SUNGARD ADAPTIV

ADAPTIV AND INTEDELTA

Credit Valuation Adjustment
the challenges of implementation

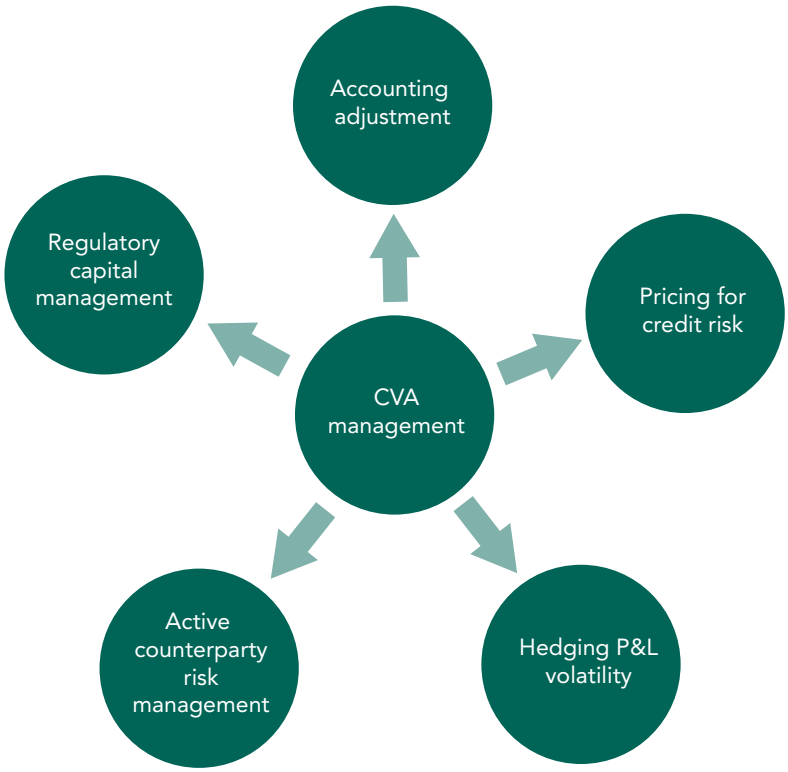
InteDelta

TABLE OF CONTENTS

CREDIT VALUATION ADJUSTMENT - THE CHALLENGES OF IMPLEMENTATION

INTRODUCTION

There are many texts on the theory of Credit Valuation Adjustment (CVA) but CVA is about much more than theory. The motivation for setting up an infrastructure to manage CVA varies considerably across institutions. The implementation of a CVA function can be highly political as it cuts across product lines and blurs the boundaries between risk management and the front office. There are also considerable systems, methodological and trading challenges. In this paper we examine some of the different motivations that have lead institutions to set up a CVA function and the practical issues they have faced.



DEFINITION OF CVA

The simplest definition of CVA (and we are not going to get into the mathematical complexities) is the expected (i.e average) credit loss arising on counterparty transactions. This can be thought of as the product of the expected exposure (the mean of the distribution of the evolution of mark to markets), the counterparty default probability and the "loss given default".

WHY MANAGE CVA?

There are a number of motivations for establishing a CVA function which are given different emphasis in different institutions.

The mandate of a CVA function can therefore vary between institutions. The diagram above shows some of the key factors influencing the establishment of a CVA function.

The move to fair value accounting requires that financial contracts are marked to market. For credit risky products this means making an **accounting adjustment** to reflect the possibility of counterparty default. In many institutions the need to calculate such an accounting adjustment was one of the first reasons for considering CVA. In many Tier 2 and 3 banks this may still be the only relevance of CVA, and in such cases the methodology and systems surrounding CVA tend to be fairly simplistic and the "management" of CVA just consists of a report produced by the finance or risk management function. Most Tier 1 banks, and an increasing number of Tier 2 and 3 institutions are, however, realising that there is more to CVA than just an accounting adjustment, and that a more sophisticated approach to measurement and management is required or desirable. Even if CVA is considered solely as an accounting adjustment, the methodology can become highly sophisticated, giving rise to modelling challenges which are described later in this paper.

