

xVA – The Past, Present and Future

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It's Derivatives Pricing, Stupid

- **Pricing (and risk management) of OTC derivatives has been a large field and covered many products, for example:**
 - A lot of effort went into attempting to price and hedge such products
- **But then xVA happened**
 - xVA represents the correct pricing and valuation of credit, funding, collateral and capital costs

	Traditional bank approach	Best Practice
CVA	Trading desk and sales division face default losses	CVA pricing, accounting and central management
FVA	Treasury funds the bank and charges trading desk overnight funding	FVA inception pricing, accounting and central management
CoIVA	Collateral management manages operational aspects of collateral.	CoIVA inception pricing, accounting and central management
KVA	Trading desk is charged for capital and businesses set soft return on capital metrics	Capital is priced directly into transactions via hurdles and released over the lifetime

The Past

The Present

The Future

History of xVA

Late 1990s

- Asian crisis and LTCM failure
- Some banks large price CVA into trades
- Only passive CVA management (historical data, no hedging)

2000s

- Large banks refine approach to CVA
- Lack of interest otherwise
- Accounting rules (IAS39 and FABS157) imply CVA should be considered

2007 onwards

- Major financial crisis
- LIBOR no longer considered risk-free
- IFRS 13 accounting standards (CVA/DVA)
- Funding costs important (FVA)
- Basel III and CVA capital charge (KVA)
- Central clearing mandate and bilateral margin rules (MVA)

A Remark on Pricing

- Pricing CVA depends on credit exposure
- Credit exposure is

$$E = \max(V_{MTM}, 0)$$

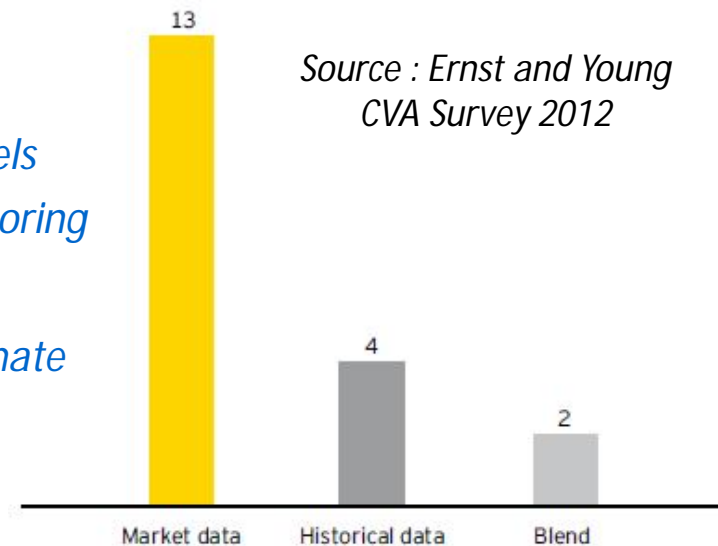
1992 ISDA		2002 ISDA	
Method	Description	Method	Description
Market Quotation	<i>Obtain at least 3 firm quotes for the portfolio in question and use average</i>	Close out amount	<i>Indicative quotations, public sources of price information, models</i>
Loss Method	<i>Assess own losses as a result of the default in good faith</i>		
Cure period 3 days		Cure period 1 day	

$$V_{MTM} \neq V_{close\ out}$$

- The same problem arises repeatedly in other forms for xVA

Accounting Rules – CVA and its Evil Twin

- **IFRS 13 (1st January 2013)**
- **CVA**
 - “The entity shall include the effect of the entity’s *net exposure to the credit risk of that counterparty* or the counterparty’s net exposure to the credit risk of the entity in the fair value measurement
- **DVA**
 - “Non-performance risk includes, but may not be limited to, an entity’s *own credit risk*”
- **CVA is increasingly “risk-neutral”**
 - For example, “*it is not acceptable to have CCR models based on expected loss or historical calculations ignoring risk premia*”
 - “*The CVA challenger model then calculates an estimate of the CVA based on Benchmark PD parameters estimated from current index CDS curves....*”



The Debate Around DVA

Quant Congress USA: Ban DVA, counterparty risk quant says

Author: Laurie Carver

Source: Risk magazine | 16 Jul 2010

Categories: Credit Risk

Banks' profits boosted by DVA rule

The profits of British banks could be inflated by as much as £4bn due to a bizarre accounting rule that allows them to book a gain on the fall in the value of their debt.

