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SOLUM FINANCIAL PARTNERS

Counterparty Risk and CVA Survey

Current market practice around counterparty risk regulation, CVA management and funding

February 2013

Contents

Preface

It is with great pleasure that we present this Counterparty Risk and CVA Survey, the result of a collaborative effort by Deloitte UK and Solum Financial Partners in conjunction with Deloitte Germany, Deloitte Italy and Deloitte Norway. Counterparty risk management has been a key area of focus for financial institutions over the past few years, and the aim of this survey is to take stock of the industry's response to the numerous theoretical issues and operational challenges raised as a result of the evolving regulatory, accounting and risk management environment.

We would like to express our thanks to the institutions and individuals who participated in the survey. The time and dedication put in by the respondents in articulating their views was a key contributing factor to its success.

We trust you will find this survey topical and insightful, and we hope the contents will help you navigate this rapidly changing environment.

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Executive summary

Counterparty risk is a topic which has been elevated to the forefront of the front office, risk management and regulatory agendas following mark-to-market volatility and defaults over the global financial crisis.

Universal acknowledgement of credit valuation adjustment (CVA) and debt valuation adjustment (DVA) as essential components within the fair-value of derivatives and securities financing transactions has reinforced the importance of counterparty risk management across a much broader spectrum of financial services firms. As a result, banks are facing a much stricter regulatory environment, the impact of which will have far-reaching implications for the way they manage their counterparty credit risk (CCR) through CVA and how they ensure that they are generating sufficient return on capital. There are additional requirements on financial reporting under revised international accounting standards. Finally, the uncertainty in the international financial markets has also resulted in sizeable increases in the cost and scarcity of funding available to banks.

Since the previous survey conducted by Solum Financial Partners in 2010 there have been significant changes to the regulatory framework governing financial institutions, and we see such supervisory considerations permeate almost every area of the survey responses. We have adopted an approach that provides three different analysis perspectives: a regulation point of view, a CVA standpoint and finally a focus on trading and valuation challenges related to counterparty risk modelling. The first part of the survey in particular focuses on the implementation challenges associated with the new regulations, and how respondents are managing the capital cost and the operational and methodological challenges of transitioning to the new regime.

The forthcoming Basel III revisions to the counterparty risk capital standards represent a meaningful departure from the existing regime, and the introduction of CVA VaR will materially increase the capital held against bilateral credit exposure.

The survey found that the perceived capital savings that could come from leveraging the advanced CVA approach is incentivising a new set of respondents to pursue advanced 'internal model method (IMM)' approval from their respective supervisory bodies and existing IMM banks to expand their product coverage.

The introduction of a low risk weight to central counterparties (CCPs) will force banks to hold capital for exposures to CCPs which was not required before and would require the modelling of exposures to CCPs as well as default fund contributions. Emerging securities markets legislation which is designed to mandate the use of CCPs for standardised derivatives and requires robust margining for bilateral trades, has placed renewed emphasis on banks' ability to model collateralised exposure.

The ability to model collateral has also come under regulatory scrutiny with Basel III introducing additional conservatism into the so-called shortcut method, on which a quarter of those IMM banks surveyed were reliant. The responses revealed that banks have a considerable way to go in this space, with a large majority of the respondents unable to perform full collateral modelling over the entire duration of the trade, and fewer still capturing other credit support annex (CSA) specific features, FX mismatches or price variation in non-cash collateral. There is however, an acute awareness amongst those surveyed that this is fast-becoming an urgent priority in order not only to allocate capital efficiently, but also to price these instruments correctly.

The valuation challenges presented by collateral agreements were explored within the survey, especially as consensus is emerging amongst practitioners for the need to move away from LIBOR discounting for secured funding trades – and in fact survey responses indicated the overwhelming majority of participants are moving towards overnight index swap (OIS) discounting. A smaller, but growing subset of those respondents also commented that they had the capability to capture the optionality associated with multi-currency CSAs within the discount rate.

It is however not just collateralised exposures for which participants have recognised the need to integrate more closely the funding costs and benefits into pricing. Such considerations are encapsulated within what is known as a funding valuation adjustment (FVA) for their uncollateralised equivalent; a theme explored throughout the survey. Virtually all participants acknowledged the necessity of such an adjustment, even if the accounting standard setters appear to be less convinced. Furthermore, the majority of respondents already claim to charge for FVA at the trade level and charge it to the relevant trading desks, analogous to CVA and DVA. That said, the extent to which all three components can be simultaneously incorporated within the fair-value and in what proportion, is something which is still the subject of much debate and academic interest.

The widespread acknowledgement that such considerations materially impact the price, must then necessitate an integrated framework within which banks can adequately risk manage their exposure to each component. The final part of the survey explores the operational and organisational challenges faced by banks and looks at how they are overcoming such difficulties and implementing solutions within the context of their own operations.

What is clear is that the regulatory, accounting, front office and risk-management perception of counterparty risk has changed dramatically in recent years, bringing to the forefront new technical challenges for banks. In particular, areas such as OIS discounting, collateral optimisation and funding have become increasingly important. This survey is designed to capture market practices in these new areas, and in particular to highlight the heterogeneity in how these risks are measured, managed and mitigated given the unique set of organisational constraints specific to each participant.

Despite having much more clarity as to the final form and substance of the emerging banking and securities markets regulations, and the fact that banks are further advanced in developing their CVA risk management capabilities, future trends remain very hard to predict. Certainly, we expect CVA, DVA and FVA to remain at the forefront of the risk, regulatory and accounting agenda for some time to come.

What is clear is that the regulatory, accounting, front office and risk-management perception of counterparty risk has changed dramatically in recent years, bringing to the forefront new technical challenges for banks.

Glossary

AMC	American Monte Carlo
BIS	Bank for International Settlements
CCDS	Contingent credit default swap
CCP	Central counterparty
CCR	Counterparty credit risk
CDS	Credit default swap
CEM	Current exposure method
CollVA	Collateral valuation adjustment
CSA	Credit support annex
CVA	Credit valuation adjustment
DVA	Debt valuation adjustment
EAD	Exposure at default
EEPE	Effective expected positive exposure
EPE	Expected positive exposure
FVA	Funding valuation adjustment
HJM	Heath Jarrow Morton (model)
IFRS 13	International Financial Reporting Standard 13 'Fair Value Measurement'
IMM	Internal model method
LGD	Loss given default
LMM	LIBOR market model
MTM	Mark-to-market
OIS	Overnight index swap (rate)
OTC	Over-the-counter
PD	Probability of default
PFE	Potential future exposure
P&L	Profit and loss
RWAs	Risk-weighted assets
SCSA	Standard credit support annex
VaR	Value at risk
WWR	Wrong way risk

Survey methodology

This survey has been conducted jointly by Deloitte UK and Solum Financial Partners, alongside Deloitte Germany, Deloitte Italy and Deloitte Norway. The survey examines the approaches used to manage CCR in light of the financial crisis and increased regulatory focus covering CVA, DVA and FVA. We surveyed 21 banks in 2012 and their responses were given as a current state of the situation that existed at that time. Subsequent changes may have occurred.

This survey report is based solely upon the responses received from the participant banks. Not all participants have provided the same level of detail in relation to all sections and questions. In addition, the participants represent a wide cross-section of the industry and, as such, the extent and granularity of their responses will be limited by the extent of their operations.

The approach involved having each of the participating banks complete the survey. In some instances follow up interviews were conducted for consistency and completeness. The answers were anonymised and analysed for key trends.

Within the survey the number of banks represented can be broadly described in two ways. The first are those banks who already have much of their CVA infrastructure in place in terms of models, systems, CVA desks and regulatory approvals. These banks are focusing more on enhancing their capabilities across FVA, CVA hedging and capital optimisation. The second group of banks are in the process of developing their CVA infrastructure with respect to accounting rules, trade pricing, CVA desk setup and obtaining advanced regulatory approval.

Introduction

There continue to be significant shifts in the financial landscape as a result of increased regulatory scrutiny and the tougher operational environment for banks. The extent of change is evident when comparing results of this survey to the one carried out by Solum Financial Partners in 2010. The scope is broader primarily as a result of the growing importance of CVA in light of accounting requirements and Basel III capital rules. The survey questions were designed to span a broad spectrum of topical issues, including how banks are positioning themselves ahead of the revised Basel III counterparty risk requirements, CVA pricing and risk-management solutions; and their integration within the existing architecture, valuation challenges for collateralised counterparties and the incorporation of funding costs. Before analysing the results, we first consider the key background areas and themes that are the subject of this survey.

Accounting

International Financial Reporting Standard (IFRS) 13 'Fair Value Measurement' is effective from 1 January 2013. It is based largely on the accounting standard applied in the U.S. One of the aims of IFRS 13 is to harmonise the definition of fair value and in doing so harmonise the approaches to determining fair value in accounting. Fair value is characterised as an exit price, which is described as the price that would be received or paid in an orderly transaction between market participants. An important but complex component of fair value is the CVA (and DVA).

There appears to be market consensus that the reference to an exit price in the accounting standards will necessitate a move from historically-based to risk-neutral (market-implied) parameters in CVA quantification. This is very significant in terms of default probability estimation. Whilst many large banks have for a number of years used market implied default probabilities to calculate their CVA, this practice has been less common in smaller banks that have not been subject to the U.S. accounting standard, FAS 157 (generally those domiciled outside the U.S. and Canada). A natural consequence of the remaining banks moving to risk neutral CVA is that overall accounting CVA numbers will be significantly higher and more volatile. This is due to the well-known existence of a significant risk premium within a credit spread, making the proportion of risk-neutral default probabilities significantly larger than real world ones, especially for high quality ratings.

The CVA profit and loss resulting from the systemic component in a credit spread can be essentially offset with the analogous component within a bank's own credit spread. This latter component is contained within the DVA component which is also a requirement of IFRS 13. IFRS 13 requires an institution to account for the fair value of the non-performance risk (also referred to as the entity's own credit risk) of their liabilities. Some banks question the use of DVA as it implies they profit from their own declining credit quality and leads to hedges which may create wrong way and systemic risk. Other banks see DVA as a completely logical component, alongside CVA, which can be monetised (albeit with some difficulty). Some banks see DVA more as a funding benefit and therefore the links between DVA and funding must be considered carefully.

Regulatory capital

The first version of the Basel III capital requirements had a large focus on CCR and CVA, and left little doubt that the associated capital requirement needed to be substantially increased. It explicitly mentioned that essentially two-thirds of the risk, due to CVA volatility, was not capitalised at all. The Basel Committee introduced the concept of a new capital requirement for CVA VaR which makes a clear reference to credit spreads as the driver of default probability in the CVA formula. Under Basel III, this risk-neutral default probability requirement is explicit. It should also be noted that, although DVA is an accounting requirement under the fair value measure, the benefit arising from it must be removed from Tier 1 equity and is therefore not allowable in quantifying capital requirements under Basel III. This represents a double blow as Basel III forces the use of comparatively high risk-neutral default probabilities without giving the associated benefit of own default risk. Furthermore, Basel III does not consider market factors other than credit spreads (for example interest rates and FX rates) which limits the scope for potential capital relief through hedging.

Basel III gives two possible frameworks for the calculation of CVA VaR: the standardised and the advanced. The framework used depends on whether a bank currently has IMM and specific interest rate risk approval for bonds. Capital relief is given for hedging with single name and index credit default swaps (CDS) and it seems that Basel III is intending to push banks to hedge their CVA credit component where possible.

This is potentially controversial as the CDS market is not particularly liquid for all counterparties, and it is not clear to what extent banks hedging their CVA relating to illiquid counterparties with credit indices represents a reasonable form of risk transfer. Furthermore, the more straightforward CVA related underlying asset hedges may actually consume, rather than reduce, capital. The unintended consequences of CVA hedging have already created problems in terms of market instability such as in spiralling sovereign CDS spreads driven by CVA desk hedging. This, together with the need to reduce CVA VaR charges for sovereign exposures (resulting from interest rate hedging of large debt issuance), has led to an exemption in Europe for sovereign CVA VaR (under CRD IV covering the implementation of Basel III capital rules). A further exemption for European non-financial counterparties is also under consideration. Possible capital relief achieved through other hedging strategies, such as that provided by synthetic securitisation for example, is another possibility for potentially improving efficiency.

Implementing changes in capital rules will clearly represent a very significant cost for banks (and therefore their clients). However, the complexity of capital methodologies, together with the uncertainty around specific rules and possible exemptions, makes the overall magnitude of this hard to gauge.

Alignment of front office, accounting and regulatory practices

Within a given bank, there can exist multiple definitions of CVA. The most obvious examples are 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 inappropriate 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 profit & loss (P&L) 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.

Whilst accounting standards and regulatory capital rules appear likely to create more uniformity over CVA quantification (for example by use of risk-neutral parameters such as credit spreads), they also create ambiguity (for example in terms of DVA benefit). It is therefore not clear how rapid and complete the convergence will be, and to what extent a bank should attempt to align these calculations.

CVA, DVA, funding and risk-free valuation

Since CVA and DVA should adjust the non-credit risk value of a trade or portfolio, it is crucial to determine the correct way to perform a benchmark risk-free valuation. In recent years, the significant rise in short and long term funding rates has seen attention placed on both risk-free valuation and funding costs. LIBOR rates, previously seen as a close proxy for risk-free rates, are now seen as inadequate discount rates due to their credit and funding component divergences with respect to both tenor and cross currency basis effects. This has driven the need to use dual curve, or OIS discounting (at least for valuing collateralised derivatives). There has been a trend to switch to these more sophisticated valuation methods, led by CCPs and banks. Related to this discounting issue there is a need to account for currency and type of collateral posted under the CSA (or other) agreement and ideally the optionality inherent in collateral posting requirements and substitution rights.

The financial crisis has driven short-term rates such as LIBOR away from benchmark risk-free rates. Additionally, banks are being required to rely less on short-term funding and more on longer-term, more costly borrowing. These aspects have led to the notion of FVA due to the need to assess funding costs and benefits in the valuation alongside other elements such as CVA and DVA. There is controversy over whether or not FVA should form a component of pricing and also to what extent it overlaps with the existing notion of DVA. Coupled with the fact that there are no specific accounting and regulatory requirements governing the use of FVA, this leads to very different treatments of funding benefits and costs.

Survey findings

It is evident that the investment in IMM programmes is paying off as an increasing number of banks are heading towards IMM compliance.

1. Regulation

1.1. Overview

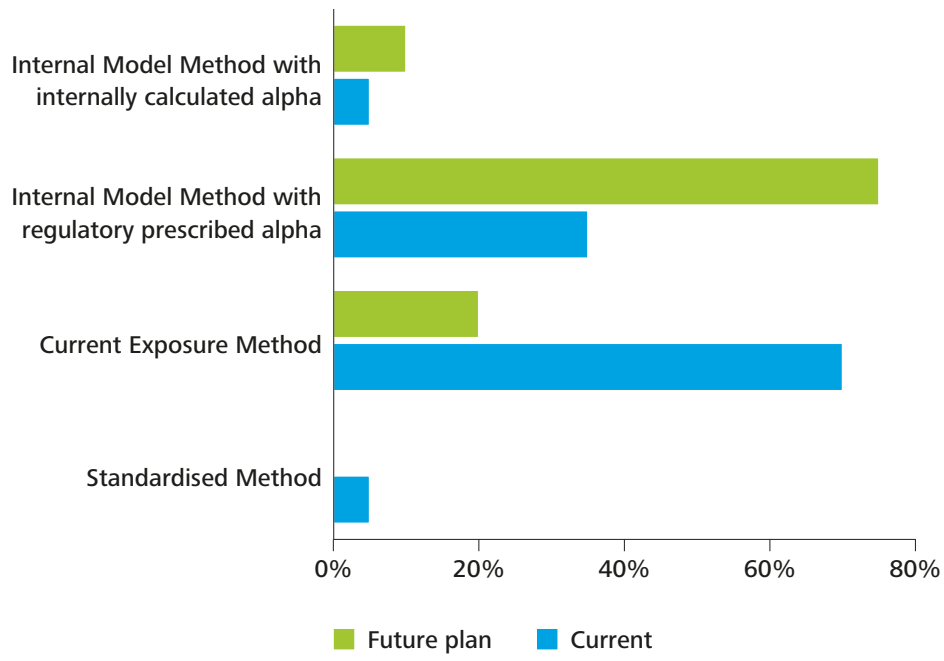
Over the course of 2012, banks' CCR programmes were mainly focused around obtaining IMM approval prior to the Basel III 'deadline' imposed by the Bank for International Settlements (BIS), previously set to January 2013 and recently extended to later in 2013. Failure to calculate CCR exposure under IMM would have had a significant double blow on banks from both the regulatory capital charge as well as the regulatory CVA charge: banks would have had to calculate the CVA VaR charge under the standardised approach whilst pursuing the much-needed IMM approval which would permit the use of the advanced CVA approach.

It is evident that the investment in IMM programmes is paying off as an increasing number of banks are heading towards IMM compliance. Banks that are compliant with IMM do not have full coverage across their portfolios as some exotic trades are calculated using a semi-analytical approach, and for which regulatory capital requirements are determined based on the current exposure method (CEM).

1.2. Exposure modelling approach

About 70% of the banks interviewed are currently calculating regulatory capital associated with their CCR exposures for at least a part of their portfolio using the CEM. However, there is continuing effort towards gaining full IMM approval by means of organisation-wide large-scale projects, using the prescribed alpha factor in the first instance followed by the assessment for use of their own alphas.

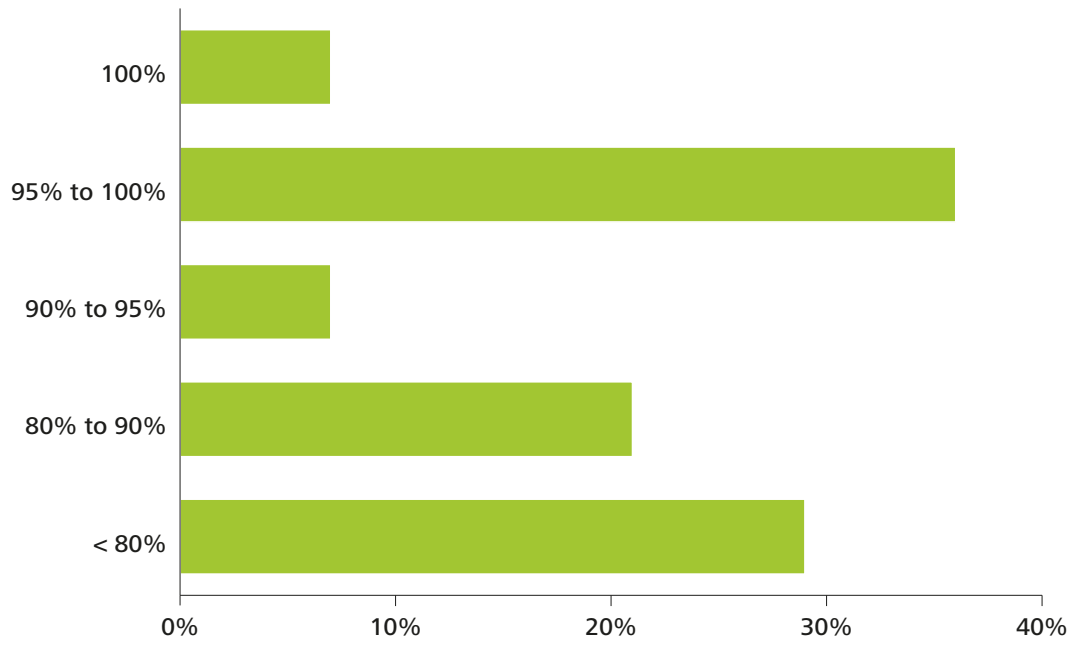
Figure 1. Regulatory capital calculation approach



The alpha factor applied to effective expected positive exposure (EEPE) in order to capture portfolio diversification and general wrong way risk (WWR) effects, is currently prescribed at 1.4, unless the regulator deems it necessary to increase this factor (on a case by case basis), in which instance the regulator will provide the particular bank with an alpha factor which it deems appropriate. Whilst not many banks have done internal analysis to assess the 'true' alpha associated with their own portfolios, 1.4 is deemed to be conservative and, using subjective judgement, alpha is generally expected to be between 1.2 and 1.4.

