WHITE PAPER:  
Credit Value Adjustment / Debt Value Adjustment [CVA/DVA]

DERIVATIVE VALUATIONS ADJUSTMENTS - HOLISTIC VIEW

Before the financial crisis the credit risk on derivatives were mostly considered insignificant, a view that was quickly revised when risks increased and traders started adjusting the values quoted on derivatives from counterparty to counterparty, and so market prices began to diverge. Naturally this evolved into calculating “valuation adjustments” from the mid-market price as part of trading to account for the credit risk of the counterparty with whom you were trading with. The calculation of these adjustments became standard among banks and regulation subsequently required them to be included as part of the fair value of derivatives within financial statements.

More recently, with the introduction of IFRS 13, the concept of “non-performance risk” within fair value was included within the accountancy standards of any corporates who had elected up to IFRS standards. Non-performance risk covers anything that could influence the likelihood of an obligation being fulfilled. For derivatives the credit risk is one of the more prominent non-performance risks but is not the only risk. In addition, the methodologies required to quantify such risks are not trivial.

In addition to the value of these adjustments significantly impacting the purchase price of a derivative, from banks or counterparties factoring them into the value, on restructure the change in the value of these adjustments can often be the value-driver for the cost borne or savings received e.g. as the new restructured trade may have greater valuations adjustments which would be a cost to the restructure or lesser adjustments which would be a release to the restructure.

This paper aims to summarise the leading valuation adjustment calculation methodology and briefly explain and summarise the key valuation adjustments produced.

CORE VALUATION ADJUSTMENTS
Credit Valuation Adjustment (CVA)

CVA encompasses the credit risk of your counterparty to you. The size of your credit risk is dependent upon the size of the exposure that you have with your counterparty e.g. a bank. If the value of a large derivative position with a bank is positive (in the money) then it is saying that the future cashflows on the obligation is likely to be valuable to you given current market expectations of future market conditions. If your counterparty were to default then you could potentially lose the value of these cashflows.

If current markets rates and expectations of future market rates were to change such that the obligation became negative to you (out of the
money) then there will be very little credit risk as you’re not expected to receive a benefit from the obligation, so the counterparty defaulting would not be a concern, however a credit risk would still exist as, right up until the maturity of the contract, as there is always the chance that market rates change again so that the obligation becomes in your favour again.

From this we can see that possible movements in the market can be important. It is common to calculate the possible future values of the obligation to the client by running scenarios in order to model how the value of the derivative may change based on market expectations of future volatility. The same methodologies can be used as market option pricing and tens of thousands of simulations can be run to show how the derivative valuation may change under different market circumstances, an example of this charting 100 paths of such a calculation is below:

Once the likely future exposure on the obligation has been calculated:

- The likelihood that any positive value might be lost is derived.

- Then the percentage of value that is assumed to be recoverable in a default scenario is removed from the calculation, to produce the loss in event of default amount (Loss Given Default – LGD).

- The LGD is then adjusted by the probability of whether or not the default might occur. The default probability is normally implied from market trading of the counterparty’s credit spread.

- The probability adjusted loss is then discounted to today to produce the present value of the risk, which is the amount by which the derivative’s value should be adjusted.

This is a broad overview of a full CVA calculation methodology however there are many factors within the process that can impact the credit risk produced such as:

- the impact of collateral held against a counterparty

- netting between trades with a counterparty

- the impact of your own default on your counterparty exposure.

Simplified approximations of the method described here are available in the market; which rely heavily on the assumptions applied.

**Debit Valuation Adjustment (DVA)**

The debit valuation adjustment is the impact of your credit risk on the value of a derivative (which would be the CVA from the perspective of your counterparty looking at you). Some people find the concept counterintuitive, especially as the movement in DVA often offsets movements in the value of the derivative, so that when the value of the derivative decreases there’s an increase of the DVA through the financial statements. There are, however, some strong arguments for DVA to be included in the derivatives fair value.

The first argument is that the DVA is necessary in order to get an equal view of the derivative from both counterparty’s point of view and so arrive at a single mid-market price for the derivative, from which the pre-CVA/DVA value is normally derived.

The second argument is that the DVA has always been included when pricing a bond and so this can be viewed as an extension to derivatives. DVA can be most easily seen at issue when a spread to the coupon is added to account for your own credit risk. Subsequent trading in the bond takes into the value of the issuer’s credit risk in calculating the traded price, which is very similar to a DVA. The reason that a bond doesn’t exhibit CVA is due to the fact that the flows after
issue are always to the investor and never from
the investor and so there is no investor risk.