Many banks have established a regime for **credit pricing**. A bank usually starts by putting in place a process to ensure that it fairly prices credit risk into its customer deals and that it is adequately compensated for the credit risk taken on. This is often accompanied by an approach to measure the bank's Risk Adjusted Return on Capital (RAROC) with its clients. When banks first implement credit pricing there is an often a requirement for originators to meet a RAROC hurdle but they remain the "owners" of the credit risk generated. The next stage in the evolution of credit pricing is to establish an internal transfer pricing mechanism whereby the credit risk is transferred to a central function and the originating desks pay "insurance" to divest themselves of this risk. This is the point at which measurement methodologies can no longer be highly simplistic, infrastructure needs to be developed and the politics starts.

When a regime of credit transfer pricing is in place, an embryonic CVA "function" has been established. The CVA function has its own P&L – it collects premiums from the originating desks in return for indemnifying them against the credit risk they have originated. Any counterparty losses are borne by the CVA function. In some institutions the CVA function does no more than this and there is no further active management of CVA. Such a function may nevertheless significantly improve the management of counterparty risk. A problem of traditional counterparty risk management is that the front office often care little about counterparty risk unless they have a limit constraint. Sure, if the counterparty defaults they may not get a bonus, or worse, but the likelihood of this is considered so remote that it does little to modify behaviour. The imposition of credit pricing means that the front office is constantly focussed on the risks they are taking because it immediately affects their P&L. If the pricing properly reflects risk mitigation such as close-out netting and collateralisation, the front office will also be motivated into ensuring that credit risk is mitigated as fully as possible. This is a more healthy environment than a bank in which risk management seeks to impose credit mitigation techniques but the front office sees this as bureaucracy which may lose it the deal.

The next stage in CVA sophistication comes when the management of CVA moves from being passive to active by entering into trading positions. This can take different forms in different institutions. In some institutions the primary motivation is to **hedge P&L volatility**. Market spreads can be very volatile, particularly in times of market turbulence. The CVA charge can introduce a major volatility into the P&L. Citigroup's 2009 4th quarter earnings, for example, included a $1.9 billion correction to CVA versus earnings of $3.5 billion. Many banks see the hedging of P&L volatility as one of the primary roles of the CVA desk.

Other institutions extend this role of the CVA function to more **active counterparty risk management**. The CVA desk is responsible not only for hedging counterparty risk for the purpose of reducing P&L volatility but also has a remit to facilitate more business by hedging exposure against specific names where there is an appetite for more business but credit limits are constrained. Hedging counterparty risk is costly and should only be done after other mitigation techniques such as ensuring the transaction can be netted, collateralisation, break clauses and mark to market resets have been applied. Such risk mitigation techniques have been historically insisted on by risk management. Whilst the ultimate determination of policy should remain the domain of risk management, there is an increasing trend for some responsibility to be transferred to the

active counterparty risk function which can take a holistic view of counterparty exposure and has responsibility for the whole range of techniques to manage it which may or may not include buying hedges.

The final driver that often comes into play when banks are establishing a CVA function is the **management of regulatory capital**. The double default formula under Basel II allows for a reduction in regulatory capital where counterparty exposure has been hedged by buying protection or is otherwise guaranteed. This gives rise to a role for the CVA function in optimising regulatory capital.

In its December 2009 paper *Strengthening the Resilience of the Banking Sector* the BIS expressed concern that over the financial crisis CVA losses were substantial but in many cases failed to be captured by Basel II capital. The BIS made some controversial proposals on changes to the measurement of regulatory capital to incorporate CVA. Whatever the final shape of the Basel III rules, CVA is bound to feature prominently in the calculation of regulatory capital, and the importance of the management of CVA will therefore continue to grow.

ORGANISATIONAL CHALLENGES AND THE NEED FOR AN OPERATING MODEL

The above discussion highlights a number of organisational reasons why a CVA function can be a challenge to implement:

- There can be a variety of reasons for establishing a CVA function and the emphasis placed on these will vary from institution to institution
- The CVA function impacts many parts of an institution and may result in these functions losing some responsibility to the CVA desk. The impacted functions typically include other front office areas, credit risk management, finance and regulatory risk
- P&L is transferred from other trading desks to the CVA desk and the basis of inter-desk charging can be highly political

The path to the implementation of a CVA function can be greatly smoothed if an **operating model** is established at an early stage which is bought into by all affected parties. Institutions which regard the implementation of a CVA function as a purely modelling and systems implementation exercise are likely to face difficulties if they have not confronted the organisational issues at an early stage. An operating model should include:

- Mandate of CVA function
- Reporting lines – is the CVA desk a front office or risk management function? Most banks which actively trade CVA locate this function in the front office, although the function is sometimes seen within risk management. Where active management does not take place it is more common for the CVA function to be located within risk management or even the finance function
- Whether the CVA function is a profit or cost centre. If it is a profit centre, the basis of inter-desk charging should be specified
- Interaction with other departments. How, for example, will the CVA function interact with credit risk management and how will the latter's responsibilities change.