For banks which use a combination of IMM and CEM, the proportion of trades for which exposure is calculated using IMM is either small (less than 80%) or large (more than 95%), indicating bimodal behaviour amongst the participants, and, potentially, the market. Interestingly, it is not necessarily the larger banks that have a greater proportion of trades under IMM.

Figure 2. Exposures measured under IMM



1.3. Collateral modelling approach

The majority of banks are using, or planning to use, the full collateral modelling approach. About 70% of banks apply haircuts to non-cash collateral, and just under 60% of banks consider the FX risk associated with nondomestic currency collateral. The challenge lies in the modelling of the collateral portfolio composition, with only 43% of banks ensuring future margin calls and postings are anticipated and incorporated in the future. Given the increased focus on collateral management that will flow as a result of increased interaction with CCP clearing houses, there is likely to be an increased effort to improve collateral modelling.

Figure 3. Collateral modelling approach

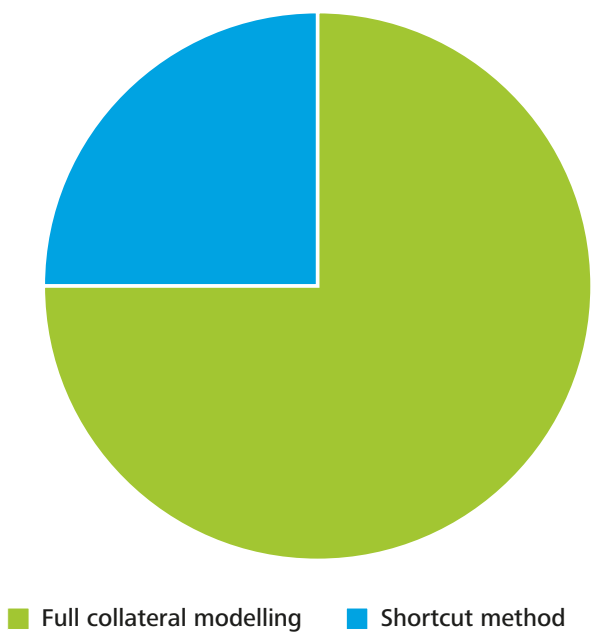
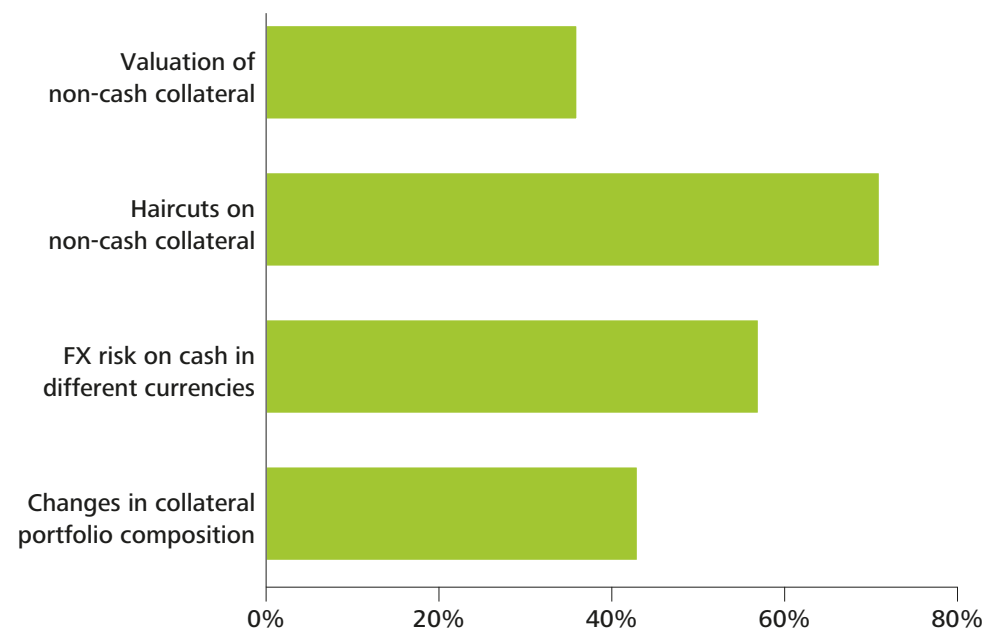


Figure 4. Collateral model characteristics



We questioned respondents on the common issue of the allocation of collateral between netting sets which contain trades which are modelled using a combination of IMM and CEM approaches. The two approaches mostly observed to deal with this issue are:

- Ensure all IMM trades are fully collateralised, using the collateral for IMM trades first and then allocating any remaining collateral to the CEM trades.

- Allocate collateral proportionally between IMM and CEM trades, based on the absolute mark-to-market (MTM) at day 0.

Both approaches only allocate collateral at the current time, and re-allocation of collateral across time does not seem to occur over the life of trades belonging to that particular netting set. This is mainly attributed to system restrictions since most banks calculate CEM and IMM exposures in different systems (or sub-systems).

1.4. From Basel II to Basel III

The implementation of projects that will ensure compliance with Basel III requirements are generally well underway, although there is a sense of relief that the Basel III/CRD IV effective timelines for CCR have been postponed.

In order to use the advanced CVA approach under Basel III, the bank is required to hold regulatory approval for the Specific Interest Rate Risk VaR model for bonds. As there will be a significant difference in the amount of capital required, hedging permissions and intuitive representation between standardised CVA and advanced CVA, internal debates as to whether a bank should use standardised CVA or advanced CVA continue. Almost 70% of the participating banks already have Specific Interest Rate Risk VaR model for bonds approval (either partially or fully), with those who currently do not have this approval planning to do so in early 2013.

However, the challenge lies in determining the CDS for names that do not have actively traded CDSs. The proxy methodology to be used should be based on general industry, region and rating, which poses a question on the derivation of this proxy CDS level. The question remains as to whether the CDS should be based on the specific intersecting dimensions only, or whether a proxy should be considered based on an average of the industry, region and rating, whilst ensuring appropriate representativeness when incorporating hedging. Sourcing and mapping names to the appropriate proxy is a practicality which is proving to be unnecessarily challenging. Half of the banks surveyed have indicated that they will be adding a specific credit risk spread to the general proxy based estimate to account for the fact that counterparty is not traded.

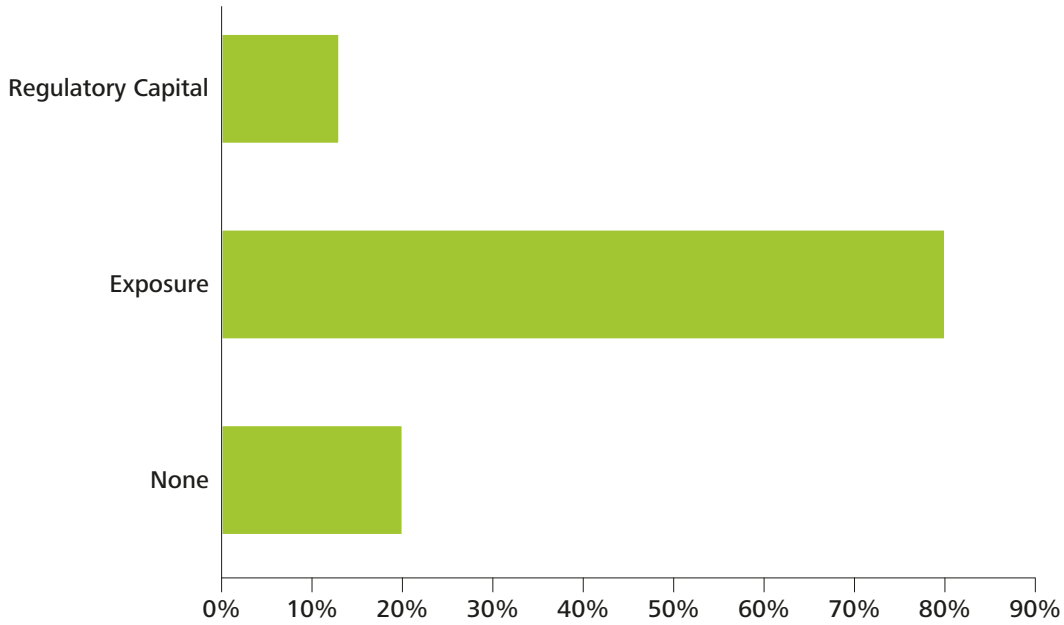
Once the cost of the new capital charge has been determined, the costs will be passed from the bank to the client by capturing it in the return on capital charge, with the treatment of the cost of capital being mixed between full lifetime of the trade versus the first year of the trade. The majority of banks consider this cost at trade level, and on a case by case basis, especially for larger trades. Additionally, trades are reviewed against hurdle rates to ensure the target revenues are achieved, with target revenues reviewed as part of management planning to account for the larger CVA and FVA charges. Typically, only trades that meet the hurdle rate are approved.

1.5. Central counterparties

As a direct result of the financial crisis, regulatory bodies are placing increased pressure on banks to move the industry towards centralised clearing. Whilst such a regime has advantages and disadvantages, the integration of the new requirements into banks will require significant effort. Since CCPs were not previously deemed to be risky, and to optimise the portfolio exposure and regulatory capital calculations, some banks did not previously include the trade exposure to CCPs in the overall exposure and regulatory capital calculations. Also, the differentiation between qualifying CCPs and non-qualifying CCPs is still being embedded within some banks, both from a business user perspective and from a systems perspective.

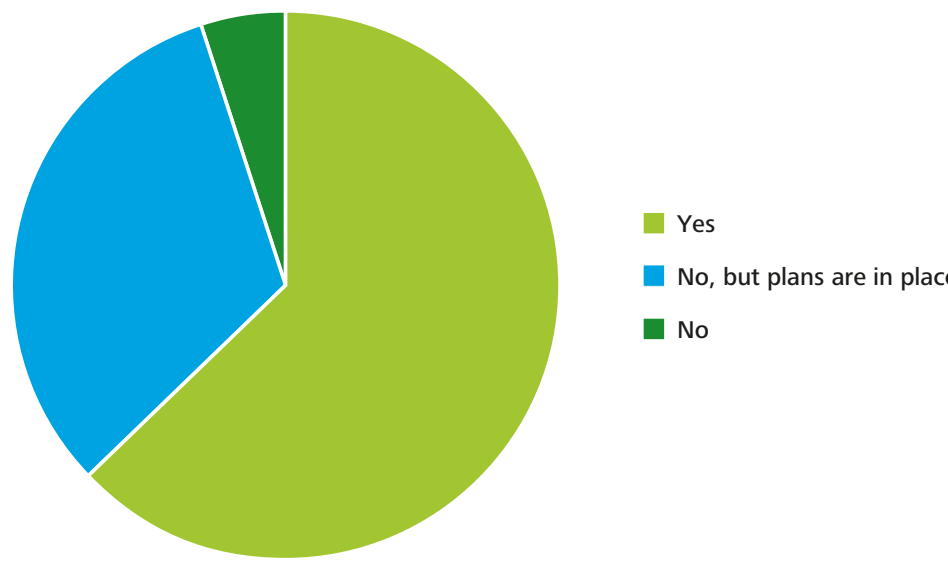
Following significant investments in technology projects, banks are now heading towards calculating bilateral exposure for all CCPs and performing credit monitoring of these exposures. Margins posted are tracked and sensitivity to CCPs is monitored.

Figure 5. CCP risk measure calculations



Infrastructure programmes to calculate the capital requirements for the exposures and default fund charges have been initiated at almost 65% of participants, with a further 30% of banks planning to initiate these programmes once the CCP regulations and requirements have been finalised.

Figure 6. Risk weight calculation programme



1.6. Modelling

All banks calculating regulatory capital using IMM do so for vanilla interest rates and FX products, with just under 80% calculating regulatory capital using IMM for credit derivatives. A third of the participating banks are calculating regulatory capital using IMM for all vanilla over-the-counter (OTC) derivatives. Some banks model first generation exotics under IMM for regulatory capital purposes but more complex exotics are generally capitalised based on the exposure generated under the CEM approach.

Internal models are being used considerably more for exposure monitoring than regulatory capital calculations, in particular for the calculation of exposure associated with more exotic derivatives.

Figure 7. Internal model for regulatory capital

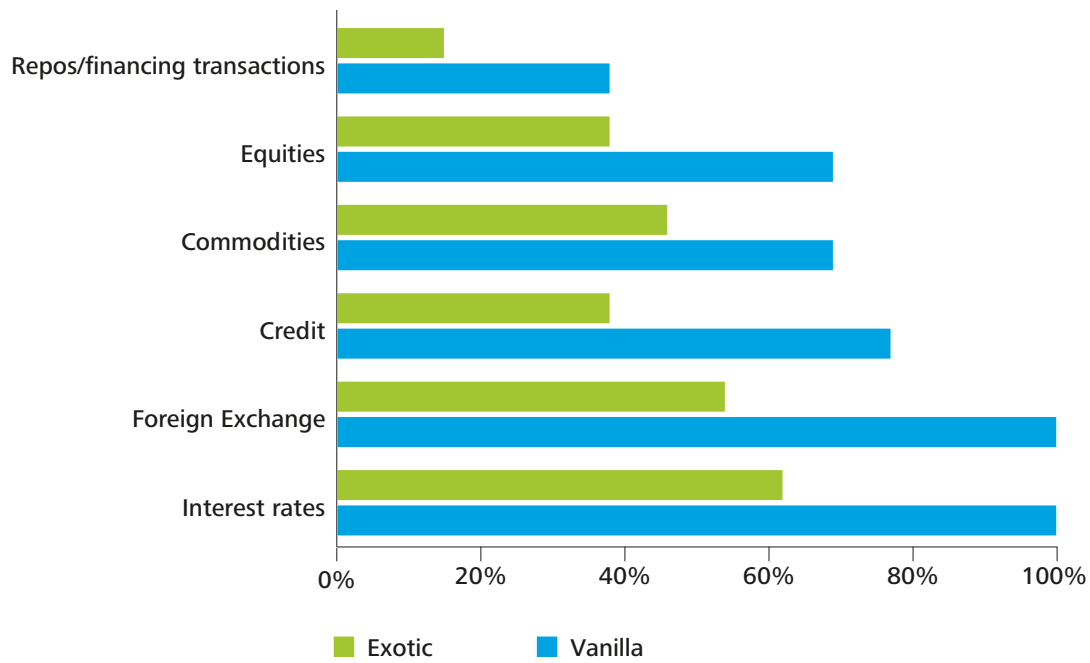
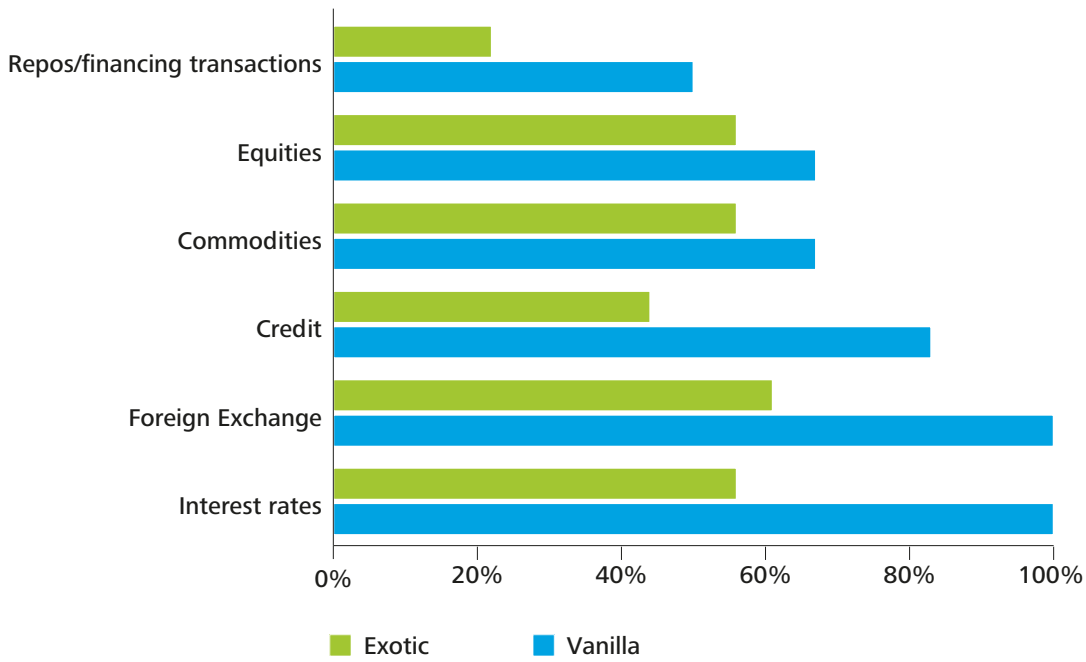
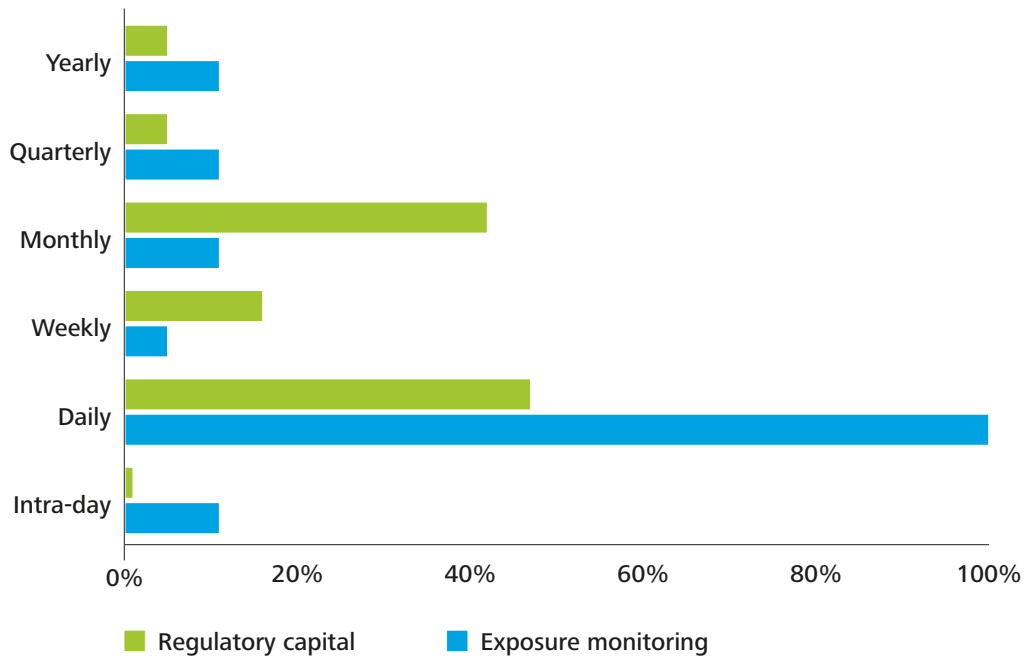


Figure 8. Internal model for exposure monitoring



All banks calculate exposure for credit risk monitoring purposes at least daily, and almost all banks use the previous day's trade and market data to perform this calculation. Just over 10% of banks have the capability to update exposure in real time (as soon as the trades have been traded). Regulatory capital calculations generally occur daily or monthly, with the calculation mostly based on the same or the previous day's data, but some banks are going as far back as the previous month's data.

