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The Different Guises of CVA

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SOLUM FINANCIAL PARTNERS LLP
www.solum-financial.com

Introduction

The valuation of counterparty credit risk via credit value adjustment (CVA) has long been a consideration for banks, especially those with large over-the-counter (OTC) derivatives positions. The global financial crisis has increased the significance of counterparty risk and CVA as credit markets have become extremely turbulent. Changes to regulatory capital rules and accounting standards have emphasised the importance of CVA still further. Basel III capital rules require a specific capital charge for the volatility of CVA (so-called CVA VaR) and IFRS 13 accounting standards make a more specific reference to the calculation of CVA as a market determined value. Controversy exists over DVA (debt value adjustment), which is the mirror-image of CVA and relates to an institution's own default.

Given all the importance of CVA, something that is particularly surprising is that it is not very well-defined as a quantity and can differ significantly across institutions. This refers to both mathematical definitions and practical parameterisation and implementation. An extreme example of this is that some institutions do not price CVA into trades nor include it in their accounts. More subtle examples involve the use of historical or market implied parameters, choice over including DVA and assumptions around closing out trades in the event of a counterparty default. Whilst future accounting standards and regulatory capital rules appear likely to create more uniformity over CVA quantification, it is not clear how rapid and complete the convergence will be.

With the above in mind, the current paper aims to define the differences in CVA approaches between different institutions and also *within* the same institution. We explain how future accounting and regulatory requirements are likely to create a convergence but also highlight aspects that will create on-going divergence.

Two banks, two different CVAs

There exist very different practices within the market when institutions calculate CVA charges. This is driven largely by current accounting standards which are not precise about if and how CVA should be accounted for. For example, if two banks are in competition on a trade, the following components may explain why their pricing in relation to CVA may be different:

- ***Risk mitigants.*** With respect to netting and collateral, different institutions see a different trade populations and collateral (CSA) terms. For this reason, risk mitigants will have different impacts and create different prices. Extreme examples of this are trade unwinds (where – all other things being equal - the original counterparty should give the most competitive price due to netting benefits) and first trades (where the counterparty with no existing trades should give the worst price). Note that this is a completely realistic reason for prices being divergent.
- ***No or limited CVA treatment.*** Although increasingly less common, it is still possible that banks may not charge CVA or may knowingly reduce CVA charges so as to win a trade even at a CVA-induced loss[1].
- ***Modelling assumptions.*** Different modelling assumptions lead to different prices. This will include choices over multi-factor models, smile approaches and also the treatment of subjective components such as collateral and break clauses[2].
- ***Parameter assumptions.*** Even within the same model, different parameter assumptions for calibration will create price divergence. The most significant difference here comes in the choice of real world vs. risk-neutral parameters. In particular, real world default probabilities (for example, driven by ratings) tend to be significantly smaller than risk-neutral (driven by credit spreads) values.
- ***DVA and FVA.*** Finally, choices over the use of DVA and FVA (funding value adjustment) create price divergence. For example, DVA can be seen as reducing CVA charges and would lead to the more risky institutions being the most aggressive in pricing counterparty risk.

With the exception of risk mitigants (and potentially FVA), the above differences between CVA calculations do not have any economic reality. Future changes to regulatory capital rules and accounting standards appear to create forces of convergence and may lead to more uniformity. For example, IFRS13 and Basel III lead towards risk-neutral parameters, in some cases explicitly. However, IFRS13 and Basel III are discordant on the treatment of DVA. This leads to a further consideration, which is to what degree different definitions of CVA different even *within* a single institution.

[1] One example of this latter effect is charging less CVA on cross-currency swaps under the assumption that this will be balanced by profits on shorter dated FX trades with the same client.
[2] For example, optional or rating linked.