Being two-faced over counterparty credit risk

A recent trend in quantifying counterparty credit risk for over-the-counter derivatives has involved taking into account the bilateral nature of the risk so that an institution would consider their counterparty risk to be reduced in line with their own default probability. This can cause a derivatives portfolio with counterparty risk to be more valuable than the equivalent risk-free positions. In this article, Jon Gregory discusses the bilateral pricing of counterparty risk and presents an approach that accounts for default of both parties. He derives pricing formulas and then argues that the full implications of pricing bilateral counterparty risk must be carefully considered before it is naively applied for risk quantification and pricing purposes

tions have a dedicated unit that charges a premium to each business line and in return takes on the counterparty risk of each new trade, taking advantage of portfolio-level risk mitigants such as netting and collateralisation. Such units might operate partly on an actuarial basis, utilising the diversification benefits of the exposures, and partly on a risk-neutral basis, hedging key risks such as default and forex volatility.

A typical counterparty risk business line will have significant reserves held against some proportion of expected and unexpected losses, taking into account hedges. The recent significant increases in credit spreads, especially in the financial markets, will have increased such reserves and/or future hedging costs associated with counterparty risk. It is perhaps not surprising that many institutions, notably banks, are increasingly considering the two-sided or bilateral nature when quantifying counterparty risk. A clear advantage of doing this is that it will dampen the impact of credit spread increases by offsetting mark-to-market losses arising, for example, from increases in required reserves. However, it requires an institution to attach economic value to its own default, just as it may expect to make an economic loss when one of its counterparties defaults. While it is true a corporation does 'gain' from its own default, it might seem strange to take this into account from a pricing perspective. In this article, we will make a quantitative analysis of the pricing of counterparty risk and use this to draw conclusions about the validity of bilateral pricing.

Counterparty credit risk is the risk that a counterparty in a financial contract will

default prior to the expiry of the contract and fail to make future payments. Counterparty risk is taken by each party in an over-the-counter derivatives contract and is present in all asset classes, including interest rates, foreign exchange, equity derivatives, commodities and credit derivatives. Given the recent decline in credit quality and heterogeneous concentration of credit exposure, the high-profile defaults of Enron, Parmalat, Bear Stearns and Lehman Brothers, and writedowns associated with insurance purchased from monoline insurance companies, the topic of counterparty risk management remains ever-important.

A typical financial institution, while making use of risk mitigants such as collateralisation and netting, will still take a significant amount of counterparty risk, which needs to be priced and risk-managed appropriately. Over the past decade, some financial institutions have built up their capabilities for handling counterparty risk and active hedging has also become common, largely in the form of buying credit default swap (CDS) protection to mitigate large exposures (or future exposures). Some financial institu-

Unilateral counterparty risk

The reader is referred to Pykhtin & Zhu (2006) for an excellent overview of measuring counterparty risk. We denote by V_t, T the value at time t of a derivatives position with a final maturity date of T . The value of the position is known with certainty at the current time ($t < s \leq T$). We note that the analysis is general in the sense that V_t, T could indicate the value of a single derivatives position or a portfolio of netted positions, and could also incorporate effects such as collateralisation. In the event of default, an institution must consider the following two situations:

■ $V_t, T > 0$. In this case, since the netted trades are in the institution's favour (positive present value), it will close out the position but retrieve only a recovery value, $V_t, T \delta_r$, with δ_r a percentage recovery fraction.

■ $V_t, T \leq 0$. In this case, since the netted trades are valued against the institution, it is still obliged to settle the outstanding amount (it does not gain from the counterparty defaulting).

*We note that since exposures within several portfolios are linear then this case is readily general.

Risk February 2009

Using debt value adjustment to inflate profits

Financial results in large banks have been inflated in the third quarter due to an accounting rule called "debt value adjustment" (DVA). DVA states that banks are allowed to mark their debt to market. In other words, if their debt decreases in price on the market, this is interpreted as a decrease in liabilities and is reported as profit. In the third quarter, this rule created £10 billion in profits in the biggest U.K. banks and \$12 billion in profits in the biggest U.S. banks.

How to Monetise DVA?