Figure 9. Calculation frequency



Monte Carlo simulation is mostly used for the internal models, with the number of scenarios ranging between 1,000 and 10,000. The majority of banks consider a single set of scenarios across all portfolios and asset classes. However, there are some banks that vary the number of scenarios depending on the complexity or size of the asset class and convergence capabilities of the underlying stochastic processes. Potential future exposure (PFE) is mostly calculated at the 95th, 97th or 99th percentiles, but some banks consider loan-equivalent exposure measures as their PFE. Time steps are usually tighter in the near future, in particular to capture the potential effect of margining, but become further apart over long time horizons, with time horizons varying between 30 and 50 years.

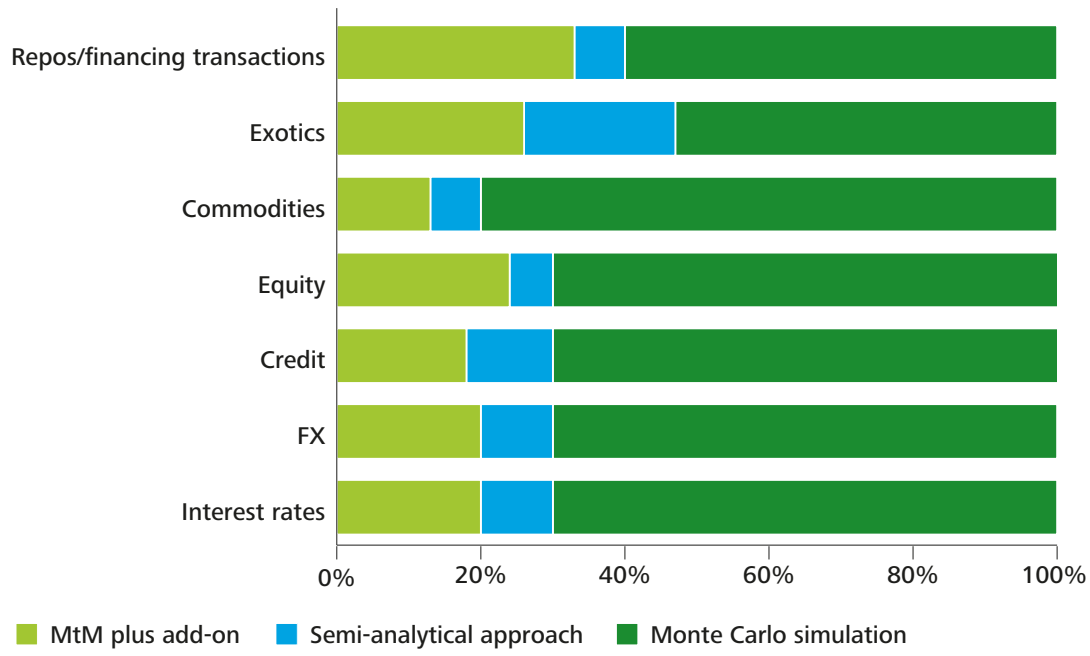
The modelling of exposure for exotic trades is done by means of a variety of different methods, ranging across:

- off-line calculations with manual upload into the risk systems;
- MTM + add-on approach;
- semi-analytic approach using approximations;
- decomposition of the trades into replicating structures of simpler, more vanilla products; and
- valuations using front office models.

When banks use the MTM + add-on approach, the add-on is either taken to be the regulatory add-on, or it is calibrated internally using a proxy simulation and inferring the MTM from the simulated exposure.

The majority of banks generally incorporate the more traditional risk mitigants such as netting, cash, bonds and

Figure 10. Internal model calculation approach



equities for credit risk monitoring and regulatory capital reporting.

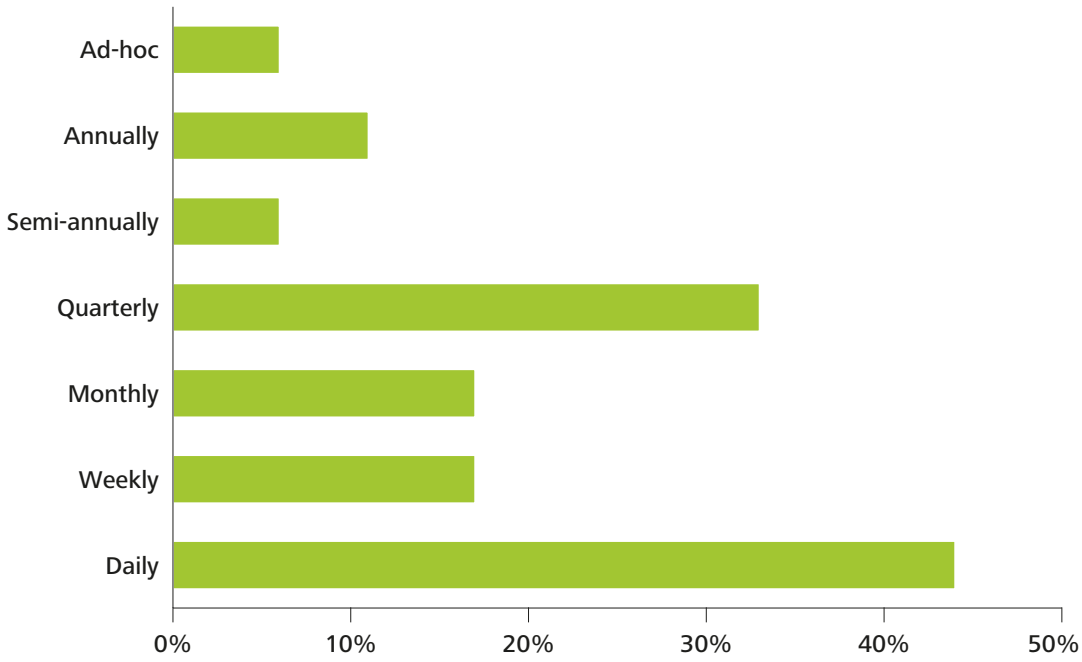
There remains debate around the inclusion, treatment and modelling of optional and mandatory break clauses, downgrade triggers, letters of credit and guarantees. Some banks only incorporate mandatory break clauses, and monitor downgrade triggers and optional termination events as part of the credit risk monitoring process. Letters of credit and guarantees may be considered on an ad-hoc basis.

Collateral modelling seems to focus on the modelling of margin calls and break events rather than the collateral deterioration or improvement itself.

The parameters used in the stochastic process models underlying the Monte Carlo simulation consist of implied and historical parameters, where banks choose to use implied parameters if these are available and can be sourced appropriately from up-stream systems. 45% of banks re-calibrate the model parameters on a daily basis, and the majority of banks comply with the regulatory requirement of at least quarterly calibration when using historical parameters.

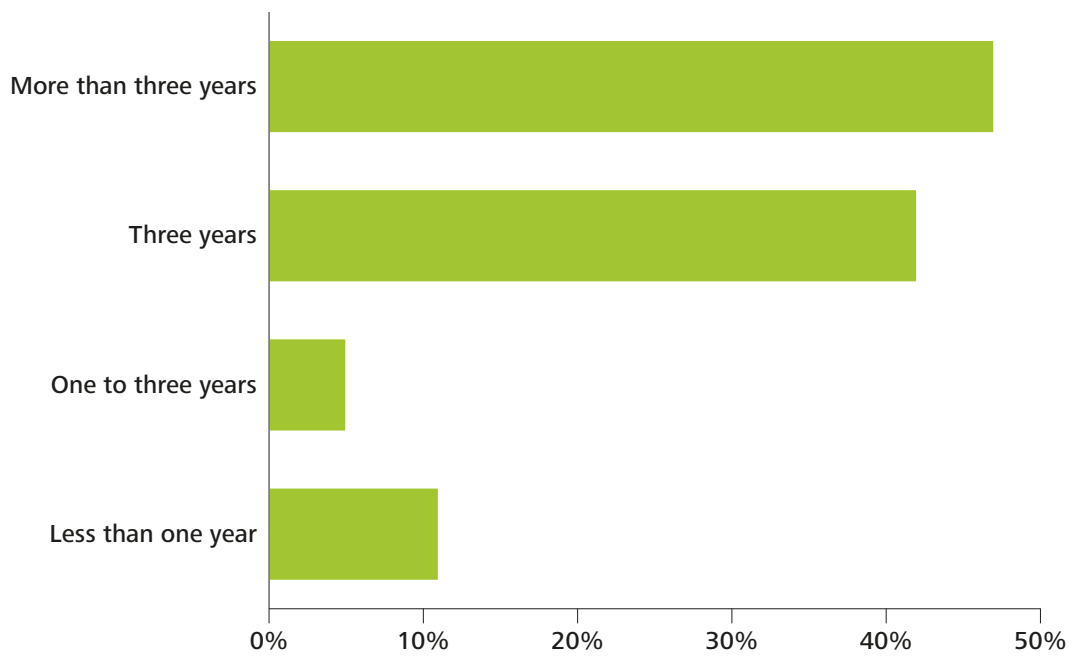
Once parameters have been estimated, an impact review is performed and the results are assessed at various methodology committee meetings, where a decision is made on whether or not to implement the recalibrated parameters. Discussing the impact of new parameters with heads of business illustrates a strong example of satisfying the 'use test' requirement as exposure calculation outputs are used more widely across the bank.

Figure 11. Calibration frequency



About 90% of banks using historical data for the calibration of Monte Carlo simulation parameters consider at least three years of data, with 42% of banks considering more than three years of data in order to represent an entire business cycle.

Figure 12. Historical data series length



Under the new Basel III/CRD IV regulations, banks will be required to calculate an additional EEPE based on stressed parameters, therefore requiring the inclusion of a stressed period in the calibration dataset. The definition of this 'stressed period' is subjective, and banks are currently defining the approaches to be taken to identify them. More than half of the banks take the stance that, given the recent economic downturn, a stressed period is automatically included in the last three or four years and they are therefore compliant with new regulatory requirements.

In addition to calibrating a set of stressed parameters, the bank needs to calculate two sets of exposures, stressed and 'normal', and use the most conservative exposure figures to calculate the capital charge. This will affect the run-time of the exposure calculation, and is also expected to increase exposures (and therefore capital requirements) significantly.

1.7. Technology

More than 75% of banks surveyed use internal systems and are investing significant time and resources to migrate multiple legacy or asset class systems into a single, all-encompassing system.

There is also a shift towards the use of integrated systems between CCR and the front office CVA systems, allowing for increased efficiency, leveraging off a single golden source of data and enabling scenario consistency.

1.8. Backtesting and validation

Backtesting of the CCR models has proven to be challenging, with various factors making portfolio backtesting in particular much more complicated than market risk backtesting:

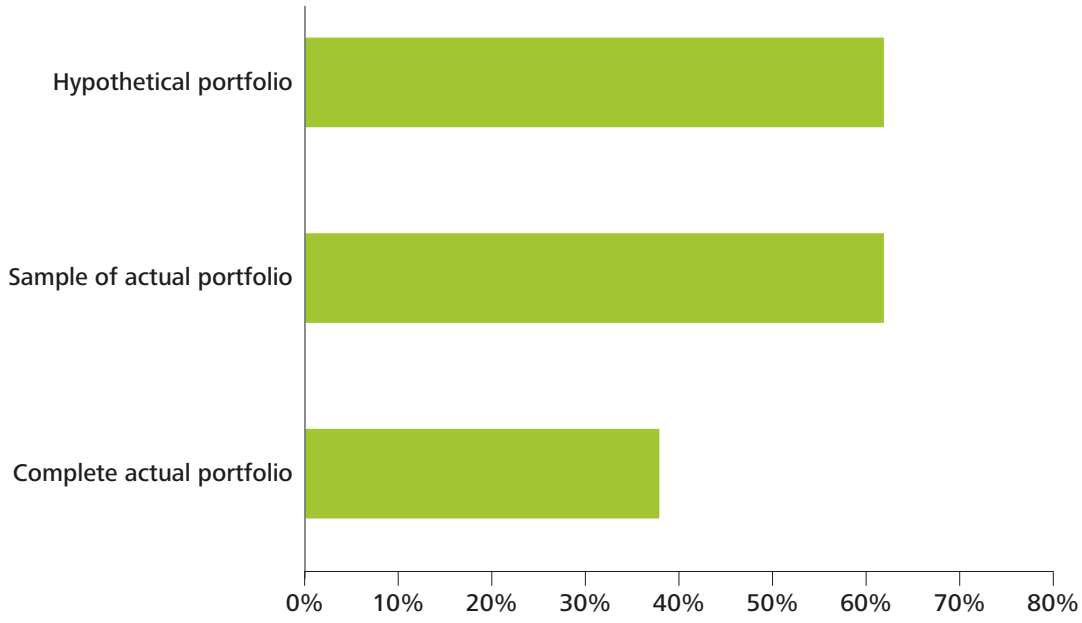
- difficulties in obtaining historical data to test models over 'sufficiently long time horizons';
- changes in portfolio composition over long periods; and
- changes in simulation models and associated parameter calibration over long periods.

The majority of banks are in the process of implementing risk factor as well as portfolio backtesting programmes as part of model assessment and performance monitoring.

Risk factor backtesting is either performed for the most important risk factors to which the bank is exposed or, if banks have sufficient infrastructure in place, all risk factors are backtested.

For portfolio backtesting, a combination of complete, sample and hypothetical portfolios is generally used. The hypothetical portfolios are selected to be representative of the book, considering asset class concentrations in notionals, trade numbers or uncollateralised exposure, or building hypothetical portfolios representing the complete actual portfolio based on key risk drivers, and considering collateralised and non-collateralised portfolios. When samples of the portfolio are selected, they are chosen subjectively as key counterparties, countries or asset classes.

Figure 13. Portfolio backtesting



All banks consider MTM distributions when performing portfolio backtesting, although only 40% consider current exposure and only 25% EEPE. The majority of banks backtest over multiple time horizons up to one year, with a few banks also considering time horizons beyond two years.

Figure 14. Portfolio backtesting: risk measures considered

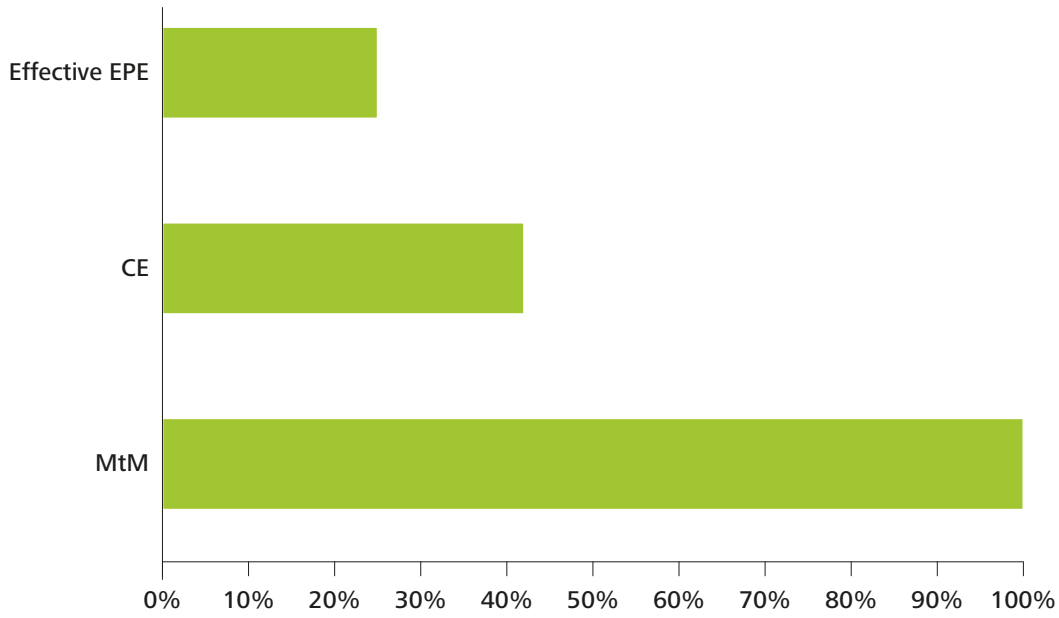
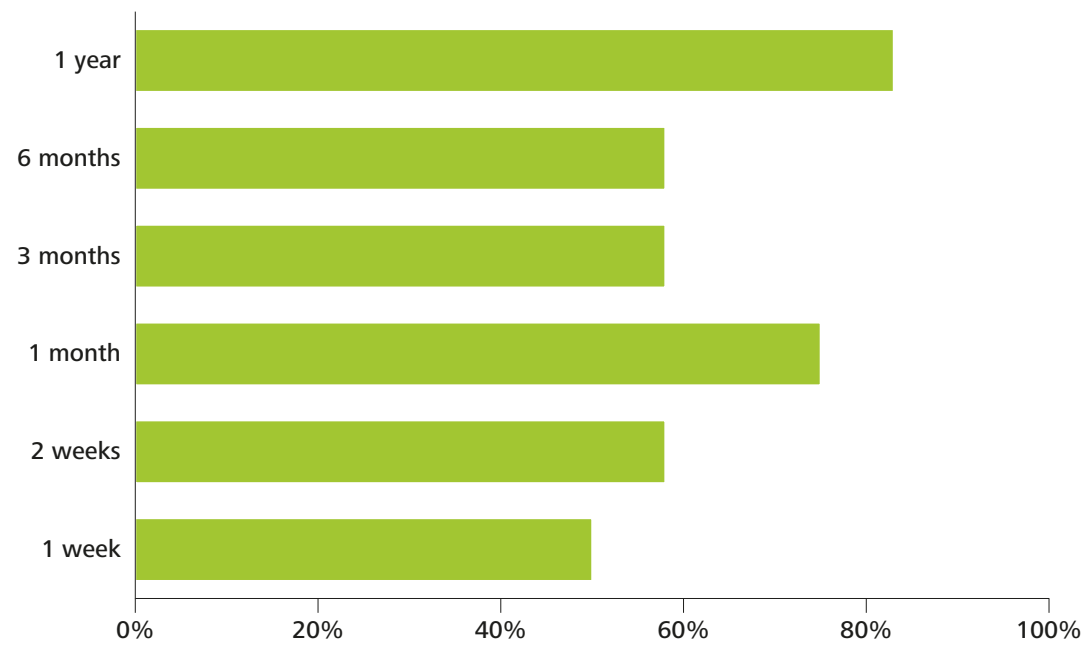