One bank, three different CVAs

Within a bank, there may exist multiple definitions of CVA. The most obvious would be accounting CVA (for books and records), front-office CVA (for pricing new transactions) and regulatory CVA (for defining capital requirements). This is particularly important to consider as misalignment between CVA definitions can lead to poor trading decisions, incorrect assessment of risk and mismanagement of capital. For example, if accounting and front-office CVA definitions do not match then apparently profitable trades may not appear that way to shareholders and PnL volatility as seen by a CVA desk may not be equivalently represented in earnings volatility. Another example would be that if front-office and regulatory CVA were misaligned then a reduction in capital may increase CVA volatility and vice versa (for more discussion on this point see our whitepaper last month entitled "CVA Capital Charges: A Comparative Analysis").

CVA definition may differ for both fundamental and regulatory reasons. The differences are summarised in Table 1:

	Default Probability	Exposure	DVA	Exceptions

Accounting	• If CVA is seen as a reserve then real world:
	  ○ Historical (or blended) default probabilities
	  ○ Historical volatilities and correlations
	• If CVA is seen as a market price then risk-neutral:
	  ○ Credit spread implied default probabilities
	  ○ Market implied volatilities and correlations (where available)
	• Current accounting rules (IAS 39 / FAS 157) do not give clear direction
	• IFRS 13 requirements over exit price imply a risk-neutral approach (particularly relevant for the calculation of default probabilities)
			• Currently mandatory (FAS 157) or optional (IAS39)
			• Future IFRS 13 requirements imply DVA is mandatory
				Possible exceptions:
				• Collateralised counterparties
				• Short-dated trades
				• Central cleared (CCP) trades
				• High credit quality counterparties

Front-office (for trade pricing)	• Potentially risk-neutral (spread based) even if bank's accounting CVA is defined historically • May charge based on historical (or blended) but then ignore DVA	• Typically risk-neutral exposure • Real world simulation if used will probably be a facet of using older PFE type systems for CVA calculations	• Typical price will include some (but not all) of the DVA (not with real world default probabilities)	
Regulatory (CVA VAR)	• Risk-neutral (Basel III clearly defines CVA with respect to credit spreads) • Mapping methods are important	• Real world parameters for simulation (IMM), or implicit in other methods (e.g. CEM) • Risk-neutral approach a consideration for IMM banks to give better alignment • Stressed VAR component creates misalignment • Need to assume fixed EAD for CVA VaR creates misalignment as related hedges do not achieve capital relief	• Not allowed (no DVA offset in calculation of CVA VAR)	Only possible exceptions are: • CCPs • European Sovereign exemption (CRD IV)

Table 1. *Comparison of different CVA definitions as they apply to OTC derivatives.*

We discuss the different CVA definitions in more detail below:

- ***Default probability.*** A major classical split in CVA practice has always existed in defining default probabilities where both real world (historical[3]) and risk-neutral (spread-based) have been deemed acceptable under accounting requirements. To some degree the difference is definitional since real world approaches view CVA as a reserve or provision whereas risk-neutral calculations define it as a market price with DVA typically used as an offset. Nevertheless, this point is still controversial as historical default probabilities tend to give much lower CVA numbers. Typically, large banks with more significant OTC derivatives exposures have tended to follow a risk-neutral approach. Looking forward, where robust front-office CVA pricing is implemented, it tends more commonly to use risk-neutral default probabilities so as to be market based. Within an institution (at least for a period of time), accounting CVA may often lag behind front-office pricing approaches and be more historically-based. Basel III capital requirements and IFRS 13 accounting requirements define default probabilities as risk-neutral and spread mapping procedures for illiquid names are therefore important. It seems likely that such changes will drive CVA to be consistently defined as being spread based, irrespective of the liquidity of the underlying credit derivative market.