- **Go bankrupt**

- Usually not a popular choice

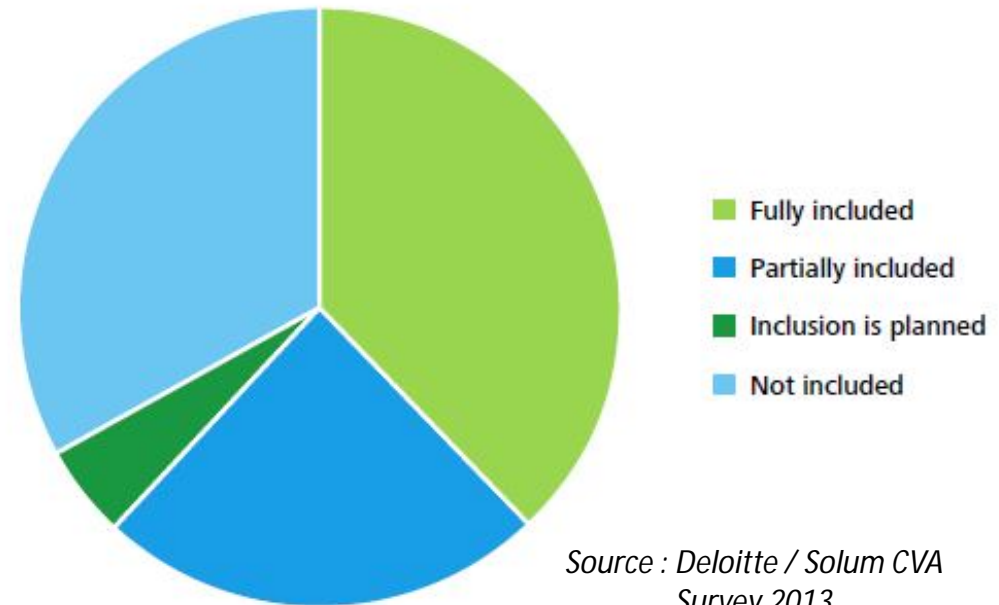
- **Unwinds / novations**

- An institution may realise a DVA gain if a trade is unwound in the future (e.g. banks unwinding transactions with monolines)

- **Hedging**

- Sell CDS protection on yourself!
- Sell CDS on another counterparty (who is highly correlated with you)
 - Not a perfect hedge
 - Creates wrong-way risk for buyer of protection
 - Careful who you choose (Lehman)
- Buy back your own debt (not really a dynamic hedge) – link to FVA

Figure 28. Inclusion of DVA in pricing



Source : Deloitte / Solum CVA Survey 2013

The Past

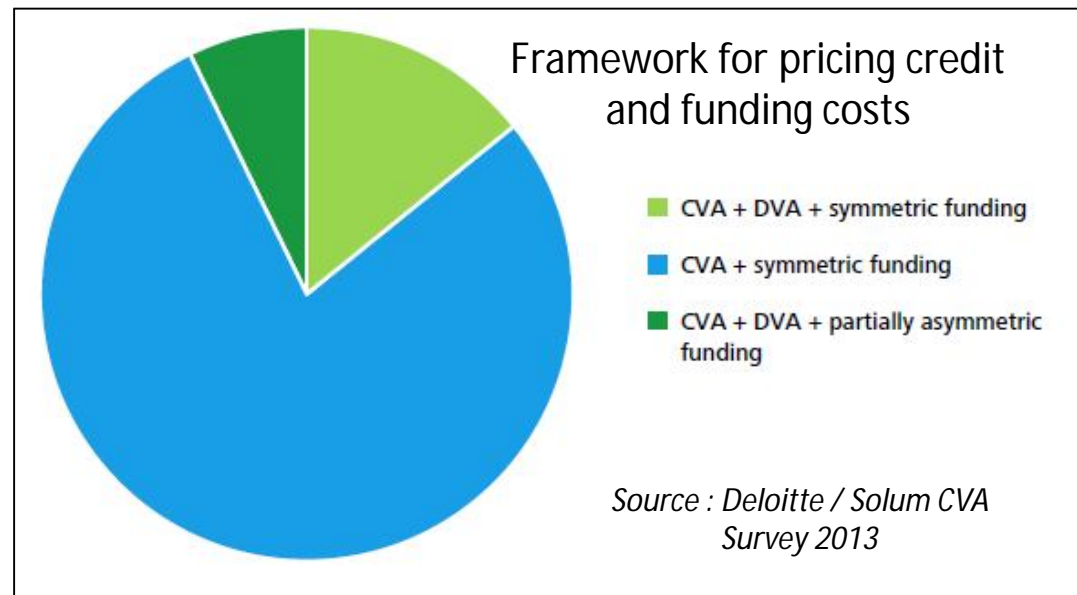
The Present

The Future

Problem with your DVA? Use FVA!

