grown.

Overlay this with the new (and still debated) regulatory guidelines around credit value adjustment (CVA) and counterparty credit risk seems like an impossible concept to understand. This article – which examines counterparty credit risk on interest rate swaps – is the first in a series that aims to make the counterparty credit risk space accessible to everyone and ultimately relate counterparty credit risk to CVA.

In the broad scheme of things, while everyone is jumping up and down about the counterparty credit risk in the credit derivative market, the bigger risk in terms of transaction notional is from the interest rate swap market – which is more than ten times the size of the credit derivative market. Interest rate swaps are also easier to think through because we can broadly ignore correlation as a risk factor, as will be explained in the following articles on CDS and Wrong Way Risk.

The concept of counterparty credit risk is to some extent a function of dealers maintaining a hedged derivative trading book. For example, the dealer pays fixed e.g. 3% (versus receiving floating) with a client. It hedges by receiving fixed e.g. 3.04% (versus paying floating) from another dealer on the same notional, currency and maturity, assuming all other terms are equal.

The risk about which the dealer is concerned is that the client defaults when the dealer is in-the-money on the client trade. In this example, that occurs when interest rates have risen.

For example, if interest rates move to 4%, the dealer is 100bp in-the-money on the client trade. If the client now defaults, the dealer has to replace the trade with the client to keep his trading book hedged.

The 'replacement trade' is executed at 4%, which is the current market rate. This crystalises a loss for the dealer, which it will now want to claim back from the client. (We will talk about the process of making this claim in a following article on the ISDA framework.)

What the dealer wants to know when it executes the trade is with some degree of certainty what amount of money it could lose if the client defaults. Thankfully, we have loads of historical data in the interest rate swap market.

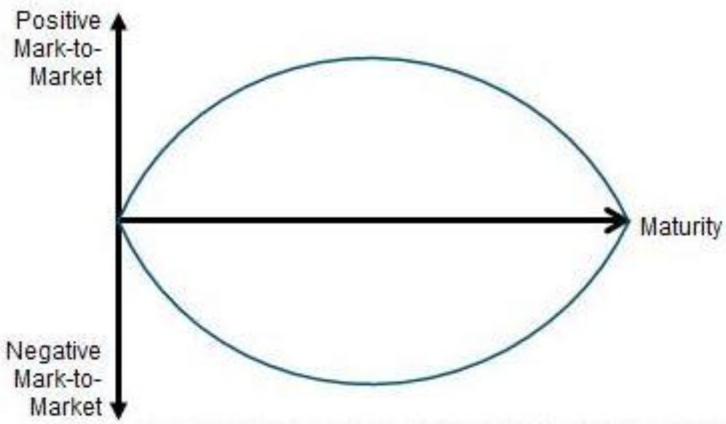
In particular, we care about the volatility of interest rate swap prices. In other words, how much can we expect interest rate swap prices to move, and hence how much might the dealer be in-the-money, over the life of the client trade? We care about the entire life of the client trade because we don't know when a client default might occur.

Breaking the calculation down into intuitive steps, we can use daily historical volatility to tell us with a certain degree of confidence (e.g. 95% or 99%) what the maximum amount the mark-to-market could be on the trade with the client tomorrow. Then from that point, we can see what the maximum amount the mark-to-market could be on the trade with the client the following day.

This allows us to draw a picture of what the potential future exposure is on this interest rate swap with the client. Intuitively, the potential mark-to-market on this trade should get increasingly higher as time goes on because it's more and more possible for interest rates to move away from the original market price.

However, the increase in the potential mark-to-market of the swap over time is countered by the approaching maturity of the interest rate swap. Eventually, the decrease in the duration reduces the potential mark-to-market and is the dominant feature of the calculation.

Finally at maturity, the potential future exposure is almost zero because there is only one net payment left and same-currency interest rate swaps don't have principal exchange. Thus, the maximum potential exposure is around about half-way between the trade date and maturity. For example, the maximum potential exposure on a five-year interest rate swap could be on the order of 4% of the swap notional (see the diagram below).



The graph of the potential future exposure, both positive mark-to-market and negative-mark-to-market over the life of the interest rate swap trade.

On the day the dealer executes with the client, we say that there is equal probability that interest rates can go up as well as down. (This is obviously debatable in reality, but it simplifies the analysis.) This means that the dealer has equal counterparty credit risk when it pays fixed on the interest rate swap as when it receives fixed on the interest rate swap. Thus we do the same calculation regardless of the direction of the trade.

At this point, we have only dealt with the market risk component of the counterparty credit risk. That is, we have looked at how the dealer's counterparty credit risk can be affected by movements in the interest rate market – the more interest rates move, the higher the dealer's potential exposure.

The second component is the credit risk of the client. That is, we now need to look at how the dealer's counterparty credit risk can be affected by its counterparty's creditworthiness – the less creditworthy the counterparty, the higher the probability that the dealer will be exposed to the potential exposure.

Simply put, we can think of the credit risk in loan terms. When the dealer does a five-year US$100m interest rate swap with the client, we can think of this as similar to giving out a loan which increases from zero (which is the mark-to-market of the swap on the trade date) to US$4m (which is the maximum potential exposure) and then decreases over time back down to zero. US$4m is the 4% maximum potential exposure mentioned in our example, times the swap notional of US$100m.

The dealer should be compensated for taking or hedging credit risk to the client in the same way it would be if it gave this loan to the client. In other words, in a simplified world, if this client has a credit spread of 50bp, then the dealer would receive 50bp over and above its borrowing cost (assume Libor) for lending money to the client or pay 50bp to buy CDS protection to hedge its credit risk to the client.

Let's assume that the dealer's average potential future exposure on the swap is 2% or in this example, US$2m. Thus to protect the dealer from this risk, the dealer could buy protection via CDS on the client on its potential future exposure of US$2m or set aside the present value of 50bp on US$2m when it does a five-year US$100m interest rate swap with the client.

This works out to a cost of approximately 1bp running on the full $100m notional of the swap. In theory, this should widen the dealer's bid-offer by 1bp on either side.

In reality, not all dealers use the same assumptions or hedging strategies and this is a competitive market. Also, dealers take into account the other interest rate swap trades done with this counterparty, as well as any collateral agreement (generally the Credit Support Annex executed as part of the ISDA Master) and any other credit risk to this counterparty. It may be that the risk to the dealer is far less than 1bp running or it could be that this interest rate swap reduces the credit risk to the client because it is an unwind of a previous trade.

Over time of course there is no guarantee that the mark-to-market on the swap will behave as we have assumed with our calculations. Thus, the management of this risk is a never-ending process of re-evaluating and re-balancing hedges.

Regardless, the theory is the same: analyse each trade based on the market risk of the product itself and the credit risk of the client, and then analyse the trade in the context of the overall existing exposure to the client. When we break it down into these steps, it no longer seems as complicated as it does at first glance.

The next article in the series will examine how correlation changes the analysis for credit default swaps.

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