

The Next Steps in the xVA Journey

Jon Gregory, Global Derivatives, Barcelona, 11th May 2017

The Role and Development of xVA

CVA and Wrong-Way Risk

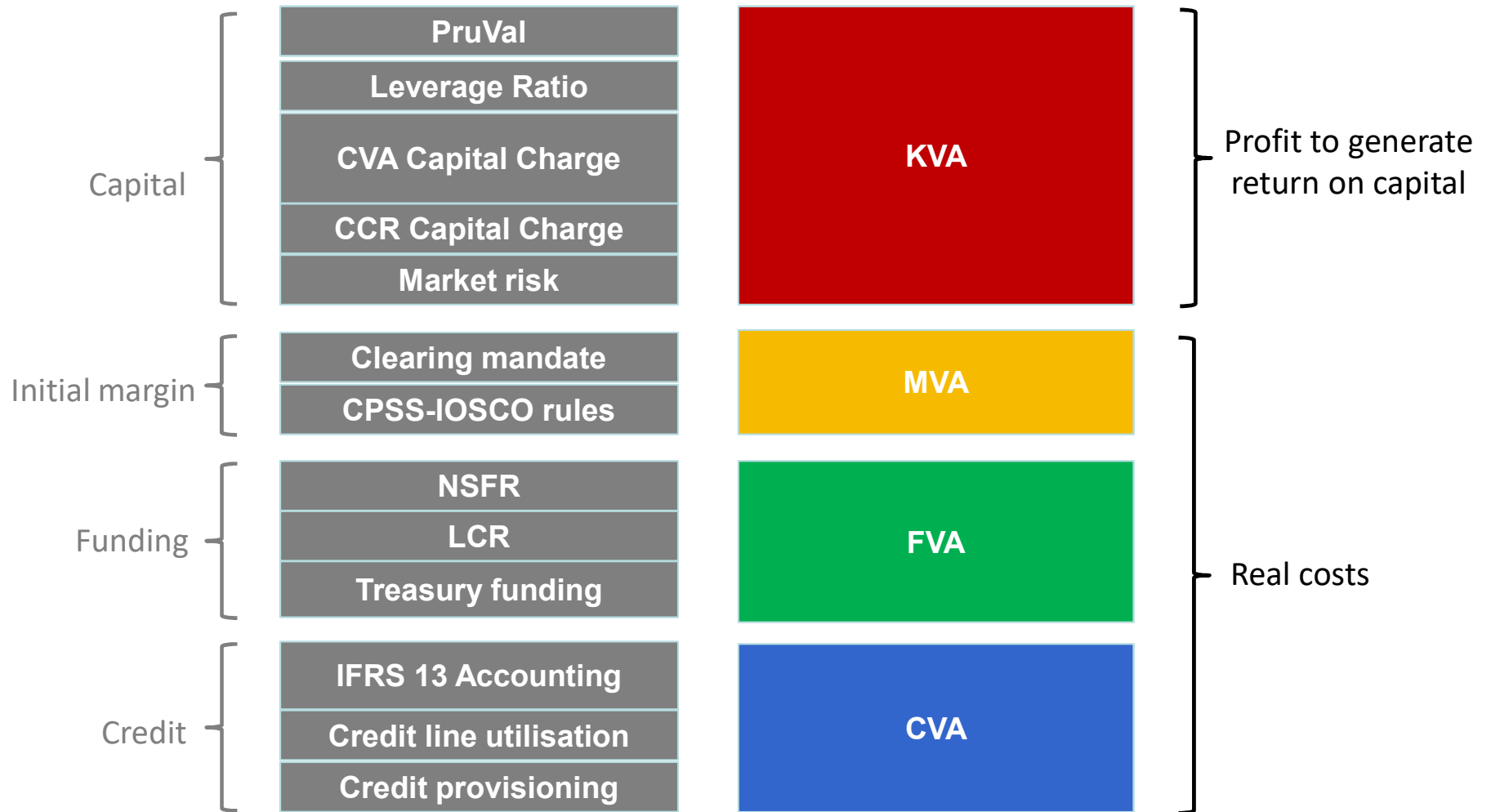
FVA and MVA framework

KVA approach

The Birth of xVA

- **Derivatives pricing was previously seen as pricing cashflows**
- **Now it is seen as being also related to**
 - Credit risk
 - Funding
 - Collateral
 - Capital
 - Initial margin
- **These aspects are not mutually exclusive and often require portfolio level calculations**
 - This has led to the birth of the “xVA desk” or “central resource desk”
 - This desk typically deals with most of the complexity in derivatives pricing

