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The smart way to manage financial risk

Under the Hood: Valuation, Issue 2

With the increased focus on valuation in financial statements due to new accounting and regulatory standards, this article focuses on some of the reasons why valuations of the same financial instruments may differ depending on their source.

We present a set of steps which can assist in resolving these potential differences.

Step 1: Determine Materiality

Whether a difference between two valuations is worth investigating depends not only on the absolute size of the difference, but also on its size *relative* to the face value of the underlying instrument.

For the latter, the materiality of the difference depends on how sensitive the valuations are to market data inputs. The sensitivity of valuations of interest rate instruments to changes in rates is sometimes known as *delta*. This measures the change in value for a one basis point rise in interest rates. The delta is also known as a present value per basis point (PVBP).

For FX and commodity instruments the delta is the amount that the value changes for a move of one tick/pip in the underlying spot rate.

When options are involved, volatility data is difficult to come by, and even when it is available, most banks will use their own volatilities. This data is a key input to the valuation of options and determines how competitively the options can be priced by a bank. As a result, most banks won't reveal the exact volatilities they use. When valuing options, working backwards to solve for the volatility may be the best approach. In doing this, we can also observe the sensitivity of a valuation to a change in volatility, also known as *vega* (normally measured as the change in value of an option for a one percent rise in volatility).

Using Sensitivities

It is important to focus on the difference in terms of its equivalent number of basis points, ticks/pips or vol points etc.

Example 1:

At current interest rates, a \$100m five year swap would have a PVBP or delta of about \$45,000. A difference of \$10,000 between two valuations would be trivial (equivalent to a $10,000/45,000 \approx 0.2$ basis point difference). Conversely for a \$1m five year swap with a delta of \$450, this would be a large discrepancy (equivalent to $10,000/450 \approx 22$ basis points).

Example 2:

If an option is valued at \$15,000 using a volatility of 10%, but rises to \$20,000 using a volatility of 11%, then the vega is \$5,000. If the bank valuation of the option was in fact \$17,500, or half the vega amount, then we can estimate that the volatility used by the bank was 10.5%. We can then decide whether the difference in volatility is reasonable or not. In this case the difference is only 0.5%, which can occur on any given day's trading. But if the difference was 1% or 2% then there may be reason to ask the bank to explain their valuation.

It is up to the reporting entity and their auditors to decide on a tolerance level in terms of these sensitivity measures.

Step 2: Validate Instrument Details

If it is determined that the valuation difference is material, then the first port of call is to ensure both sources are looking at the exact same instrument.



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Minor differences in the underlying details of the instrument can cause big changes in valuations. These could arise because of user input or a misunderstanding as to the exact instrument details.

For example,

- The first rate set for an interest rate swap might be entered incorrectly, or the rate set date might be wrong, which would affect the accruals numbers.
- The day basis might be incorrect for an interest rate instrument.
- Exotic derivatives are often constructed from several vanilla instruments. If a counterparty does not provide a breakdown of the instrument used to structure the deal then we can only assume which instruments were used and so valuation may be different. A difference of interpretation might occur here as the payoff scenarios can be quite complex.

To rule out this possible source of variance, every detail of the instrument should be cross-checked.

Step 3: Check Market Data

If both sources appear to be using the same instrument, then it's time to check that both valuations are derived from the same market data.

Data related differences

a) Compare interest rate curves

The curves used to carry out the valuations may differ. For example, if you use end-of-day data for Australian time, but a counterparty uses end-of-day data based on US time, then the valuations could be different. The data can also vary between providers such as Reuters or Bloomberg as they might have different sources and ways of capturing the rates. Finally, data spikes can occur where the data provider has given an incorrect rate, probably due to human error.

Another problem can be the interpretation of the market data. For instance, swap rates can be quoted based on different fixed rate payment frequencies (e.g. quarterly, semi) and/or different day bases (e.g. Act/360, 30/360).

b) Check Volatilities

As noted above consistent volatilities can be difficult to obtain. For many markets the market volatility will vary according to the time to maturity and the strike price of the option. So care should be taken when obtaining and using these rates for valuations and comparisons.

Market-related differences

a) Determine bid-offer spreads

IAS39 requires that an instrument is valued using its replacement cost (i.e. a bid for an asset and an offer for a liability). But for hedge accounting it may be possible to use a mid-price. Frequently a bank may add a spread on to a valuation that they are providing for accounting purposes as an "insurance" against being asked to deal on the valuation number. When comparing valuations, you will need to compare like with like.

b) Consider transaction sizes

Similarly, unusually small or large amounts may be approached differently by a bank. Small amounts are sometimes quoted with an extra premium to normalise the bank's margin. Large amounts can be priced differently depending on market depth and conditions.



A system will typically not account for the above factors so you would need to ensure you understand what adjustments another counterparty might be making.

Step 4: Check for Model Differences

Finally, the calculation engine which takes all the inputs might differ. Some possible problems here are

- Different interpolation methods, for generating interest rate curves there are a variety of methods for calculating and interpolating zero rates. Cubic spline, exponential and linear are all used. These can lead to variations in valuations. However, such variations will usually be small.
- For options there are a number of methods to value these, apart from the standard Black-Scholes formula. Monte Carlo simulation or assumptions of non-constant volatility are common.

Step 5: Next Steps

If you have got to this stage and not resolved the difference, it can be difficult to get much further. On the vanilla side, you might be able to get a list of all of the cash flows and discount factors that make up the valuation to compare. For options, it may end up being a case of accepting that different models produce different numbers and settling on a single consistent source of values for accounting purposes.

Future Topics

In a later article we will discuss options and exotic instruments. Valuing these instruments is different to vanilla instruments because the cash flows are contingent on certain events. With swaps and forwards, we know when a cash flow will occur and simply need to estimate the amount. With options and exotic instruments, we are unsure if the cash flows will occur because they rely on strike prices, barriers and other conditions.

If you would like us to discuss any particular aspect of valuation or any other risk management topics in a future article then please contact us.

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