- **In January 2014, JP Morgan reported FVA for the first time**
 - \$1.5 billion pre-tax loss (delta around -\$25 million per bp?)
- **DVA sensitivity?**
 - Q4 loss of \$536 million on DVA (JPM CDS spread had tightened from 93 bps to 70 bps)
 - Delta around +\$23.3 million per bp?
- **What JP Morgan calls FVA partially offsets their DVA results**

"P&L volatility of combined FVA/DVA going forward is expected to be lower than in the past."



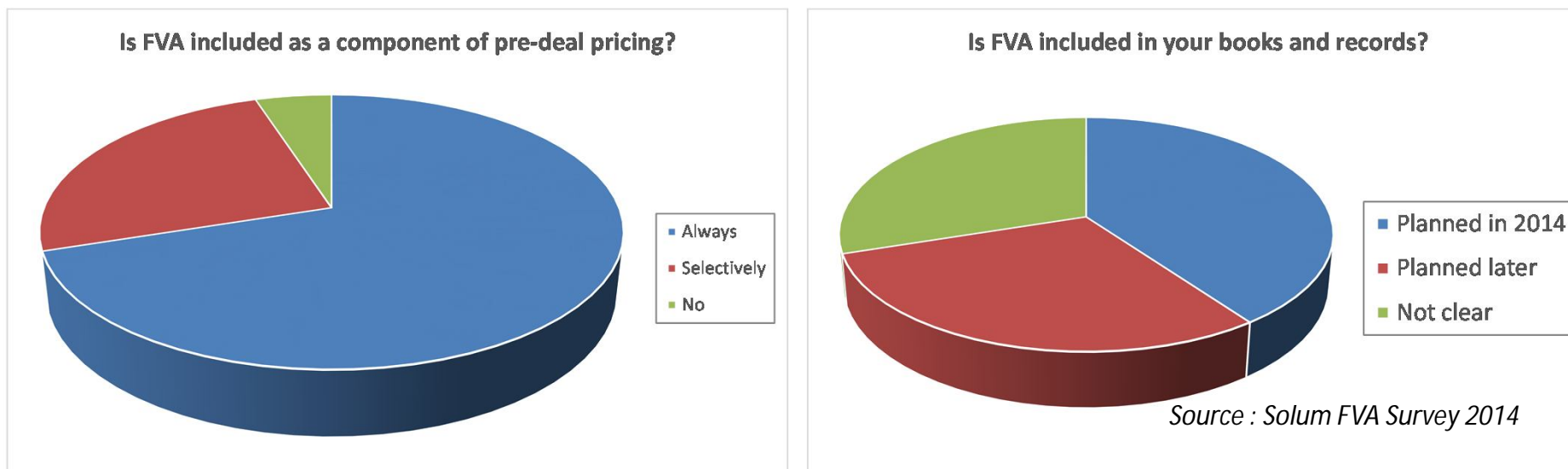
The Use of FVA

*“During 2012, a fair-value adjustment was applied to account for the impact of incorporating the **cost of funding** into the valuation of **uncollateralised derivatives**”*

*“Valuation adjustments are integral to determining the fair value of derivatives [including] credit valuation adjustments and **funding valuation adjustments.**”*

*“The group has recognised a funding valuation adjustment [of £143 million] to adjust for the net cost of **funding certain uncollateralised derivative positions** where the group considers that this cost is included in market pricing.*

*In general, FVA reflects a **market funding risk premium inherent in the uncollateralized portion of derivative portfolios, and in collateralized derivatives where the terms of the agreement do not permit the reuse of the collateral received.***