- ***Exposure.*** The distinction between using real world and risk-neutral exposure is less significant than the similar default probability definition. This is partly because the differences tend to be less severe and partly because in some cases choice does not occur. With respect to the latter point, drifts are normally calibrated to forward rates[4] and correlation and some volatilities often have to be estimated as real world (historical) parameters since there are no relevant market traded instruments. Front-office pricing will always tend to be based on risk-neutral parameters where possible so as to align with hedging. Whilst there is flexibility in both accounting and Basel III capital requirements, use of risk-neutral exposure here would appear to be more obvious so as to produce alignment. However, a bank would need to be under the advanced approach to expect a reasonable alignment for capital purposes and even then would have to use a "stressed risk-neutral calibration" which creates a unbridgeable gap between regulatory/front-office and Basel III exposure (see aforementioned whitepaper "CVA Capital Charges: A Comparative Analysis"). Finally, the requirement to fix EAD in the CVA VaR calculation creates the problem that CVA market risk hedges (e.g. interest rate, FX) that reduce CVA PnL volatility actually cause *increases* in CVA capital.[5]

- ***DVA.*** Not all banks use DVA in accounting and some do not include it in front-office pricing although, as noted above, this would generally be tempered by using historical or blended default probabilities. At the time of writing, US and Canadian banks (FAS 157) are required to account for DVA whilst European banks (IAS 39) are not. Future accounting rules under IFRS 13 require DVA to be included but, on the other hand, Basel III capital rules clearly state that DVA benefits must not be included.[6] Front-office pricing often falls between the extremes of accounting and capital definitions with some, but not all, of the DVA component included and capped by the CVA component so as not to pay more than the risk-free price (paying through mid) for a trade. The treatment of DVA in pricing would also depend on the trade type, presence of a collateral agreement and sophistication of the counterparty in question.

- ***Exceptions.*** CVA across a portfolio is very heterogeneous with the CVA of a bank concentrated mainly over a relatively small proportion of trades and counterparties. For this reason, accounting and front-office CVA may focus on only a proportion of a total portfolio with well-collateralised[7] or short-dated trades and those with high credit quality counterparties often ignored. Regulatory requirements, on the other hand, do not permit such sweeping exceptions with only central cleared trades and certain other specific exemptions[8] allowed. Notably, collateralised OTC trades, often ignored elsewhere must be capitalised.

[3] Sometimes blended default probabilities may be used which are historically based but with some risk premium component derived from credit spreads also included.
[4] On the basis that estimating "real world" drifts equates to predicting the future.
[5] We note this is not related to CVA definition per se but rather to a simplification in representing the dynamic movement of CVA through time.
[6] "Application of own credit risk adjustments to derivatives - consultative document", Basel Committee on Banking Supervision, http://www.bis.org/press/p111221.htm and http://www.bis.org/press/p120725b.htm.
[7] Meaning typically collateral agreement with small thresholds.
[8] A significant example being the European sovereign exemption for the CVA capital charge under CRD IV. Other exemptions, such as for non-financial exposures are being lobbied for.

Summary

In this paper, we have described how definitions and quantification of CVA can differ both across different institutions and also within an institution. Despite the large amount of focus around CVA valuation and management, CVA itself can vary substantially in ways which do not have any solid economic rationale. Clearly, a convergence of market practices is needed. Firstly, all other things being equal, CVA charging and accounting across different institutions should be consistent. Secondly, the definition of CVA within an institution for different purposes should be equivalent so as to produce alignment between accounting, front-office PnL and regulatory capital charges. Whilst future accounting and regulatory capital requirements due for implementation in 2013 seem to aid the standardisation of CVA components and convergence of market standards, only time will tell how rapid and complete this transformation will be.

Contact us

Solum Financial Partners LLC
12 Austin Friars
City of London
EC2N 2HE
United Kingdom
+44 207 786 9230
research@solum-financial.com

Solum Financial Partners LLP is authorised and regulated by the Financial Services Authority

Jon Gregory
Partner
jon@solum-financial.com
+44 207 786 9233

Rowan Alston
Senior Consultant
rowan@solum-financial.com
+44 207 786 9238

Bernard Stroobandt
Senior Consultant
bernard@solum-financial.com
+44 207 786 9241

Nicolas Gakwaya
Senior Consultant
nicolas.gakwaya@solum-financial.com
+44 207 786 9234

Thu-Uyen Nguyen
Partner
tu@solum-financial.com
+44 207 786 9231

Vincent Dahinden
CEO
vincent@solum-financial.com
+44 207 786 9235

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