Figure 15. Backtesting: time horizons considered

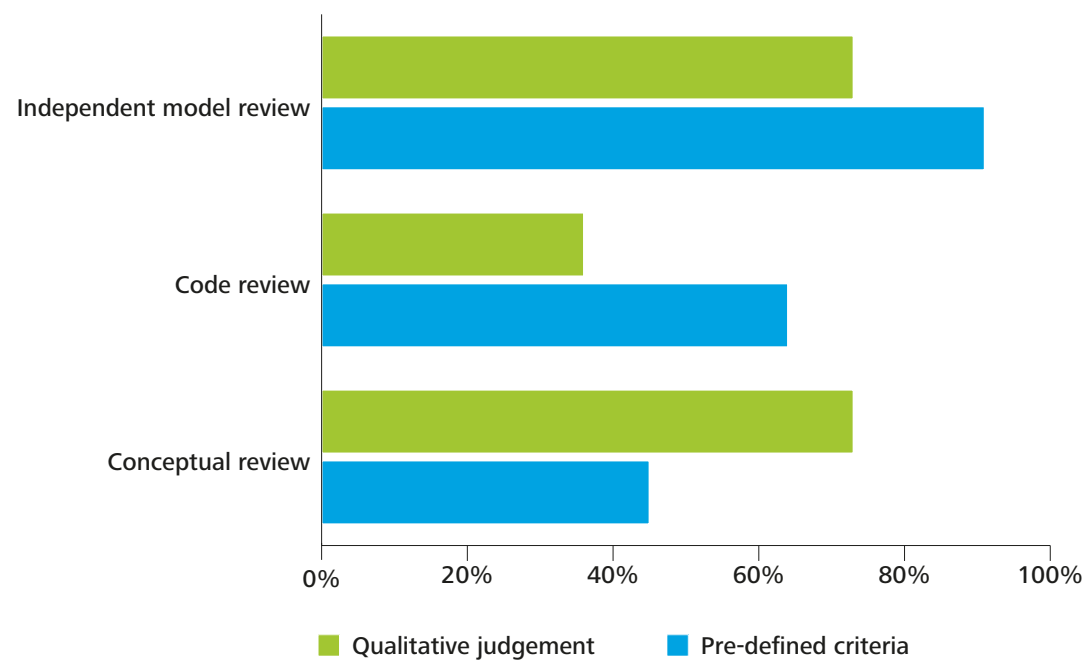


In addition to performing the 'quantitative' exercise of backtesting, banks are improving governance frameworks and processes in order to obtain more business involvement in model performance assessment.

Regulatory requirements around validation of CCR models have increased significantly following the crisis. In the US, The Office of the Comptroller of the Currency (OCC) published the Model Risk Guidance in April 2011 which highlights the importance of clear and solid validation guidelines, and US banks feel that they are 'expected' to tailor their validation exercises to these higher standards and ensure effective challenge is in place. These guidelines are also used at non-US banks to ensure all aspects of model risk are covered. Furthermore, the proposed Basel III and CRD IV requirements list increased objective requirements with regards to validation of CCR models.

However, whilst banks have independent review units in place who approve models before implementation, at initial development and on an on-going basis (usually annually), the banks interviewed feel that a good balance still needs to be found between qualitative judgement and pre-defined criteria, and validation standards still need to be increased.

Figure 16. Validation approach

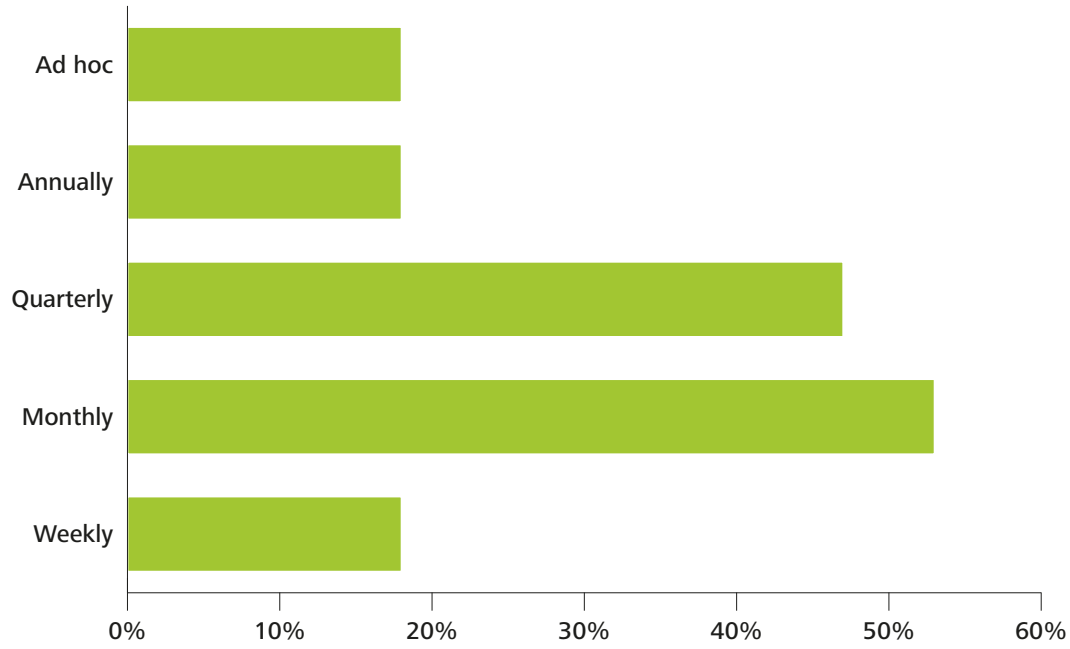


1.9. Stress testing

Another area continuously under regulatory scrutiny is stress testing, not just within the CCR trading book but across the bank. The 'Regulator's expectation' is that stress testing should not be considered a one-off, quarterly or annual 'ticking the box' exercise, but rather a bank-wide integrated effort illustrating that the firm continuously considers the impact that market or macroeconomic stresses could have on its business and CCR exposure.

The majority of banks perform a combination of daily, weekly, monthly and quarterly stress tests. These range from sensitivity tests of the key risk factors to macro-economic stress tests. Ad hoc stresses are also considered where necessary in order to test the firm's capability to withstand potential immediate stresses as well as the ability of the firm's technology to calculate the impact of 'stress on demand'.

Figure 17. CCR stress testing frequency

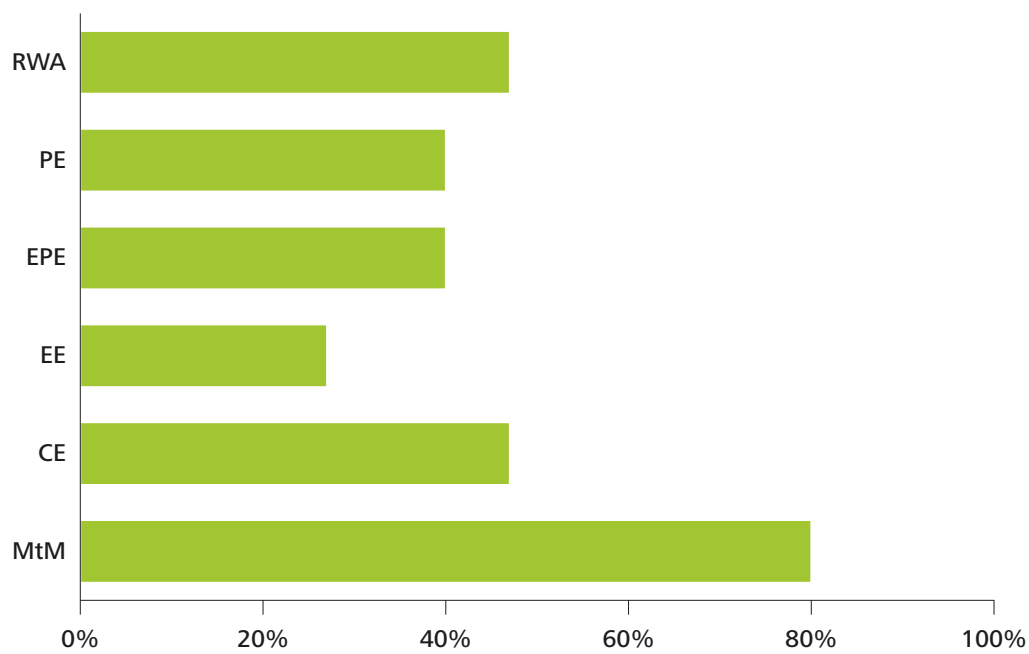


The majority of banks interviewed consider macroeconomic scenarios relating to the Eurozone crisis and the credit crisis. Reverse stress testing is also under development, generally as part of larger-scale stress testing programmes.

Whilst banks aim to obtain complete coverage of the portfolio when considering stresses, there is sometimes a small, immaterial proportion that is not covered as part of the wider stress testing programme. Monitoring of these exposures is performed on a continuous basis in order to ensure that these segments remain immaterial and that the exposures would not increase significantly were they subject to stresses.

The stress test performed by the CCR areas mainly focuses on the calculation of stressed MTMs, although at least 40% of banks also focus on risk-weighted assets (RWAs), current exposure and potential exposure.

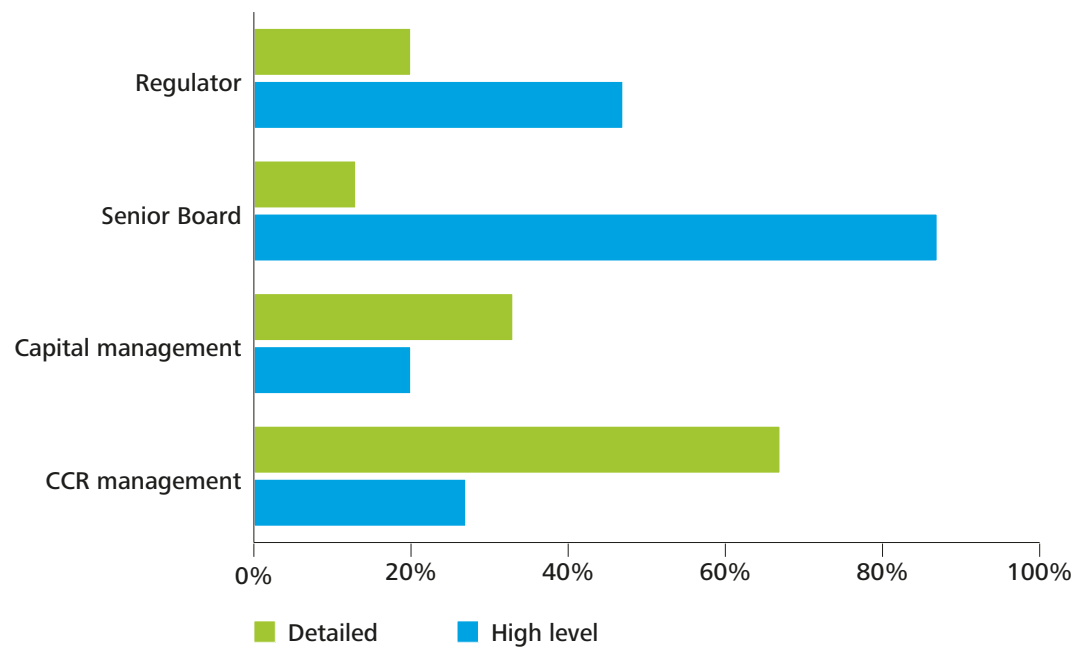
Figure 18. CCR stress testing measures



About 70% of banks perform stress testing of credit worthiness, through probability of default (PD) and loss given default (LGD) when performing CCR stress testing, generally stressing point in time PDs and downturn LGDs when performing these joint stress tests. Having said this, 64% of banks do not explicitly model the correlation between credit worthiness and market movements when performing the stress tests; rather, the correlation is assumed to be implied by the macroeconomic scenarios.

Reporting of stress testing results takes a varying number of degrees, with almost all banks providing at least high level reporting to the senior board and detailed reporting and integration into the day-to-day CCR management.

Figure 19. CCR stress testing reporting



Stress testing programmes are currently integral in the development and enhancement of banks' CCR frameworks. Future enhancements to banks' stress testing framework focus on an improvement in the technology infrastructure to enable more frequent and faster stress testing, combined with additional flexibility in the specification of scenarios. In addition, firms are considering the use of stress testing limits against certain counterparties, industries or sectors to identify vulnerabilities and manage risk appetite to these vulnerabilities accordingly.

1.10. Wrong way risk

The interaction of WWR between the front office and the risk perspective remains an interesting debate. Whilst WWR should be identified, monitored and controlled, it should also be accounted for in front office pricing. During our interviews we have seen that almost all banks have processes in place to identify WWR, in particular specific WWR as banks move towards meeting Basel III regulatory requirements.

Identification

Banks are investing in the integration of risk practices into the front office environment, by rolling out training programmes and enforcing procedures whereby new trades should be checked for potential WWR (specific or general).

Specific WWR trades are identified at origination by performing systematic checks between the various counterparty and collateral entity hierarchies. General WWR is usually identified by comparing the trade type, direction and counterparty to pre-defined general WWR scenarios, with the scenarios reviewed on an on-going, at least annual, basis.

In addition to identification of WWR at trade origination, automated triggers are in place to report and identify any WWR trades.

The identification of specific WWR is required prior to trade approval, and approvals are assessed on an individual basis with sufficiently senior Risk Manager sign-off required in some instances.

Measurement

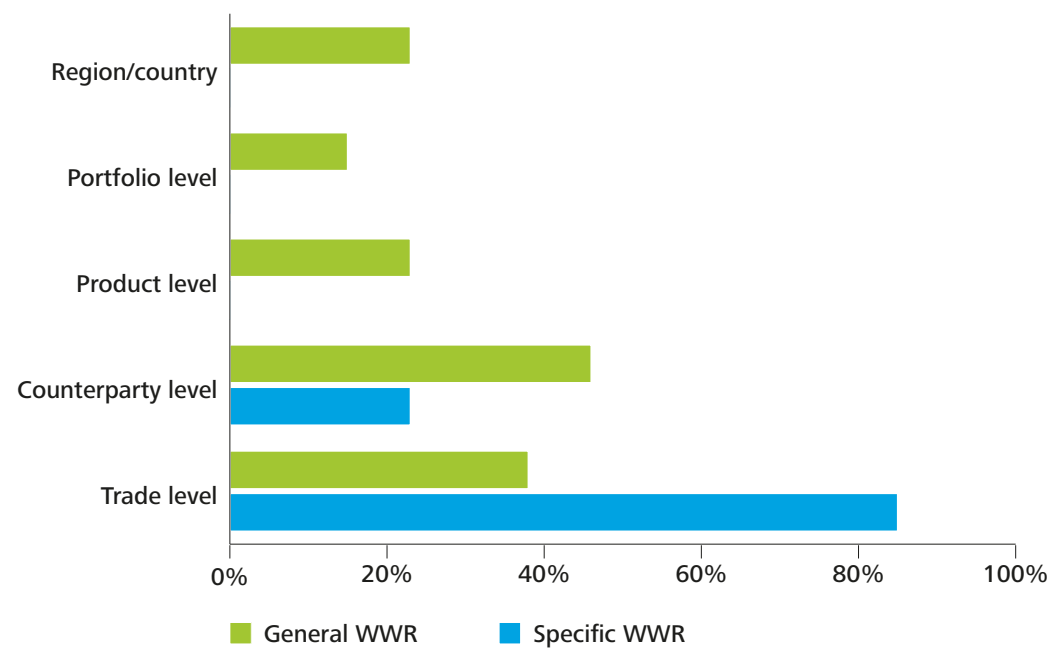
The degree to which PFE is adjusted to incorporate effects of specific WWR on exposure has varied over time, with some banks initially making an expert-based adjustment to capture the specific WWR in the trades, as a percentage of MTM or notional, and other banks working towards the more stringent Basel III framework whereby these Specific WWR trades are segregated into another netting set and exposure at default (EAD) is assumed to be full notional.

A few of the banks interviewed have the capabilities to capture and measure general WWR, but are only using this for trades strongly affected by general WWR and not as a blanket approach for all trades. Banks that do not currently have the capability to measure general WWR are investing in the enhancement of their own or vendor systems to enable the measurement of WWR, mainly through simpler, expert based or deterministic correlation measures but some with more advanced modelling.

One potential driver of the focus on simpler general WWR measurement approaches rather than more advanced modelling techniques is the introduction of the EEPE using stressed parameters under Basel III. In the interim, stress testing has also been used to identify and measure general WWR, by jointly simulating credit spreads and underlying risk factors and therefore linking credit worthiness and exposure.

Of banks that measure WWR, 85% measure specific WWR at trade level, whereas general WWR is measured across various dimensions. Where banks measure general WWR at portfolio level, regional and sector dimensions are incorporated and concentrations within these dimensions are monitored.

Figure 20. WWR measurement dimensions



Monitoring and control

The majority of banks that consider WWR have processes in place to monitor the WWR exposure. These processes encompass the identification of WWR at inception as discussed previously, the measurement where possible against WWR limits, and continuous reporting of specific and general WWR trades.

Approvals and policies are in place to limit specific WWR, and positions are closed-out if specific WWR limits are breached. During the pre-approval process, trades are reviewed against the specific WWR limit and if there is no longer appetite the trade will not be executed. For approved specific WWR it is expected that a limited appetite and structural mitigations such as reduced tenor, enhanced collateral requirements and minimum credit risk rating requirements are in place.