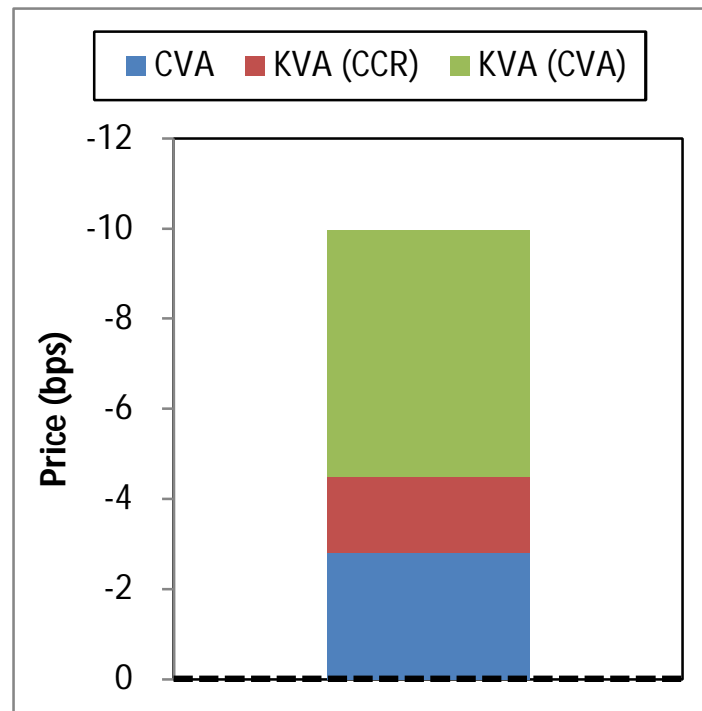


Basel III and the CVA capital charge

- **BCBS Consultative document (December 2009)**
 - “Roughly *two-thirds of CCR losses were due to CVA losses* and only about one-third were due to actual defaults. The current framework addresses CCR as a default and credit migration risk, but does not fully account for market value losses short of default.”
- **This led to the CVA capital charge**
 - “Banks will be subject to a *capital charge for potential mark-to-market losses (CVA)* associated with a deterioration in the credit worthiness of a counterparty.”
- **But don't include that weird DVA thing.....**
 - “the Basel Committee is of the view that all **DVAs for derivatives should be fully deducted.....**”

Capital Value Adjustment (KVA)

- Increased regulatory capital requirements puts greater emphasis on pricing capital, now known as KVA (Kenyon and Green 2014)
- Aim of KVA
 - To provide a profit that can be released over time and matches the cost of regulatory capital requirements



*Uncollateralised
7-year swap
Single-A counterparty*

Overlaps

- **Whilst there may not be as much debate over xVA formulas, what about their *interactions*?**
- **DVA and FBA**
 - Double counting of DVA (own default) and FBA (funding benefit)
 - But what curve should we use (own CDS, own cost of funding)?
- **CVA and FCA**
 - Arguably some overlap which may lead to using a lower cost of funding (funding liquidity risk premium?)

Hull and White (2014) "FVA is justifiable only for the part of a company's credit spread that does not reflect default risk"
- **CVA and KVA**
 - CVA is the (theoretical) cost of hedging counterparty risk
 - KVA is the cost of holding regulatory capital when we don't or can't hedge
- **FVA and KVA**
 - Can we use regulatory capital for funding?