MODELLING ISSUES

CVA poses some challenging modelling issues. This is not intended to be a highly technical paper and we will refrain from the mathematical detail.

The starting point for the calculation of CVA is generally the calculation of Expected Positive Exposure (EPE). This is a similar metric to Potential Future Exposure (PFE), which most banks use for limit control purposes, except EPE is the expectation of the exposure distribution whereas PFE is measured to a much higher confidence level, typically 95%, 97.5% or 99%. A spectrum of methodologies exists for the calculation of PFE, from a simple "mark to market plus add-on" approach to Monte Carlo simulation. If CVA is to be used as a relatively crude accounting adjustment an add-on methodology may suffice. However, if CVA is to be actively traded a Monte Carlo methodology will almost certainly be required.

Although there is some debate amongst practitioners, most would agree that real world (historical) simulation should be used for the calculation of PFE whereas risk neutral (market implied) is required for CVA. The implication is that it is likely some of the models used will be different between PFE and CVA, and where the same models are used these need to be calibrated in different ways.

Once the exposure element of the CVA calculation has been determined the default scenarios may now be applied. The least sophisticated methodologies for calculating CVA simply involve multiplying EPE by a static Probability of Default (PD) and Loss Given Default (LGD). This may be sufficient where CVA is used as a simple accounting adjustment, but a more sophisticated calculation is required for trading purposes and particularly to capture wrong way risk (see below). This is often achieved by correlating PD with market risk factors as part of the simulation process.

Adjustments may also be made in the calculation to take account of the order of default of the counterparty and the bank. If CVA is to calculated for trading purposes, particularly if it will be dynamically hedged, it will be necessary to calculate CVA sensitivities, such as IR, FX, Credit deltas, gammas and cross-gammas. If this has to be done by a brute force "bump and run" method, the number of calculations required is further increased by orders of magnitude.

A further modelling issue is that of wrong way risk – the risk that transaction exposure and counterparty default may be positively correlated. Counterparty risk is substantially increased in the presence of positive correlation because at the time of default the MTM of the counterparty's portfolio is likely to be much greater than its average value. Wrong way risk is difficult to model because it requires correlations to be systematically introduced between default probability and transaction MTM. Such correlations are very difficult to determine and practitioners' approaches vary from the imposition of fairly crude judgmental correlations to attempts to build sophisticated correlation models.

Finally, but by no means least, is the issue of whether CVA should be calculated on a unilateral or bilateral basis. Unilateral CVA only takes into account the bank's exposure to its counterparties. A bilateral calculation also includes the counterparty's exposure on the bank. This is based on the principle that the total CVA in the system is a zero sum gain. A simple illustration will demonstrate the point. If two similarly rated banks enter into a derivative transaction, say an interest rate swap, and they both calculate CVA on a unilateral basis, both banks calculate that a spread for credit risk is required from the other counterparty. If they both stick rigidly to this requirement they will fail to agree on a price and the deal will not get done. If, however, the banks both calculate CVA on a bilateral basis they should both calculate that one party owes the other the same spread because they both take into account the risk that they have on the other. The spread is actually unlikely to be zero because the exposure distribution will not be completely symmetrical with respect to paying and receiving the floating rate and there may also be some differences in the counterparties credit spreads. Nevertheless, if the banks use consistent models and data (a big if) they should in theory agree on who owes what to whom, and the deal can then proceed.

A commonly cited disadvantage of bilateral CVA is that it leads to the apparently counter-intuitive result that if the bank's own credit spread widens, for example as a result of a downgrade of the bank, the CVA will show a P&L gain. Because the bilateral CVA calculation includes a deduction for the counterparty's exposure on the bank, bilateral CVA will generally be lower than unilateral.

Banks need to make a choice as to whether they will measure, report and manage CVA on a unilateral or bilateral basis. Both are seen in the market and in some cases the same bank uses both measures for different purposes.