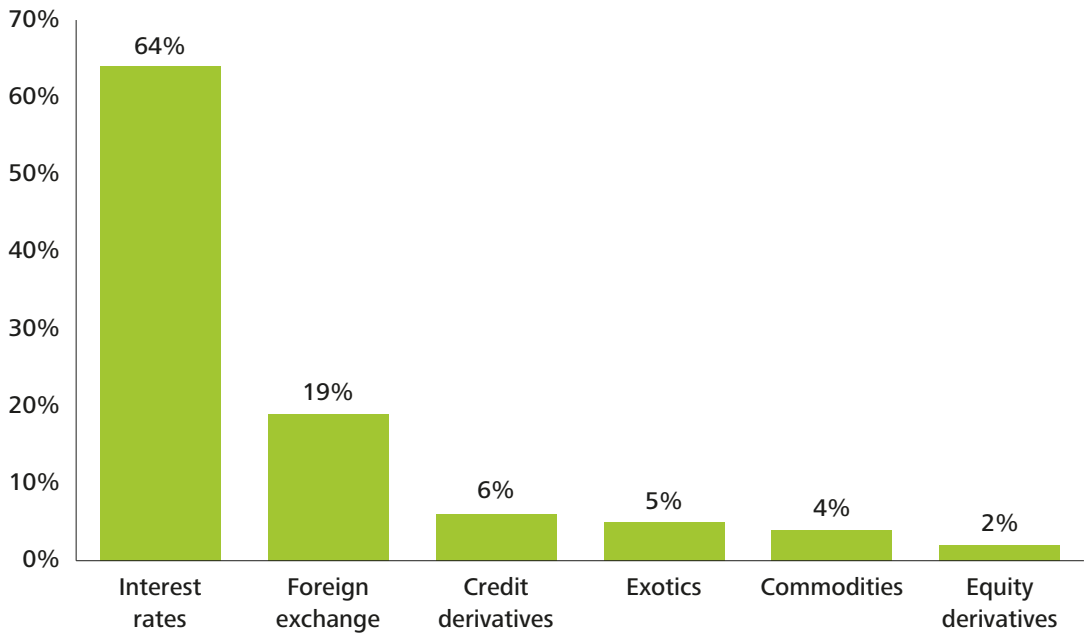
WWR risk limit management is supported by regular reporting, ranging from high-level regular management reporting to detailed daily reports listing the trades leading to specific WWR exposure.

2. CVA

2.1. Overview

As expected, all banks surveyed incorporate CVA into Fair Value for IFRS purposes. In terms of portfolio stratification, the vast majority of the banks' CVA is driven by interest rate trades with interest rate swaps obviously being the most significant product type. This is followed by foreign exchange (dominated by FX forwards and cross currency products) and credit derivatives (single name and index CDS). Equity derivatives, commodities and exotics tend to have less significance in driving the total CVA. The contribution to overall CVA is driven by several factors, with high notional amounts (e.g. interest rate swaps), long-dated trades (e.g. cross currency swaps) and overall complexity (e.g. credit derivatives) being most significant. Exotic products, even in the large banks, do not tend to make up a large part of the overall CVA but this is balanced by the inherent problems involved with dealing with exotics in a reasonably efficient manner.

Figure 21. Total CVA by asset class



Collateralised trades, often ignored or modelled with very favourable assumptions made in relation to collateral receipt, are increasingly appreciated as contributing significantly to the overall CVA bottom line. This is largely driven by an appreciation that the margin period of risk can be material and much longer than the contractual collateral call frequency under a CSA (often daily). Other important components accounted for are the imperfections of collateral agreements (thresholds etc.) and the quality of the collateral itself. Banks are tending to accept that whilst collateral reduces CVA by a significant amount, even well collateralised portfolios have a CVA reduced by a low single digit multiplier.

There is a growing understanding of the future impact of central clearing. Whilst CCPs apparently remove CVA as an issue as they are unlikely ever to (or to be allowed to) fail, banks are seeing their exposure to the default fund of a CCP as representing a complex CVA with respect to the other clearing members, and are seeking to quantify such exposure. Furthermore, the funding cost of clearing trades, due to initial margin for example, both a bank's own and that of clients, is being assessed.

2.2. Platform description

As the move to reduce risk and manage banks' balance sheets and profitability intensifies, it is not surprising that the survey showed that 80% of participants who have a CVA desk have this set up as a hedge centre (risk mitigation), with the remaining CVA desks set up as a profit centre (risk taking). However, the distinction between these two types of setup is not completely clear. For example, even hedge centre CVA desks with a zero P&L target will have reasonable discretion with respect to hedging choice, which amounts to taking proprietary positions.

For those banks that charge for CVA/DVA, the majority charge at inception with the remaining performing some form of on-going reallocation process. Reallocation is obviously difficult to manage as most trades have a profitability which is very dependent on the CVA and so not knowing this value at inception can lead to incorrect pricing and the potential to experience some form of winner's curse. Subjectivity does enter into trade pricing to some degree. One example is giving a reduction for the first trade with a client and under-pricing certain trades (e.g. long-dated trades) on the assumption that the associated CVA loss will be compensated for via other trades with the same client. In addition, banks often incorporate various assumptions regarding trade lifetime in terms of aspects such as break clauses, restructurings and unwinds, especially in terms of defining the cost of capital.

Traditional counterparty risk mitigation methods such as credit lines are not made obsolete by the existence of a CVA desk. CVA desks generally have a front office alignment and a CVA charging mechanism will naturally incentivise more concentrated positions so as to extract maximum benefit from netting agreements. Credit lines have a risk management focus and encourage a maximisation of portfolio diversification rather than netting. Despite the apparently complimentary roles of credit lines and CVA, some banks (especially the more sophisticated ones) rely less on credit lines as a result of active CVA management. Indeed, 40% of participants confirmed that the existence of an active CVA trading desk affects credit risk monitoring. One example of this is the concept of a liquid single name book where there is credit line relief or benefit for hedging the credit risk.

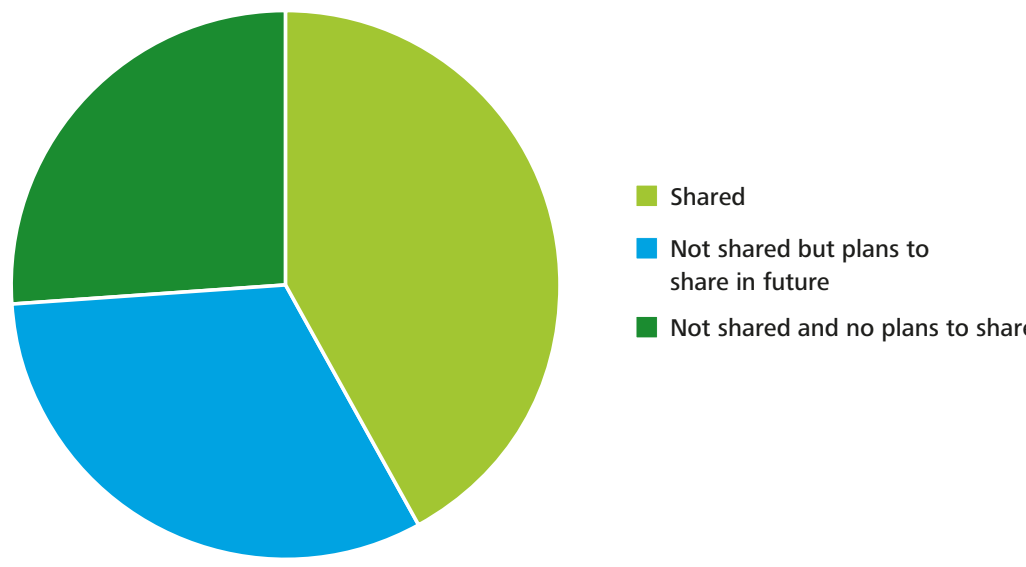
2.3. CVA modelling

It is clear that the sharing of models and systems between front office and risk management is not particularly common with a significant proportion of banks not even planning such a convergence. This may at first glance appear unusual due to the potential for duplication of effort. However, it is important to note that front office CVA and risk management counterparty risk models have very different key requirements. Front office CVA models need to be accurate and extremely fast (to support real time pricing and a high volume of sensitivities and scenario analysis) and often have more complex underlying calibrations. Balancing this, front office CVA normally focuses on a relatively small sub-population of the total portfolio with short-dated and collateralised trades, and trades with high quality counterparties, often ignored.

Conversely, risk management and regulatory models have to support an extremely large trade population irrespective of the perceived risk of those trades (upwards of 95% of the trade population). However, such approaches do not need to have the same level of model sophistication, calibrations may be more straightforward and they do not give rise to the same intensity of computation in terms of both time and volume of calculation.

The figure below shows the stratification amongst participants with respect to the sharing of the same exposure models for CVA and CCR.

Figure 22. Exposure models sharing for CVA and CCR



Almost 80% of participants confirmed that they utilise Monte Carlo techniques for simulating exposures. The range of Monte Carlo paths varies from 1,000 to 100,000 with sometimes, by necessity, fewer paths used for calculating the many required greeks. The number of time-steps also varied widely amongst participants, but the maximum we observed was 200. The number of parameters chosen generally fulfils a need to run all calculations in an overnight batch although we noted that two banks calculated greeks only on a weekly basis. In certain institutions, the number of paths and time-steps were contingent on certain factors, most notably the nature of the counterparty – for example, the more complex portfolios with liquid counterparties would attract a higher investment in time-steps and paths compared with illiquid counterparties with few vanilla trades. Collateralised counterparties will also typically require a greater number of time-steps to account for the relevant margin period of risk. All banks utilising Monte Carlo techniques for simulation believed that satisfactory convergence for CVA exposure and greeks purposes is achieved.

We have found that CVA modelling varies substantially in terms of sophistication. This level of sophistication, not surprisingly, is driven by the size and complexity of the bank's OTC derivatives portfolio. Whilst some banks believe that the simplicity of their underlying portfolio does not warrant very sophisticated modelling, others believe that it is important to have complex models capturing curve dynamics and volatility behaviour.

In terms of interest rate models, both short-rate, Heath Jarrow Morton (HJM) and LIBOR market model (LMM) approaches are used where the greater complexity of a non-Markovian approach such as LMM may be rationalised by the benefit of sophistication in terms of calibrating to volatility, and pricing exotics.

Other asset classes follow along the same lines, with some banks favouring simplistic Black Scholes approaches and others making more attempts at including effects such as mean reversion and calibrating more fully to volatility surfaces. Front office focused implementations tend to be more sophisticated compared to those with a risk and regulatory aim.

Whilst CVA systems are becoming more advanced, implementations are still required to make a number of shortcuts so as to not require excessive computational resources. One example of this is that less than 40% of participants use the same revaluation model for the CVA calculation and the main trading system. Additionally, effects such as stochastic volatility, that have for many years been a part of exotic derivatives valuation, are still seemingly too complex to incorporate in CVA modelling approaches.

There is also a divide within the overall simulation approach. The majority of banks use their own pricing models for revaluation within their counterparty risk simulation. Whilst this approach is fundamentally inconsistent in terms of approach, it does provide time zero pricing consistency, is probably the simplest approach and can be implemented in a piece meal fashion. Some banks rely instead on a generic optimised American Monte Carlo (AMC) (for example Longstaff-Schwartz approach) which requires quite a significant up-front implementation cost and can produce divergent time zero pricing. However, the internal consistency of this approach, the fact that exotic and path dependent products are better represented, together with the ability to produce faster valuations and sensitivities, may be viewed as an overall benefit, especially for banks with more complex portfolios.

Correlation between and within asset classes is generally handled within a historically based correlation approach with differences existing in length of time series used. Only 31% of banks model general WWR within their CVA calculation although several more note the future intention to do this.

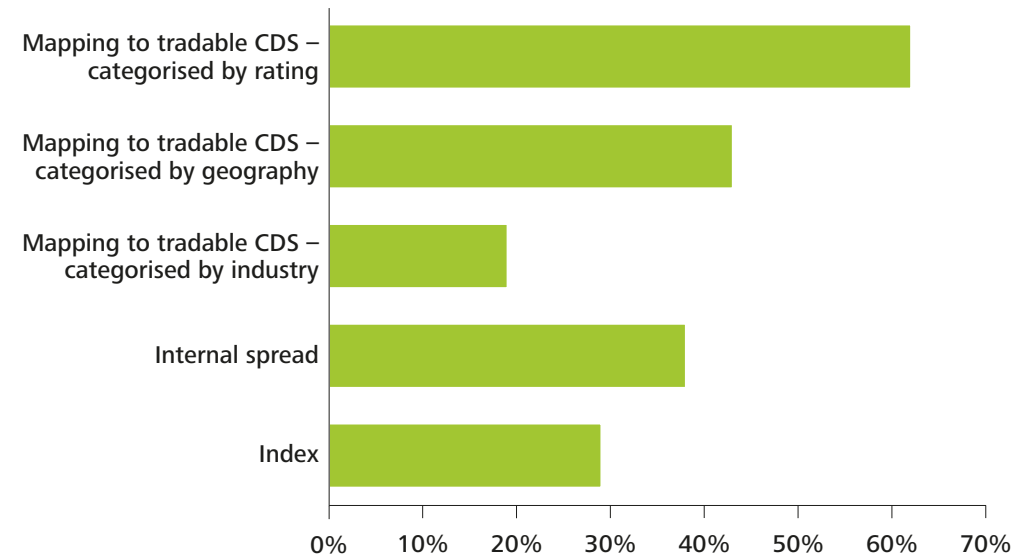
2.4. Calibration

The following charts show how participants calibrate model dynamics. This is broadly split into historical (real world) and market implied (risk-neutral) measures. In market risk terms, it is volatility, correlation and other model parameters that are important. On the credit risk side, this relates to the calculation of default probability and recovery rates.

In relation to counterparties whose CDS trade in the market, most of the banks surveyed imply the PD from the applicable observable CDS level. With the exception of some smaller banks that use an internally derived credit spread which is generally based on a historical rating-based default probability added to a risk premium component. Most of the banks (especially the larger banks) mark recoveries for liquid counterparties in a consistent way to the CDS and bond recoveries on the relevant credit trading desks. These standard recoveries are frequently adjusted for those counterparties where the bank is ranked senior in the waterfall (for example, where they hold additional security) compared to the senior unsecured level of the comparable CDS. Again, the exception is some of the smaller banks that mark to an internally derived recovery.

As noted above, the use of historical default probabilities for illiquid names seems to be declining driven by future IFRS 13 accounting rules and Basel III capital requirements. It is therefore interesting to look at the ways in which banks calculate a spread-based (risk-neutral) PD for counterparties which do not trade with sufficient liquidity in the market and cannot therefore be derived directly from a CDS price or suitable alternative. The results indicate that the majority of banks map to tradable CDS primarily by way of credit rating and then may take into account geography, followed by industry. This is not surprising as mapping by rating, industry and geography is quoted as the way to define spreads in line with the Basel III Advanced Method CVA VaR. Nevertheless, mapping via indices is also used by a proportion of banks, all of which are engaged in active CVA credit hedging.

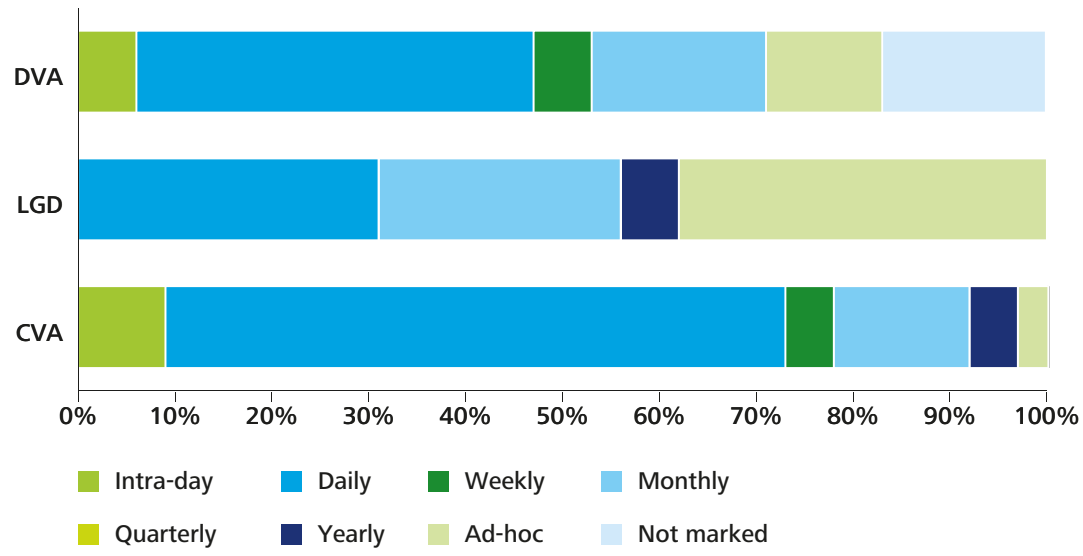
Figure 23. Probability of default mapping for illiquid counterparties



The marking of recovery rates is another key issue. The way that banks mark recoveries on illiquid names is typically in line with the way they mark recoveries on the liquid name population. It should be noted that, together with the marking of the PD under the advanced CVA method under Basel III, the new capital requirements for CVA VaR refer to the market assessment of recoveries, rather than an internal estimate.

We asked the participants how often they remarked curves for CVA, DVA and LGDs. As expected, the majority of banks remark their CVA curves on a daily basis, DVA on a daily, weekly, or monthly basis, and LGDs on an ad-hoc basis. Many banks have a regular review system in place to facilitate timely reviews of LGDs.

Figure 24. Frequency of curve remark



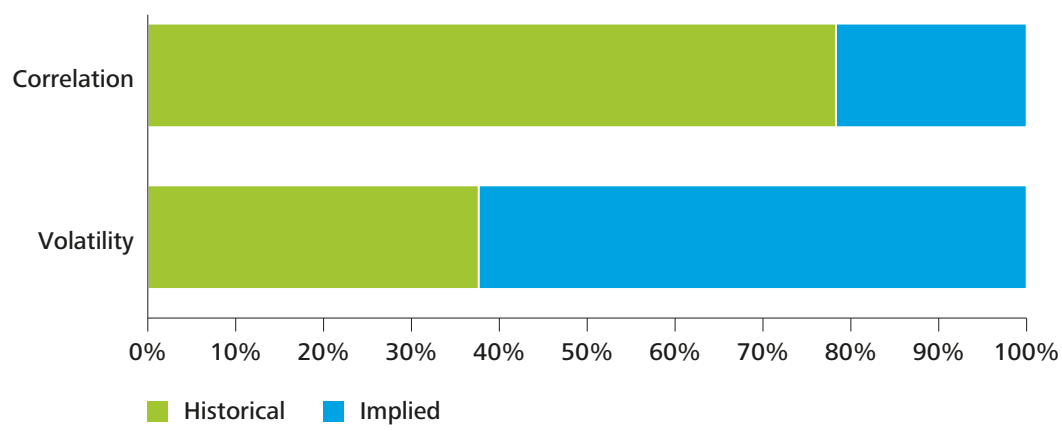
Regarding market risk components, it is interesting to note that the majority of participants mark volatility to market (risk neutral) for front office purposes.

This is driven by the exit price concept under the fair value measure for accounting requirements under IFRS 13 and the wish to hedge movements in the exposures driven by volatility. Not all volatilities can be easily calibrated as some asset classes have less developed volatility markets and long-dated volatilities are often unavailable. Finally, very off-market trades require either in or out-of-the-money volatilities which may not be observable. Often assumptions for extrapolating volatility skew across strike and maturity are important considerations.