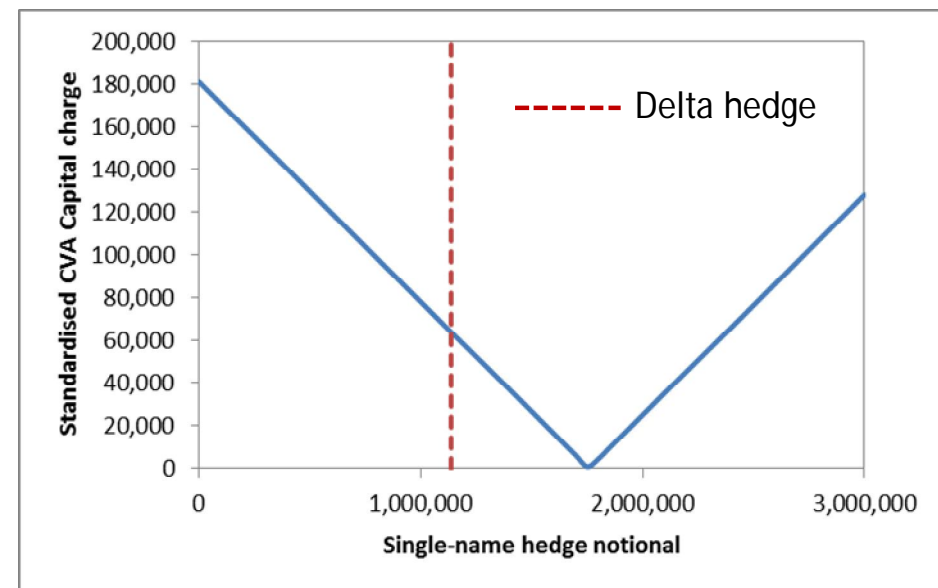
One Example – CVA Hedging and Capital

- **The doom loop and CVA capital exemptions**

- *“... CVA desks have come to account for a large proportion of trading in the sovereign CDS market and their hedging activity has reportedly been a factor pushing prices away from levels solely reflecting the underlying probability of sovereign default.”*

- **Active capital reduction causing accounting losses**

- *“.. second quarter 2013 net revenues
.... included a loss of €58 million related to the impact of a Debt Valuation Adjustment (DVA) on certain derivative liabilities, and a loss of € 69 million related to the mitigation of pro forma CRR/CRD 4 RWA on Credit Valuation Adjustment (CVA)”*

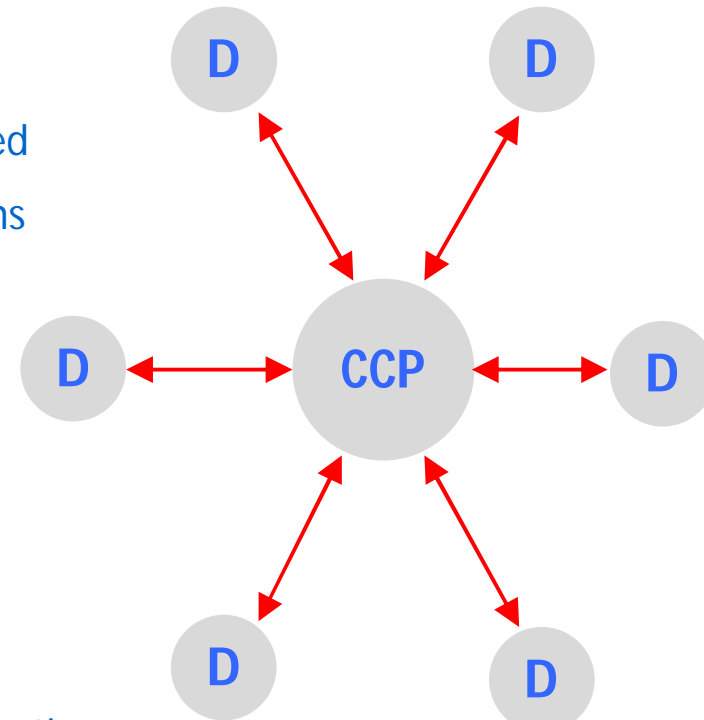


The Past
The Present
The Future

Clearing and Margining Requirements

- **Clearing Mandate**

- Standardised OTC derivatives must be cleared
- Exemptions for end-users and FX transactions
- CCPs require significant initial margin



- **Bilateral margin requirements**

- Applies to bilateral (non-clearable) OTC derivatives
- Variation margin (already quite common)
- Initial margin (uncommon in bilateral markets) phased in from September 2016
- Again some exemptions for end-users and FX trades

- **This leads to margin value adjustment (MVA or IM VA)**

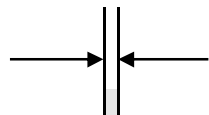
Traditional and Future Bilateral Clearing Compared

- Take an example of a 5-year transaction

Traditional Bilateral Approach

Credit exposure, PFE, CVA, Capital all assessed over entire lifetime (potentially with impact of future collateral taken into account)

Initial margin
computed over a 10-
day time horizon



Future Bilateral Approach (Initial Margin)