The third argument, is that in financial
statements if there were to be a self-default on a
derivative obligation then only the amount that
can be recovered would be paid. The amount
written off can be viewed as a benefit to the
bondholders.

Bilateral Valuation Adjustment (BVA)

BVA = CVA + DVA and is used as a short hand
reference for the two adjustments added
together.

Funding Valuation Adjustment (FVA)

Funding valuation adjustment is heavily debated
in the market and a standard calculation
methodology is still being worked towards.
Derivative obligations will normally have a
funding impact on a firm, which is normally
a benefit (FBA) or a cost (FCA). The funding
valuation adjustment aims to capture this impact
but, given that a firm normally funds at a risk free
rate plus it’s own credit spread plus additional
factors such as new issuance premium, liquidity
premium etc, there’s clearly an incomplete
overlap with the DVA calculation where the
additional factors can be difficult to quantify.

OTHER VALUATION ADJUSTMENTS

Collateral Valuation Adjustment (COLVA)

It is common for one or both counterparties
to post collateral against the current market
value of a derivative in order to reduce the
counterparty risk against the counterparty.
The impact of collateral needs to be taken into
account when calculating the CVA/DVA and
often significantly reduces the magnitude of
one or both of the adjustments. Often collateral
is posted infrequently, or only when the market
case exceeds a certain value, and so in practice
credit risk often still exists in the presence of
collateral. The impact of collateral can just be
included in the final value of CVA/DVA or can be
separated out into a separate COLVA adjustment.
In the market it can often be the case that
securities other than cash can be used instead
such as gilts, treasury bills or other assets which
can warrant a more sophisticated calculation of
COLVA.

A Word on Discounting

It is normal to receive interest on cash collateral
posted to a counterparty; as the counterparty
will invest the money in the overnight market* on
your behalf. For collateral overnight is the
maximum length of time the money can be
invested as the market rates may change and
the collateral could need to be returned the
next day. In some instances a counterparty is
able to borrow money in the overnight market
to fund the collateral posting. It is therefore
normally assumed that collateralised swaps are
funded using overnight and therefore the value
of the swaps should be derived by discounting
at OIS rates. This has been a change from
methodology used before the crisis when most
market participants discounted at Libor rates
however this change is supported by market
theory in the fact that OIS rates are closer to
a “risk free” rate than 3m/6m Libor as one is
more easily able to take a position on whether
a counterparty is going to be around tomorrow
in the overnight market over whether a bank
is going to be solvent in 3m/6m time. In the
past it has also been the market convention to
discount uncollateralised derivatives at libor
however, while it is recognised that OIS + XVA
is more appropriate, calculation of CVA/DVA
results are computationally complex when
performed accurately and are not yet required
under all accounting standards. Until CVA/
DVA adjustments more widely applied and
the discussions around FVA alluded to above
are resolved, many market participants have
chosen to continue to use the libor discounting
assumptions in many situations, in line with past
calculations.

* e.g. “Sonia” is the daily average rate of GBP
deposits made in the overnight market. This is
treated as an index within derivatives such as
the overnight index swap “OIS” where a 3m OIS
swap exchanges a fixed amount in 3 months (e.g.
£100 at 0.5%) for the compounded cumulative
return from investing (e.g. £100) in the overnight
market each night at the overnight average rate
for 3 months.
Capital Valuation Adjustment (KVA)

Basel regulation requires banks to hold capital against their derivative exposures. The incremental cost of holding the regulatory capital against a trade is encapsulated by the KVA and, while a real cost to the bank, is very hard to estimate and varies from counterparty to counterparty and from one regulatory environment to another.

Margin Valuation Adjustment (MVA)

MVA covers the remaining credit risk after margin payments on derivatives cleared through a central clearing house, but otherwise is very similar in calculation to COLVA.

XVA

XVA is the sum of all the adjustments applied to a trade e.g. CVA + DVA + FVA + KVA +....

CentrusAnalytics has been built based upon financial analytics provided by Numerix, a market leader in such analytics, and aims to calculate derivative valuation adjustments for its clients and its clients’ financial statements. The combination of in house modelling capability, derivatives pricing and accounting expertise and the use of a market leading software allows us to offer holistic services in relation to derivatives management. Our experts can provide strategic, operational and accounting support and are working as an extension to our clients treasury teams providing high quality risk and accounting reporting as well as support with stakeholder management. Please feel free to contact Centrus for more details.

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