Whilst volatilities are reasonably well accessible, the same cannot be said of correlation parameters. These are only sparsely available via a limited selection of basket, quanto and spread option products and correlations, including those representing general WWR. As a result, it is common to mark correlation parameters to historical data. This would imply a need to identify key correlation sensitivities and potentially seek hedges for these risks on a portfolio basis. Specific WWR approaches are calibrated to market parameters if they exist (e.g. quanto CDS) and otherwise are estimated empirically and with a degree of judgement.

The need to mark to both risk-neutral and historical parameters was also found in relation to model parameters. For example, participants commented that, with certain models, some parameters are marked as risk-neutral (for example, mean reversion levels) and some as historical (for example, mean reversion speed).

Figure 25. Exposure model dynamics marking



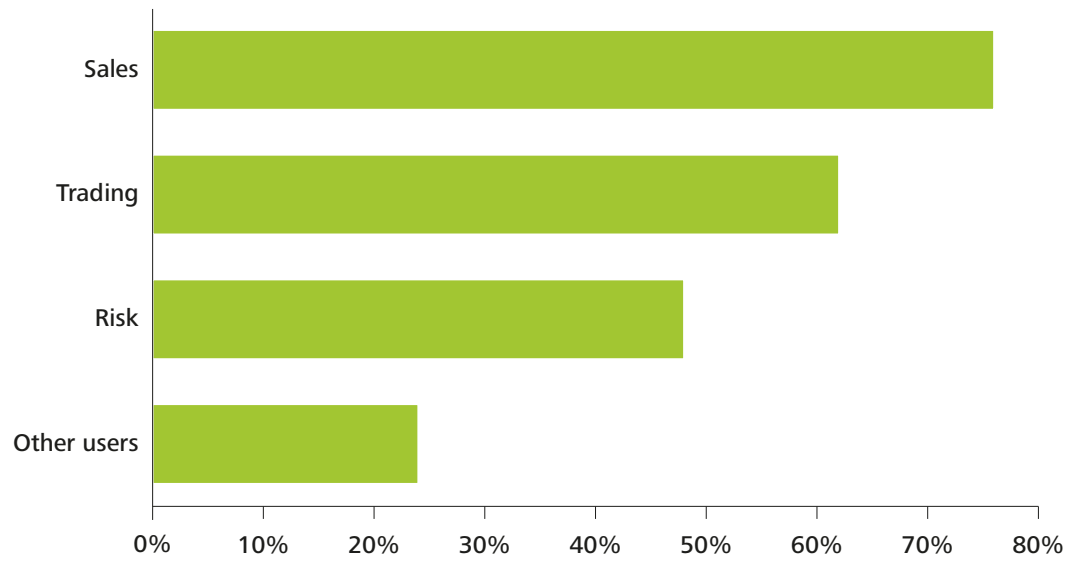
2.5. Implementation

More than 80% of participants (including all Tier 1 banks) reported having an internal system for front office pricing, with the remaining having vendor systems. There are clear advantages and disadvantages when comparing an internally built system and a vendor product. One of the primary advantages of an internal system is the control over the specification and build, and the ability to respond in a timely manner to the ever changing landscape of counterparty risk pricing and hedging.

With respect to trade pricing, 82% of participants confirmed that new trades are priced in a real-time incremental framework, accounting for netting at inception. The remaining banks do not have the operational and technology capacity to calculate such real time CVA. The deployment of CVA pricing tools is, as expected, concentrated in the front office sales and trading areas.

The trend over the last few years, certainly for the more sophisticated banks, has been to devolve incremental CVA and DVA pricing to the relevant marketer (and subsequently priced into the trade by the trader) for small vanilla deals within certain agreed limits. This then allows the CVA trading desk to concentrate on the more structured, more risky deals, and incremental deals against a large portfolio.

Figure 26. Access to pricing tools

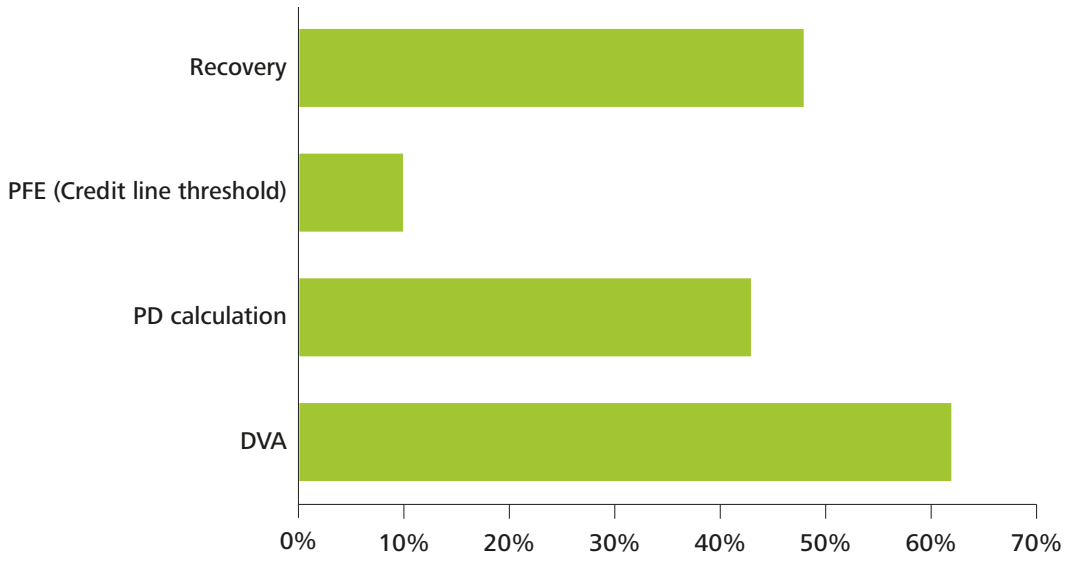


2.6. Incorporation of risk mitigants

CVA is naturally reduced by a wide range of risk mitigants, most of which are traditional in CCR management and not specific to CVA. Whilst some mitigants such as netting, recouponing and mandatory break clauses are relatively straightforward to model, other components such as DVA, collateral and non-mandatory breaks are more subjective.

When pricing CVA into trades, it is generally accepted that the presence of CVA charges, both to clients and other banks, can be prohibitive to certain types of trading activity. The most common ways in which CVA charges are reduced are by including a DVA component, or using an historical or blended default probability. We emphasise that these aspects are mutually exclusive and, as mentioned previously are not consistent with Basel III capital rules. Another common method used to reduce CVA charges is to assume a higher recovery on the claim than is assumed in the default probability estimation, either due to structural subordination or based upon the assumption that the claim process will be managed to achieve a superior recovery than that which would have been achieved at the time of default (CDS auction).

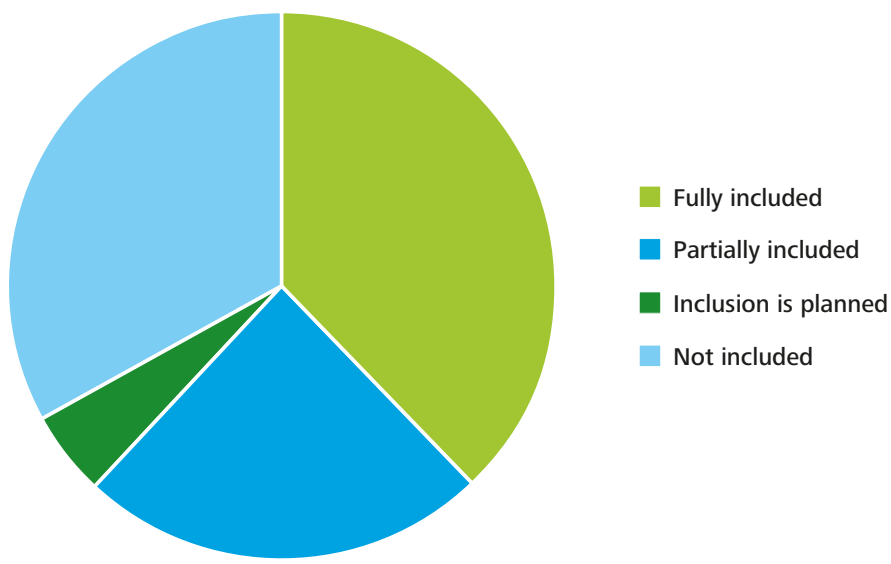
Figure 27. Risk mitigants applied to CVA calculations



Due to the debate around DVA, it is particularly interesting to explore to what extent DVA is incorporated into the pricing of new trades. Many banks include full DVA into pricing whilst a lesser number give only partial benefit. A significant proportion give no benefit at all, although these banks tend to be those using historical (or blended) default probabilities. Whilst the survey results indicate a strong trend of giving full DVA benefit, anecdotal evidence suggests that even for the most aggressive pricing, the full DVA benefit may not be given and would also be capped at the CVA (so as to not 'pay through mid' in a situation where the DVA benefit exceeds the CVA).

We further note that DVA benefit given depends on the type of trade and counterparty. For example, collateralised trades with counterparties of similar credit quality may, implicitly[1] or explicitly, be given full DVA relief whereas uncollateralised trades with end-users and/or weaker credit quality counterparties may give a small or no DVA benefit.

Figure 28. Inclusion of DVA in pricing



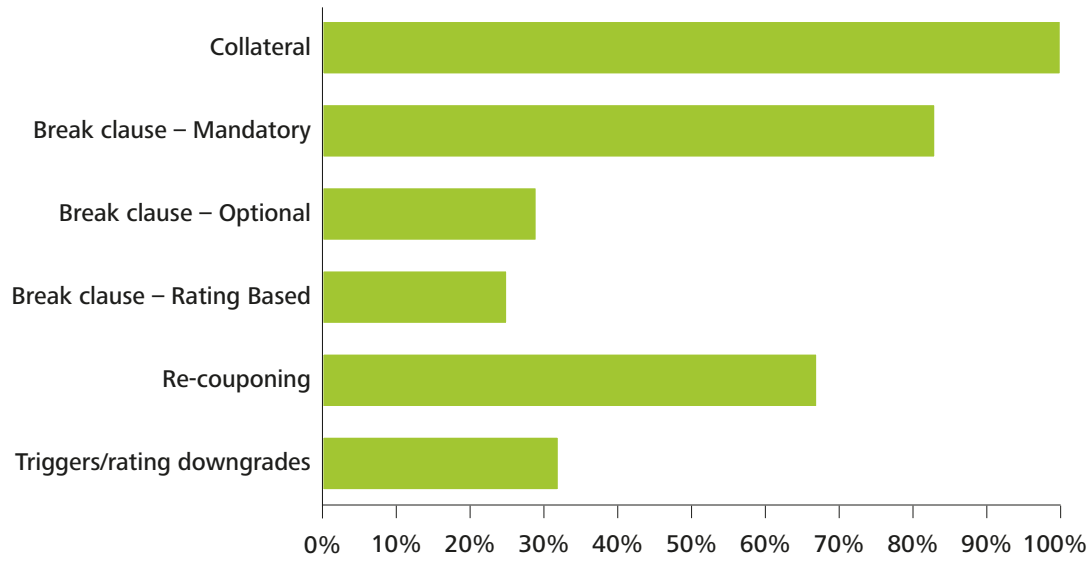
There is growing appreciation of the importance of closeout assumptions in relation to CVA and DVA calculations. Although only a few banks incorporate closeout assumptions in their methodology, a significant number plan to do this in the future.

1 Meaning that the trade is executed at mid and CVA and DVA are not even quantified. This could be rationalised by the similar credit spreads and that the use of a two-way CSA will symmetrise even a relatively asymmetric exposure profile. In such situations the CVA and DVA would be expected to be approximately equal and opposite.

In terms of other risk mitigants, collateral is, not surprisingly, always included in pricing with the only issues being having the correct legal information and the computational burden associated with providing real time calculations including such mitigants (discussed below). Other strong risk mitigants such as contractual recouponing and mandatory break clauses are also generally included when present. Softer risk mitigants are less likely to be included. These include rating based triggers, either in relation to a break or collateral receipt, which is not surprising given the difficultly in modelling rating transitions in relation to a potential default and the potential cliff edge effects that such triggers introduce. Optional break clauses are not often included: whilst these breaks can be more freely exercised, there are clear issues in defining this exercise boundary. With respect to the inherent asymmetry between the CVA desk always wanting to exercise such breaks2 (to reduce risk) and the originator of the trade never wanting to break (to preserve the client relationship), the former component is becoming increasingly dominant.

One important aspect of including DVA and FVA in valuation is that apparently risk mitigating actions do not always result in P&L gains. Examples of this are consolidation of netting agreements and bilateral reduction of collateral thresholds. A CVA desk should always price in the potential losses driven from DVA/FVA before such agreements are renegotiated.

Figure 29. Risk mitigants accounted for in the payoff



2.7 Hedging

In terms of the calculation of greeks, we found the majority of banks calculated both exposure and credit risk related sensitivities at least daily. The range of greeks calculated is also quite sophisticated with components such as jump to default and cross gamma seen as being important alongside more traditional measures such as delta, gamma and vega.

2 At least if the MTM is positive, as otherwise the DVA or funding benefit may be significant.

Figure 30. Calculation of greeks

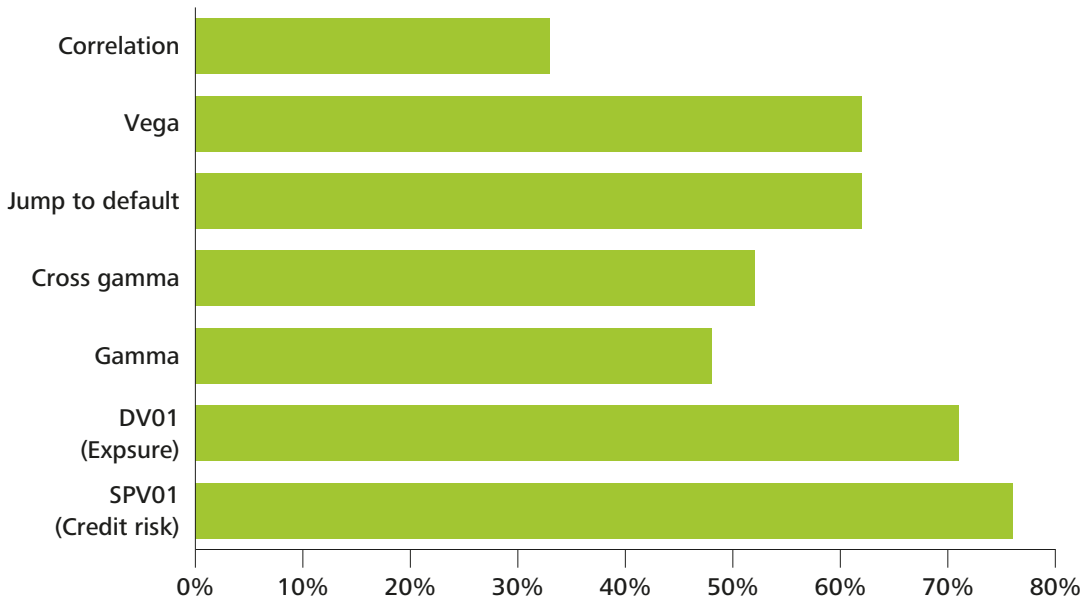
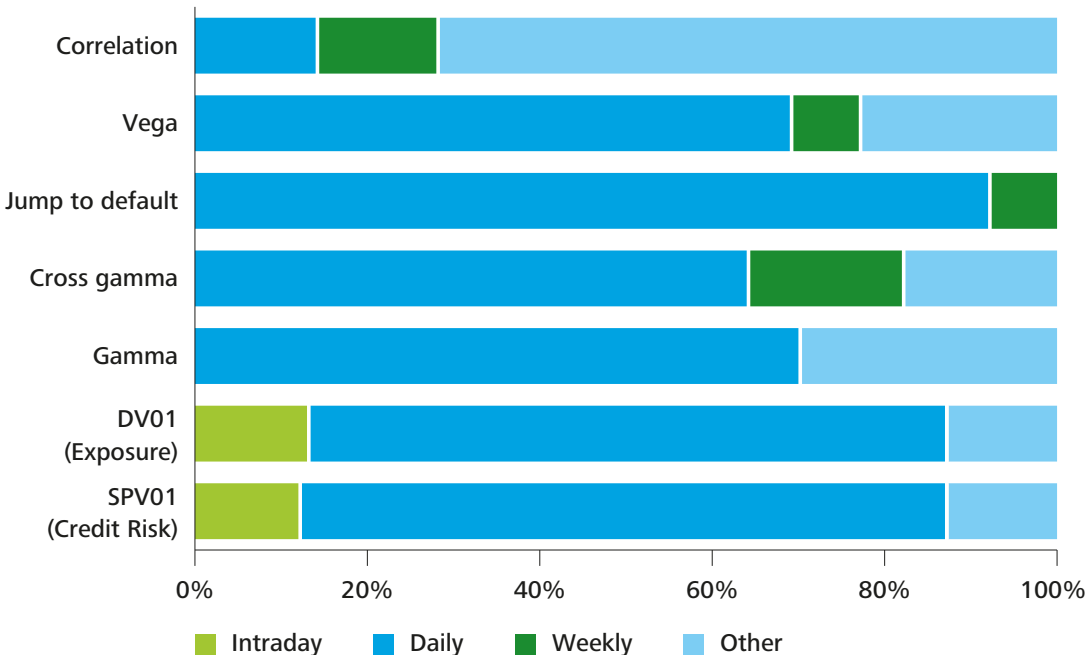


Figure 31. Frequency of greek calculation*



*Expressed as a percentage of the total number of participants that calculate the relevant greek.

Whilst a CVA desk has many greeks to monitor, not all are actively hedged and rebalancing may be infrequent. Participants indicated that the majority of hedging is discretionary in nature, which is understandable given the complex non-linear nature of CVA/DVA risk and significant transaction costs, especially in relation to credit risk. The following figures present a breakdown of which greeks banks hedge and the frequency of such hedge rebalancing.