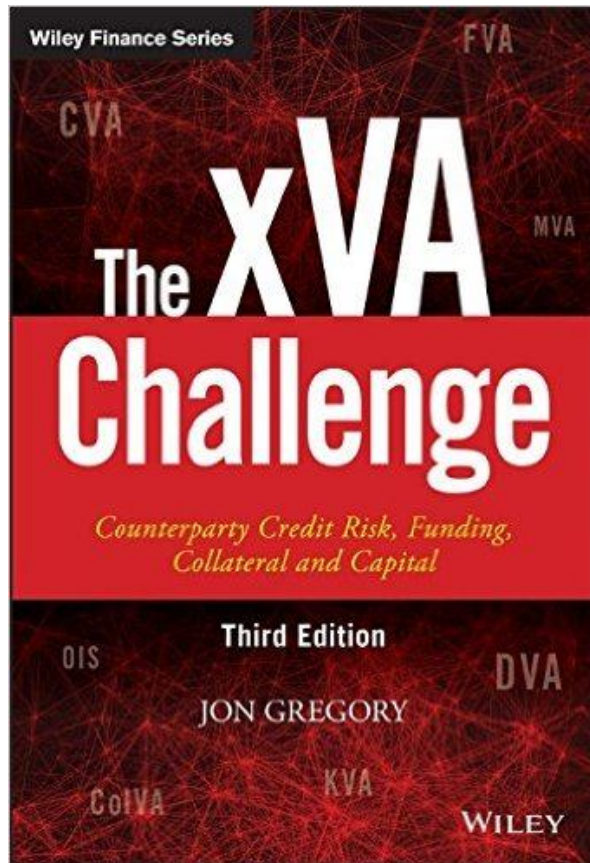
Uncertain liquidity impact of change in future margin requirements

Replacing the CVA Capital Charge

“The CVA VAR capital proposals are an example of regulation becoming needlessly complex¹.”

- **The current CVA capital charge causes problems**
 - Regulator definition of CVA is not the same as the account definition
 - Lack of (or partial) recognition of CVA hedges
- **BCBS “Review of the Credit Valuation Adjustment Risk Framework”, July 2015**
 - Capturing all CVA risks and better recognition of CVA hedges
 - In particular, including the exposure component of CVA (e.g. interest rate, FX risk)
 - Alignment with industry practices for accounting purposes (but not DVA)
- **What this means**
 - Capital may be driven from the front-office xVA implementation and not a separate regulatory implementation
 - Fast xVA calculations and sensitivities will be key

¹ *Counterparty Casino: The need to address a systemic risk”, September 2010*



"The issue of counterparty risk has undergone rapid change since the credit crisis. All end-users of OTC derivatives are affected by these changes. The new title 'xVA' of the third edition reflects the increased complexity generated by these changes. Jon Gregory provides the reader with a comprehensive, yet readable, discourse on the different facets of counterparty risk. This book is essential reading for regulators and OTC derivatives users."

Stuart M. Turnbull, Bauer Chaired Professor of Finance, Bauer College of Business, University of Houston

"Jon Gregory is one of the godfathers of the VA story. He is amongst the few who can demystify the puzzle and this book is a key tool for bringing light into these dark matters."
Wim Schoutens, independent consultant and professor in financial engineering at the University of Leuven, Belgium

"This is by far the clearest and most comprehensive reference work on counterparty credit risk and related value adjustments. With this new edition, Jon Gregory explains the latest changes in market practice, along with critical expert commentary."

Darrell Duffie, Dean Witter Distinguished Professor of Finance at Stanford Graduate School of Business

"The first and second editions of Jon Gregory's book on the post-crisis OTC derivatives markets were classics, packed with a wealth of information. This third edition greatly extends the coverage of the first two editions. Like them, it is a must-buy for anyone involved with derivatives markets. Congratulations Jon on another excellent book."

John Hull, Maple Financial Chair in Derivatives and Risk Management Joseph L. Rotman School of Management, University of Toronto

"Jon Gregory manages again to grab the XVA animal in its relentless flight and restrain it long enough to take a picture of its present state. The picture is, as usual, neat and clear, with full awareness of the continuous commitment of the market to optimise this aspect of pricing that has become a crucial factor for a bank's competitiveness."

Massimo Morini, Head of Interest Rate and Credit Models at Banca IMI and Professor of Fixed Income at Bocconi University

"Jon Gregory has written a fantastic book on counterparty risk, funding, collateral management and capital. It is remarkably clear and accessible, especially considering how technical and sophisticated these topics are. The book is an indispensable guide to the challenges of understanding and computing XVA measures and definitely one to read!"

Giovanni Cesari, Author of Modelling, Pricing, and Hedging Counterparty Credit Exposure (Springer)