SYSTEMS AND HEDGING

Systems represent one of the most challenging aspects of implementing a CVA framework and the challenges follow mainly from the complexity of modelling CVA. CVA is a relative newcomer to the world of pricing and risk calculations and most institutions who embark on a CVA initiative already have in place an engine for the calculation of PFE. Most

banks initially therefore consider whether their framework for CVA can build upon their existing PFE infrastructure. There are clear synergies in implementing a single risk engine for the calculation of PFE and CVA:

- The transaction, legal netting and collateral data required by the two engines is identical as is much of the market data. A common engine only needs one set of interfaces to be developed
- Separate risk engines require duplication of testing and calibration, both on initial implementation and for the addition of new products. The ongoing resources required to maintain a single engine are also lower
- The business and risk management can be certain that they both have an identical population of transactions for the CVA and PFE calculation.

However there are also challenges with this approach. The issues that typically arise in this appraisal are:

- Is the PFE calculation sufficiently accurate? If the bank is calculating PFE for all products under Monte Carlo this may be suitable for extending to CVA. If, however, the bank is using mark to market plus add-on for PFE and intends to build a sophisticated framework for CVA, it is unlikely to be able to build on its existing PFE capabilities
- Is it possible to extend the PFE framework to calculate CVA? For example, can the framework be recalibrated under a risk neutral assumption?
- Will the system offer sufficient performance? As we have seen, CVA requires much more processing power than PFE, particularly if sensitivities are also required for trading processes. If the PFE framework was already struggling to meet required performance, it is unlikely that it will be fit for the calculation of CVA.

In addition to the above challenges that stem primarily from modelling issues, if CVA is going to be actively traded an application is also required that provides traders with a front end to hedge the CVA. The sophistication of this trading application will depend on the type of hedging undertaken. The most simple type of hedging is restricted to static hedging of just the credit risk component of CVA. However other risk factors that contribute to CVA such as Interest rates and FX can also be hedged on a dynamic basis.

Despite these benefits of a single engine for CVA and PFE many institutions still select separate engines. This is most commonly occurs where there is an incumbent PFE engine within the institution which cannot meet the requirements for being extended to CVA. Building on the Front Office infrastructure offers the advantage of consistency with the Front Office pricing, but usually presents severe performance challenges, as Front Office models are usually not designed to age through their lifetime in a Monte Carlo simulation, nor are they typically sufficiently fast for a CVA pricing calculation. There is one other factor that should not be underestimated: politics. In many banks the PFE systems are under the responsibility of risk management and CVA falls under the front office. If a consensus cannot be rapidly arrived at for a harmonised approach between PFE and CVA, the front office is often seen to lose patience, get out its cheque book, and attempt to implement its own system. This may have short term attractions, but is likely to end up being the most inefficient and expensive option in the long run.

BEST PRACTICE CVA WITH SUNGARD'S ADAPTIV:

SunGard's Adaptiv provides enterprise-wide credit pricing, risk management and operations solutions for financial services institutions.

Adaptiv delivers fast, accurate CVA calculations with a low cost of ownership. Putting CVA to work for front and middle offices, Adaptiv creates a shared understanding of risk among CVA desks, traders and business heads.

Find out more at www.sungard.com/enterpriserisk.

Speak to an expert: +44 (0)208 081 2779

www.sungard.com/enterpriserisk

ABOUT SUNGARD

SunGard is one of the world's leading software and technology services companies. SunGard has more than 20,000 employees and serves 25,000 customers in 70 countries. SunGard provides software and processing solutions for financial services, higher education and the public sector. SunGard also provides disaster recovery services, managed IT services, information availability consulting services and business continuity management software. With annual revenue exceeding $5 billion, SunGard is ranked 435 on the Fortune 500 and is the largest privately held business software and IT services company.

For more information, please visit SunGard at www.sungard.com.

ABOUT INTEDELTA

InteDelta is a risk management consultancy whose mission is to help financial institutions better manage their risk. Through our range of consulting and associated products we provide assistance in areas such as advising on policies and methodologies, systems implementations and conducting market intelligence.

Our areas of expertise cover the major risks faced by institutions: credit, market and operational risk, and we also have a number of more niche specialisms such as collateral management.

Our clients range from some of the world's largest banks and asset managers to medium sized banks in developing markets, hedge funds, risk software vendors and other consultancies.

For more information, please visit InteDelta at www.intedelta.com

12/03-/2010-CMIB