Figure 32. Greeks hedged

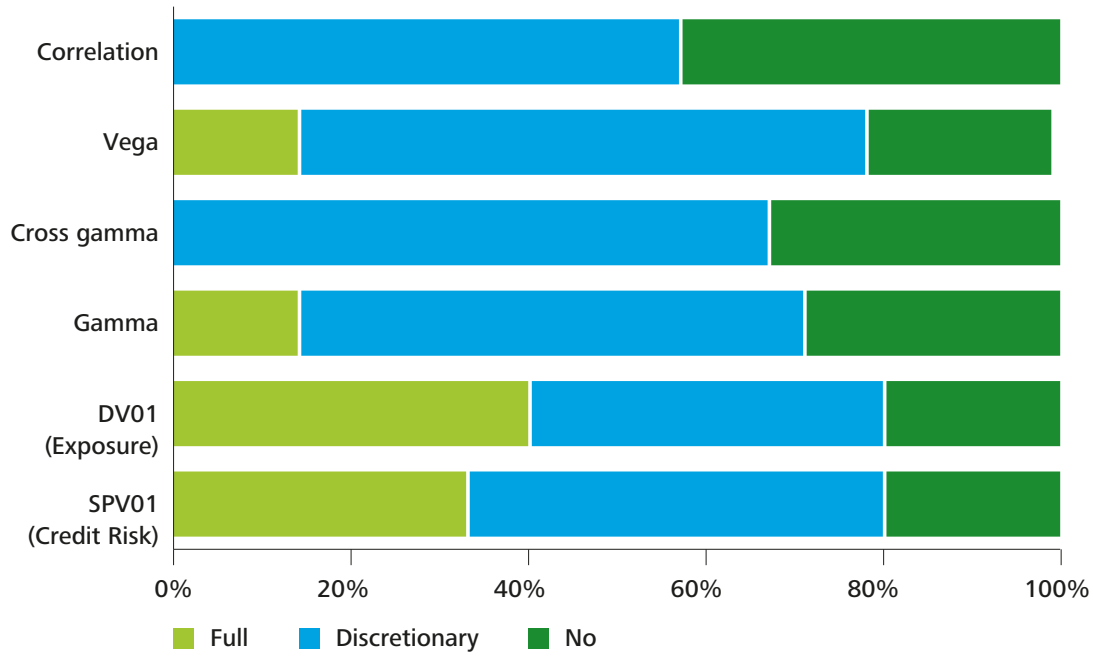
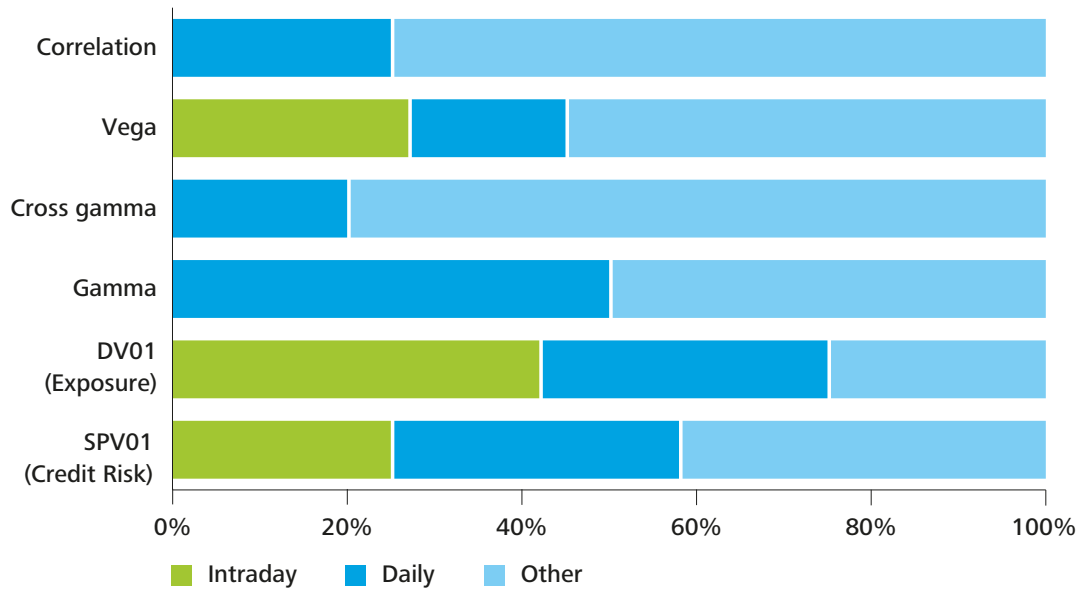


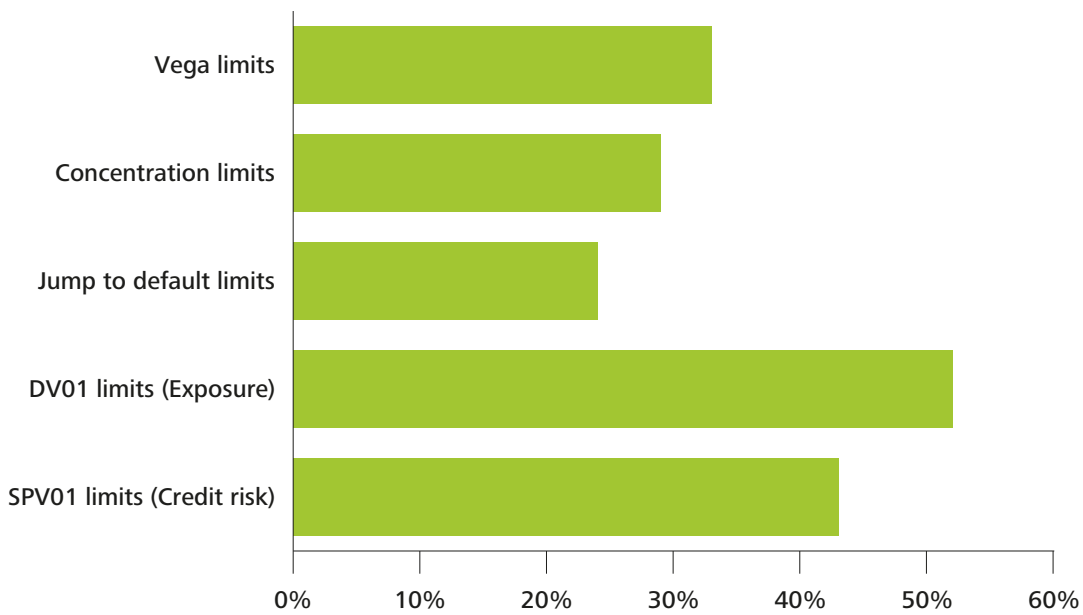
Figure 33. Frequency of greek hedging*



*Expressed as a percentage of the total number of participants that hedge the relevant greek.

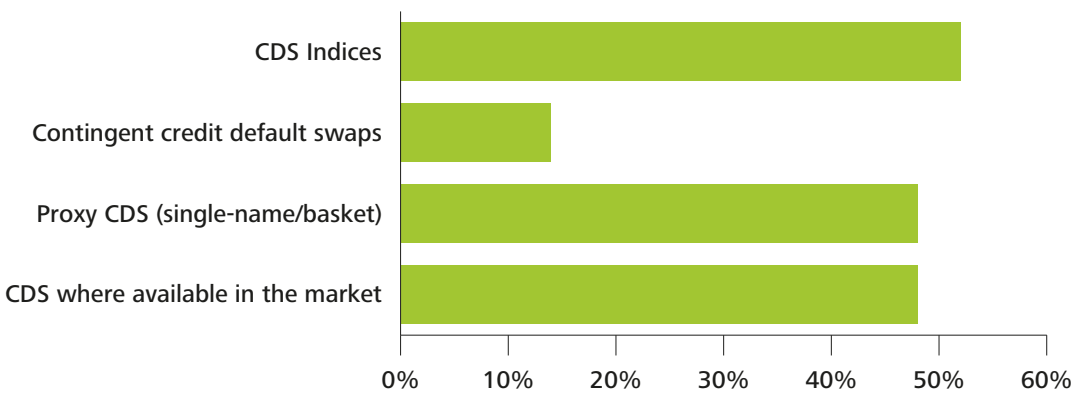
Given that most CVA desks are set up as hedge centres rather than profit centres and that in either case CVA hedging is to some degree discretionary, it is not surprising that the majority of desks are subject to various risk limits, the most common of which are credit risk and exposure risk limits (typically assessed against a VaR measure). The risk that is most predominantly hedged is exposure DV01s, which is not surprising since the underlying hedges are generally liquid and often exchange traded. On the other hand, credit risk, volatility and correlation hedges may be illiquid, subject to their own CVA and in many cases simply unavailable. By focusing on the hedging of material and liquid market risk components, a CVA desk can reduce its MTM volatility even if it is not hedged against its idiosyncratic jump to default credit risk on illiquid names. It should be noted that generally hedging practice may change under future Basel III capital requirements as capital relief is achieved for the hedges which are illiquid and have WWR (single name and index CDS) whilst more liquid hedges (for example, interest rate hedges) may actually consume capital.

Figure 34. Limits applied to the CVA desk



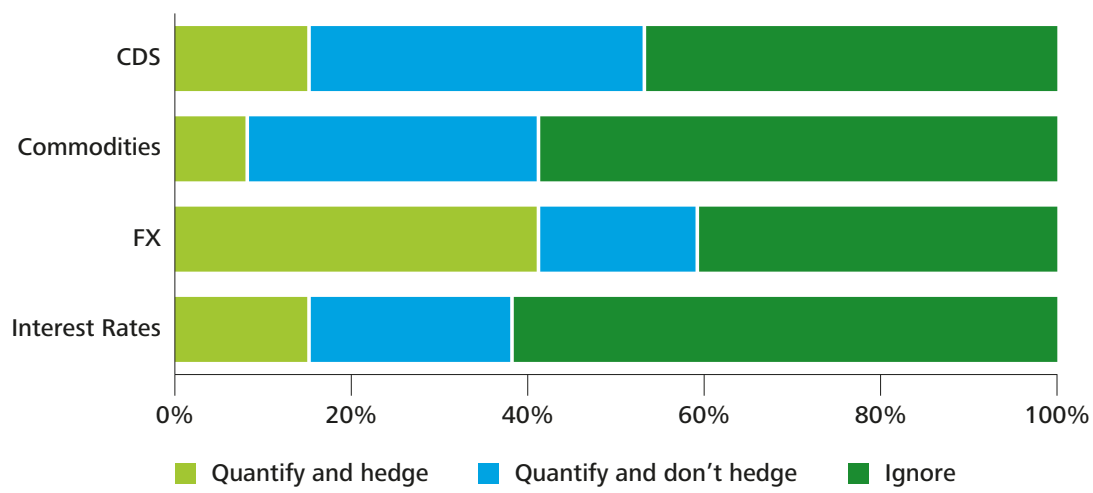
Participants hedge their credit SPV01s with the products that are most liquidly available in the market and best match their hedge methodology and mandate. Given that the population of counterparties with actively traded CDSs is limited, it is not surprising that the most traded product is CDS indices. The number of respondents that trade CDS and proxy CDS compared to CDS indices also indicates that banks would use CDS for those counterparties which actively trade and indices for the more illiquid counterparties. iTraxx and CDX indices offer the ability to hedge the systemic risk of the illiquid counterparties in a commoditised way by region, counterparty type and tenor. Whilst some of the more sophisticated banks indicated that they have traded contingent credit default swap (CCDS) in the past, this market has never lived up to the expectations that were created when the technology was first developed.

Figure 35. Instruments used for credit SPV01 hedging



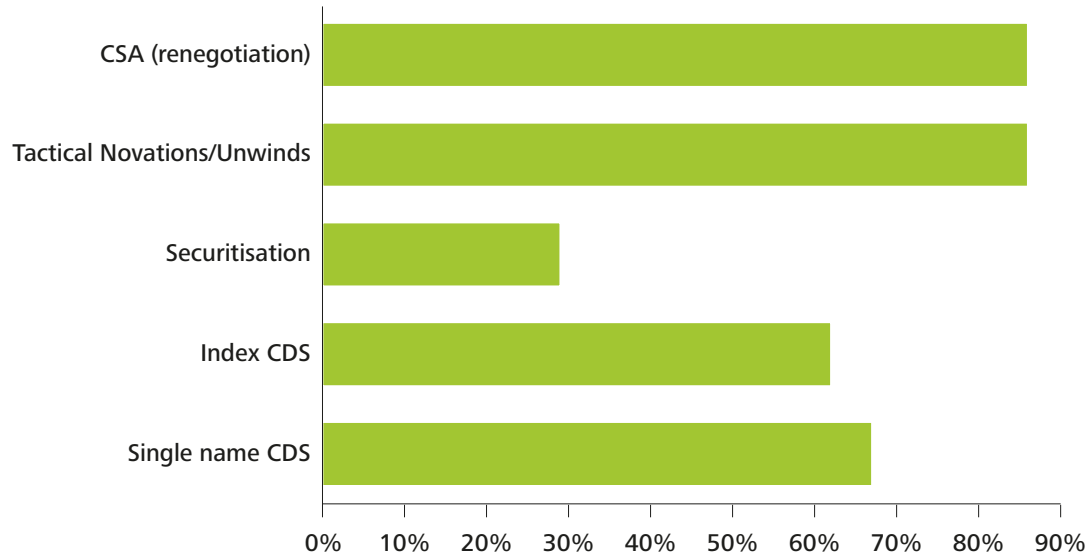
During financially stressed periods, exposures tend to increase at the same time as credit spreads widen, a phenomenon generally described as WWR. Not surprisingly, Basel III regulation has placed a stronger emphasis on both general and specific WWR, the former arising from macroeconomic relationships and the latter from badly structured trades. Some more attention is being given to WWR although, as noted above, only 31% of banks model general WWR. Specific WWR is receiving more attention although most approaches are relatively ad-hoc. The most sophisticated banks are implementing programmes to identify and attempt to work out WWR positions and often to avoid such trades entirely. As can be seen from the following chart, the main WWR under consideration are FX, followed by interest rate, CDS and commodities. For those banks that do identify WWR and attempt to calculate it, the instruments used to hedge are mainly out-of-the-money options and CDS in different currencies.

Figure 36. Treatment of wrong way risk



Given the current emphasis on controlling the linkage between CVA/DVA, as measured under accounting and front office measures, and CVA capital, as measured under regulatory requirements, it is helpful to understand how banks are looking at strategies to manage their approach to obtaining capital relief by hedging and other structural approaches. Such approaches are outlined in the figure below. CSA renegotiation and tactical unwinds and novations are used by most banks whilst hedging with single name or index CDS is slightly less common since a number of banks do not activity hedge their CVA credit risk. CVA securitisation has been tried by a few banks that participated in the survey, but the uncertainties over future capital relief (none is permitted according to Basel III) presumably has led the majority of banks to not yet pursue this option.

Figure 37. Strategies looked at to obtain capital relief



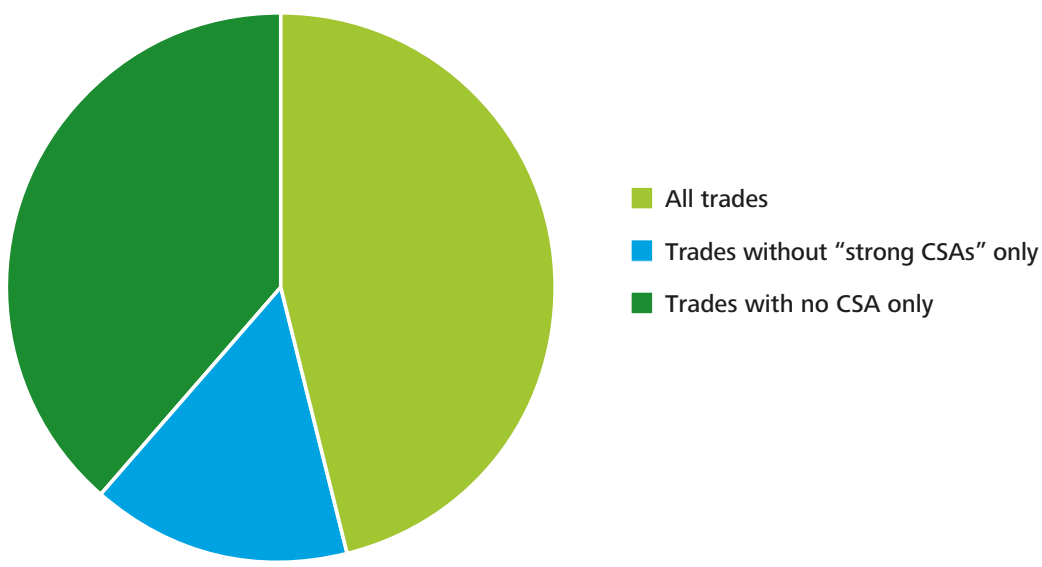
The move from using historical PDs and market parameters to using risk-neutral parameters, coupled with the adoption of DVA and FVA into front office pricing, has resulted in significant increases in P&L volatility. This has necessitated the increased control and visibility of P&L movements. Banks are generally focusing on building P&L explains, which attempt to cover as many parameters as possible and hence reduce unexplained P&L. Of the banks surveyed, 73% had a P&L explain (which constitutes all the banks following an active hedging approach) which for the more sophisticated banks has a residual unexplained amount of less than 5% of the gross daily movement in reserves.

2.8. Return on capital

Counterparty risk capital increases under Basel III are anticipated to be substantial due to both CVA VaR and the more conservative modelling assumptions such as stressed calibration and increase in the margin period of risk.

Given the increased capital usage of derivative trades under Basel III, not surprisingly, 65% of participants confirmed that their institutions price trades with clients in the context of a return on capital (equity) hurdle. For the banks that include capital costs in pricing, the trades considered are shown below.

Figure 38. Trades priced in the context of a return on capital hurdle



Additionally for those participants who price derivatives in terms of a target/hurdle:

- 30% adjust the return to reflect costs and a tax efficiency ratio.
- 70% reflect capital usage over the life of the trade in equity. Of these banks:
  - 85% discount capital at the risk free rate; and
  - 15% discount capital at the cost of capital rate.

At the time of writing, future capital requirements are mired in uncertainty with respect to the actions of local regulators. For example, in Europe the sovereign exemption under CRD IV has provided relief and banks (and their clients) are hoping that this will be followed by a similar non-financial exemption for which they have been lobbying. Clearly such an exemption would be extremely beneficial in terms of relieving the capital charges associated with, for example, corporate counterparties. Other potential methods of achieving capital relief such as CVA securitisations, and gaining recognition for market risk hedges, do not yet have a clear impact as they depend on the views of local regulators.

Given the regulatory uncertainty, defining a return on capital hurdle rate is challenging, a problem that is particularly acute for long-dated trades. Banks are either dealing with this by making their best estimate of future regulatory rules or by being conservative and viewing any future concessions as producing gains (that may be partially passed back to clients).

3. Funding and valuation

3.1. Overview

The issues surrounding CVA have spread out to cover three new but related areas that are proving just as difficult and controversial in their own ways. Firstly, CVA is defined as an adjustment to the risk-free value of a trade and therefore defining risk-free valuation is paramount. Secondly, the same intuition and mechanisms behind CVA also appear, analogously, to give rise to an FVA adjustment that defines the costs and benefits derived from the funding of a derivatives book. Finally, the concept of valuing the optionality derived from collateral agreements is increasingly being viewed as a significant valuation component, collateral valuation adjustment (CollVA).

3.2. OIS discounting

Under stylised assumptions that can be loosely defined as representing a perfect collateral agreement, it can be shown that OIS discounting is the correct valuation mechanism and no further adjustments are required. Whilst such a theoretical ideal never exists in practice, it is a useful starting point. Furthermore, certain trades such as interbank and centrally cleared ones (from the point of view of the CCP at least) are reasonably close to this limiting case.

In light of the above comments, it is not surprising that 90% of participants confirmed that all desks are already, or are planning in the near future, to use OIS discounting for the valuation of collateralised (secured funding) trades. Whilst such dual-curve discounting is much more complex due to the need to calibrate both OIS and LIBOR curves where the instruments defining the former are often illiquid except for the major currencies, OIS discounting is becoming the market standard for risk-free valuation.

Figure 39. Desks using or planning to use OIS discounting

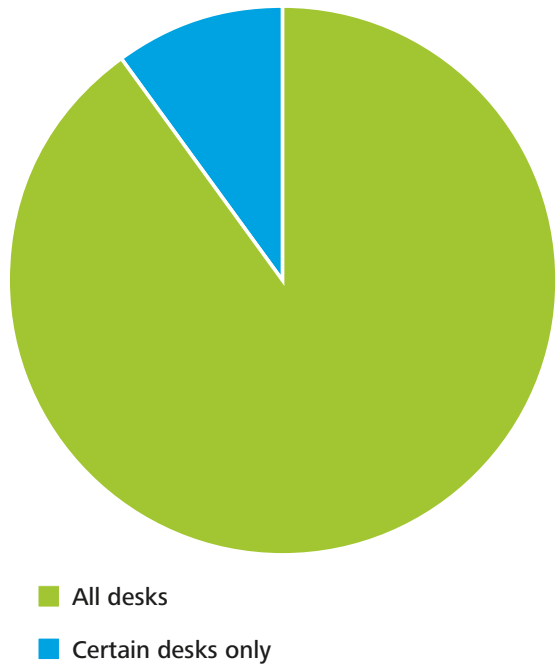
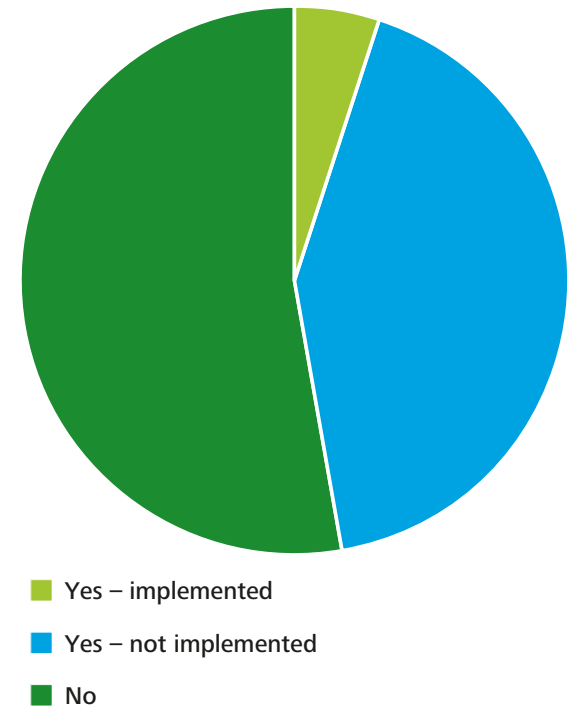


Figure 40. Stochastic models considered for OIS discounting



In addition to the switch to OIS discounting approaches, some banks have looked into stochastic models for modelling the behaviour between OIS and LIBOR rates, although the majority of these are still in development since banks consider them too complex to implement at the current time.

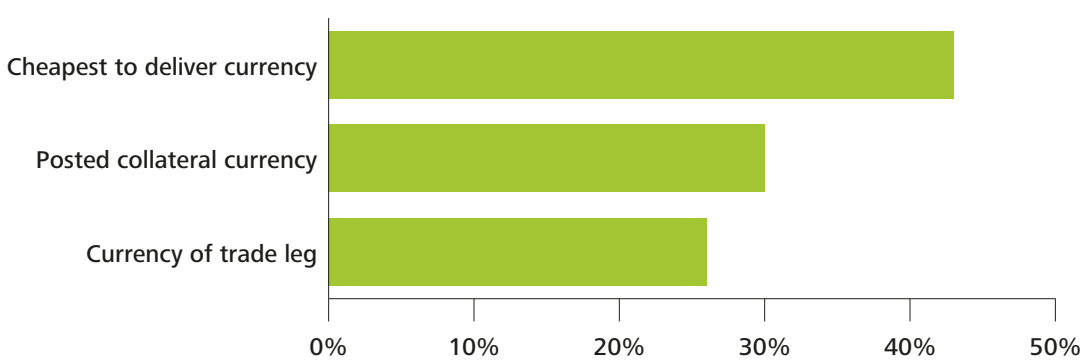
3.3. Collateral value adjustment

It has become widely appreciated that typical CSAs may give rise to a large degree of optionality due to the flexibility over the collateral that can be posted, both in terms of currency and asset type.

A bank can attempt to post (and substitute, if relevant) the collateral that is most beneficial in terms of return and balance sheet opportunity. In the case of non-cash collateral, the relevant haircuts and repo considerations must be factored into these decisions. Obviously a bank must consider the optionality that their counterparty has and the fact that this will be exercised optimally.

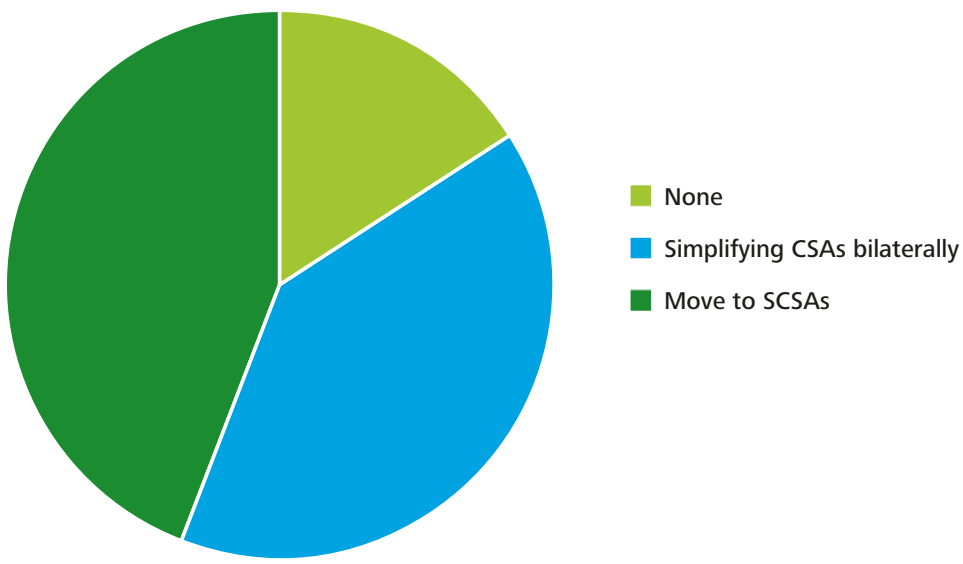
The first way in which CollVA is seen is via the choice of (OIS) discount curve used for valuation which differs between the trade currency, posted collateral and theoretical cheapest-to-delivery collateral.

Figure 41. Discount curve for secured funding trades



Whilst banks are attempting to monetise CollVA where possible, it is generally recognised as a component which is highly subject to price. Going forward, it appears likely that it will instead be structured out of trades via changes to collateral agreements. For collateralised counterparties a significant number of participants envisaged simplification of CSAs (either bilaterally or through the standard credit support annex (SCSA) in order to mitigate the complexity of modelling the components of current CSAs.

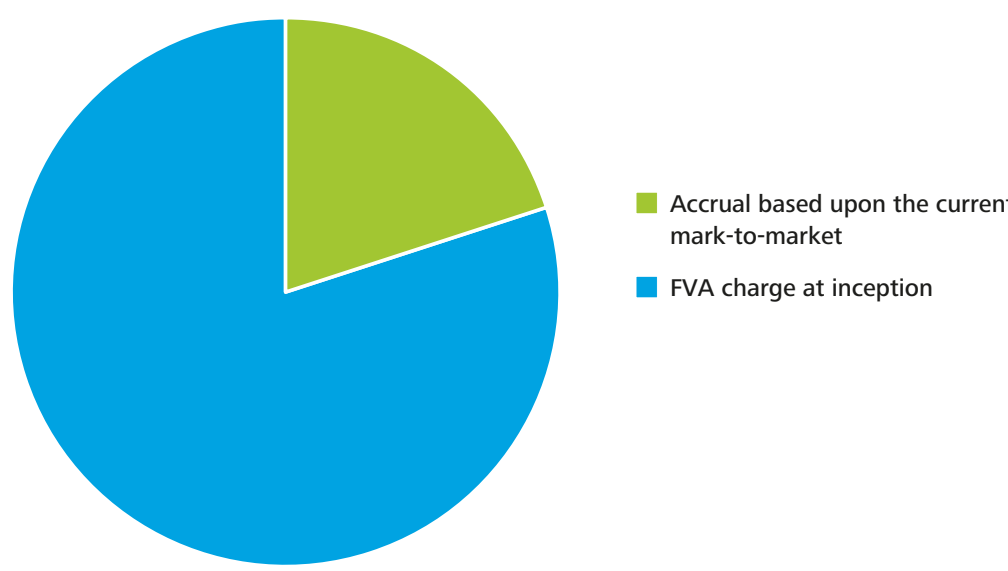
Figure 42. Changes to CSAs envisaged



3.4. Unsecured funding (FVA)

For uncollateralised trades in particular, it has become increasingly common for banks to consider funding costs and benefits via FVA in pricing. 52% of participants charge for FVA at the trade level with most charging it to the relevant trading desk at inception. The remainder recover FVA on an accrual basis or not at all. This reflects the growing consensus that FVA is not only an important component but ideally must also be charged on an upfront basis to prevent funding intensive trades appearing profitable when they are not.

Figure 43. Charging the trading desk for funding*



*Expressed as a percentage of the total number of participants that charge for funding.

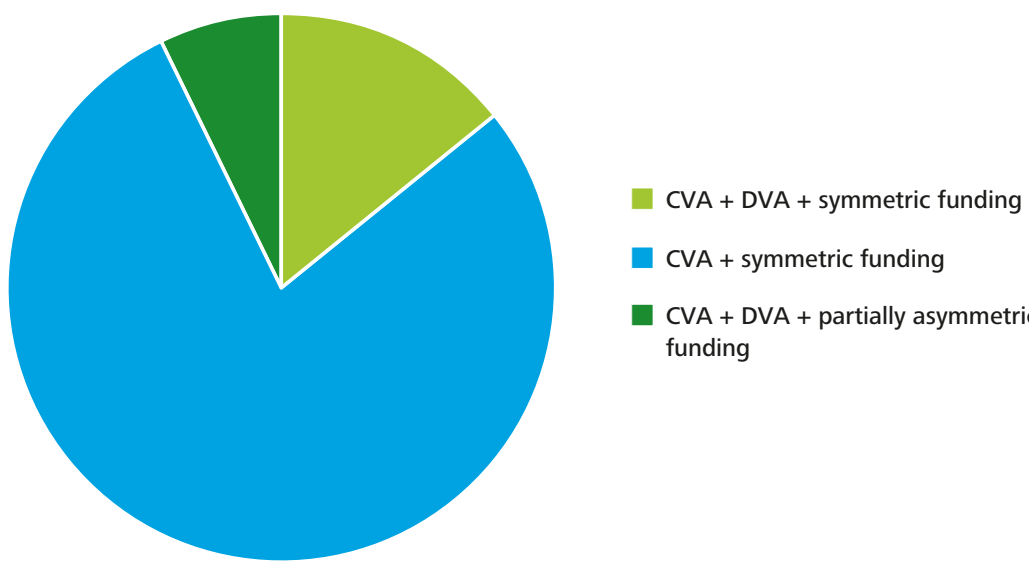
Almost 80% of banks use a rate based on the bank's internal funding policy for marking unsecured funding, with the remaining basing their calculation of FVA on a bond spread.

Interestingly, we did not generally observe a thorough treatment of partially collateralised trades (e.g. the case of a relatively high threshold in a CSA) that tend to fall in between the extreme cases of OIS discounting and unsecured funding.

In the debate as to whether DVA should be included alongside CVA, it has often been rationalised as a funding benefit. This has caused further debate as to how to price CVA, DVA and funding into trades at inception (and on an on-going basis, for example on assignments and novations).

The situation has not been clarified, rather the opposite, by a proliferation of mathematical and theoretical literature on the topic of CVA, DVA and funding, and potential overlaps between the numbers and the variables that go into producing the numbers. Many authors on the topic have expressed a variety of divergent views. For participants that consider DVA and FVA, the figure below presents how they currently view CVA, DVA and FVA from a front office perspective.

Figure 44. Inclusion of CVA, DVA and funding



Interestingly, it seems that banks are increasingly seeing DVA as a funding benefit and not as a benefit in the event they default. We note that whilst a bank may consider CVA + symmetric funding to be relevant, they may still refer to the funding benefit as DVA. An obvious reason for this is to remain consistent with accounting requirements.

However, the role DVA plays (whether it is viewed as a funding benefit or not) in terms of damping the overall volatility of the P&L of a CVA desk is also important.

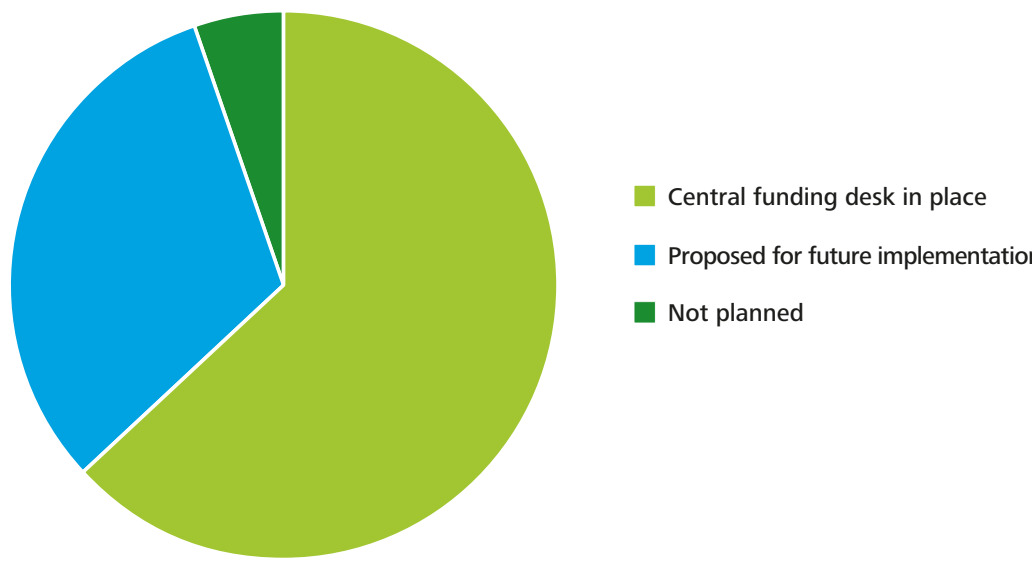
Despite the obvious disagreements over the treatment of funding, there seems little disagreement from practitioners generally that funding should be a component of valuation. This is at odds with some eminent academics[3] who have published work suggesting that funding costs should not be a component of valuation. There is potentially some middle ground to this debate relating to the fact that the theoretical and practical views of funding may differ substantially due to the fact that the market for funding does not operate in an idealised Capital Asset Pricing Model manner. In addition, devolving group treasury funding requirements across multiple businesses in a bank is highly complex. Calculating a funding cost per trade, which is tied to how the bank would fund the trade on a group-wide netted basis, is not a trivial undertaking.

3 See J. Hull and A. White, Risk July 2012, pp. 83-85 and Risk September 2012, pp. 18-22.

3.5. Organisation

The way that the majority of the larger banks have dealt with the issues resulting from the financial crisis has been to set up desks to manage the resources of the bank, from funding to credit and capital. As these resources have become scarcer, banks have been forced to focus far more on management of capital, and the return thereon. One practical application has been a trend in the larger institutions to implement a central funding desk which has been tasked with optimising the way the front office trading desks fund their derivative trades on a mark to market basis, a role which has been traditionally performed by the banks' treasury department on a global accrual basis. As can be seen from the following graph, 60% of participants confirmed they had a central funding desk in place currently, with the remaining 40% stating that they have future plans to implement a central funding desk.

Figure 45. Central funding desk setup



One mechanism the central treasury function uses to fund the bank is the issuing or redeeming of bonds.

As the trend over the last few years has been to more actively hedge the risks resulting from CVA and DVA, so has the trend more recently been to hedge the funding risks. Half of those participants who have a central funding desk in place hedge the market risk on the funding position.

Conclusion

The landscape around CVA has changed dramatically in the last two to three years and related areas such as OIS discounting, collateral optimisation and funding have become increasingly significant. Market practices are evolving rapidly, catalysed by changes in accounting requirements and regulatory capital guidelines. In keeping with the findings of Solum Financial Partners' 2010 survey, there is still an evident divergence in approaches and the nonuniformity of methodologies across the market.

Given the changes brought about by future Basel III capital rules, it is not surprising that there is a large focus on the regulatory side of counterparty risk. Banks are investing more resource into building models for advanced capital treatments. This usually includes the smaller banks that are looking to gain IMM and/or specific risk approvals to allow them to use the advanced capital methodologies charges for both default risk and CVA capital. There is a growing trend to model collateral rather than rely on simpler routes such as the shortcut method and increased emphasis on quantifying WWR. Effort is also being placed on building backtesting frameworks and establishing effective model validation procedures. Finally, the move towards central clearing is focusing efforts on quantifying CCP trade and default fund exposures, and calculating the associated capital charges.

The use of risk-neutral default probabilities via credit spreads is becoming a standard practice in the quantification of CVA, driven by accounting and capital rules. The associated problem of mapping illiquid credit spreads is receiving significant thought. Divergence still exists over DVA and the extent to which it should be used to reduce CVA charges. Return on capital considerations are being incorporated into pricing decisions and are considered especially important in light of the Basel III CVA capital charge. The potential impact of capital charges is also leading to increased focus on capital reducing CVA hedging strategies, despite the potential misalignments between capital relief and hedging in relation to DVA and non-credit related hedges.

A number of areas have developed around CVA which have recently received substantial consideration. There is a general switch to OIS discounting as the best standard valuation method (at least for collateralised trades), although some divergence exists over the correct choice of OIS currency. The optionality around collateral terms has also led to debate around the value inherent in CSAs and how best to optimise this. Finally, the consideration of FVA as a material component of valuation has become common, although this remains probably the most controversial aspect, with debate on the validity of FVA and the potential overlap between FVA and DVA creating variation in approaches across the market.

Despite substantial effort around CVA practices and related areas over the last few years, future trends remain very hard to predict. This is largely due to ambiguity over the implementation timescale and potential exemptions in Basel III. Uncertainty over aspects such as DVA and FVA, which are outside the Basel III mandate but are the subject of increased focus under accounting rules, adds to the confusion. The one thing that is certain is that CCR, CVA and FVA will remain hot topics for regulators, practitioners and academics for some time to come.

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