The xVA Hierarchy



Role of xVA – General Comments

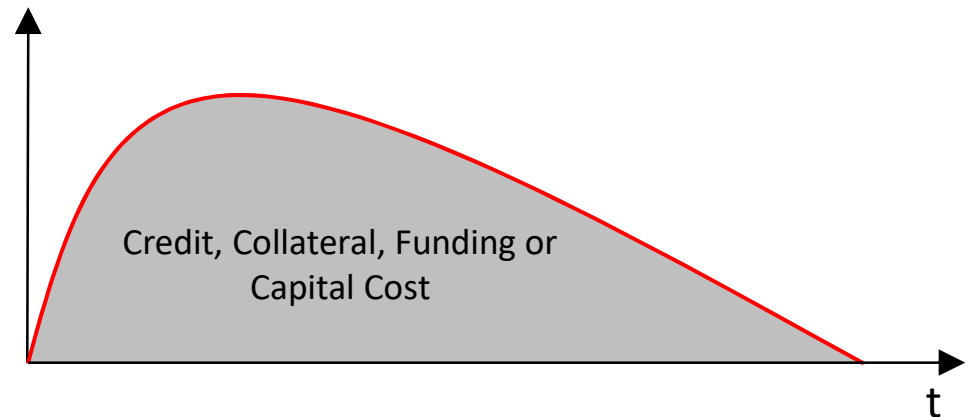
$$V_{actual} = V_{ideal} + xVA$$

- **Comments**

- It is more expensive to originate credit risk in derivatives than outright lending trades
- Do we price based on what will actually happen or to create the right incentive?
- Some regulation is very difficult to price (e.g. NSFR, leverage ratio)
- Huge computational burden
- Regulation currently encourages the above separation but this will change (e.g. FRTB)
- When is something an xVA and when is it not?
- xVA pricing not yet like traditional exotics pricing

The xVA Calculation – General Comments

$$xVA = \int_0^{\infty} C(t) e^{-\int_0^t \beta(u) du} E_t[X(t)] dt$$



- **xVA computation involves**
 - Determination of curves, $C(t)$
 - Calculation of underlying profile, $X(t)$
- **The first is more qualitative, the second is very quantitative (option pricing)**
 - Numerical aspects are a big challenge (GPU, AAD)
- **In some special case we are only really pricing forward contracts**
 - xVA can be implemented by the correct choice of discount factor
- **Recursive aspects, non-linear behaviour and overlaps are all important**
 - Close-out assumptions, discounting assumptions, $\beta(u)$
 - Eg: DVA/FBA, can capital be used for funding, how much capital relief do xVA hedges provide?

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CVA desks suffer Brexit double whammy

Cross-gamma losses estimated at more than \$25m for each dealer

FRTB-CVA Text

measured ES via a conservative multiplier. The proposed default level of the multiplier is [1.5]. The value of the multiplier can be increased from its default value by a bank's supervisory authority if a bank fails to capture the dependence between counterparty credit quality and exposure in its CVA calculations, or if it determines that a bank's CVA model risk is higher than its peer's.

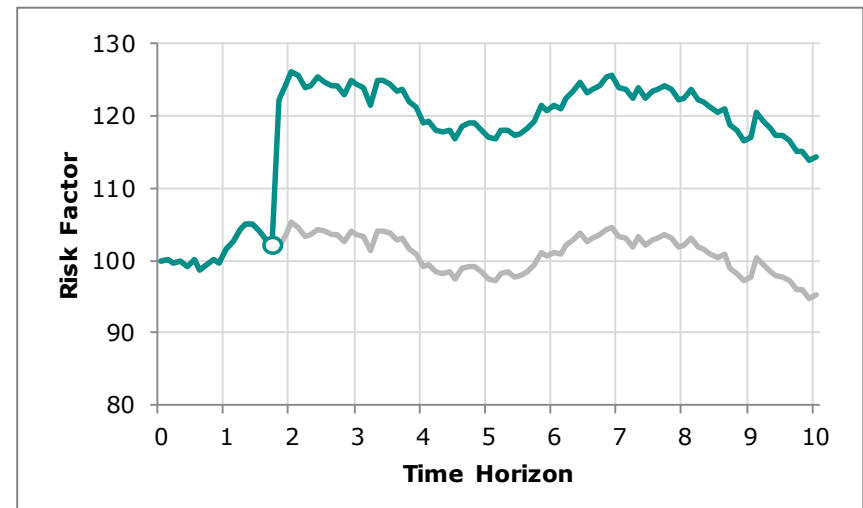
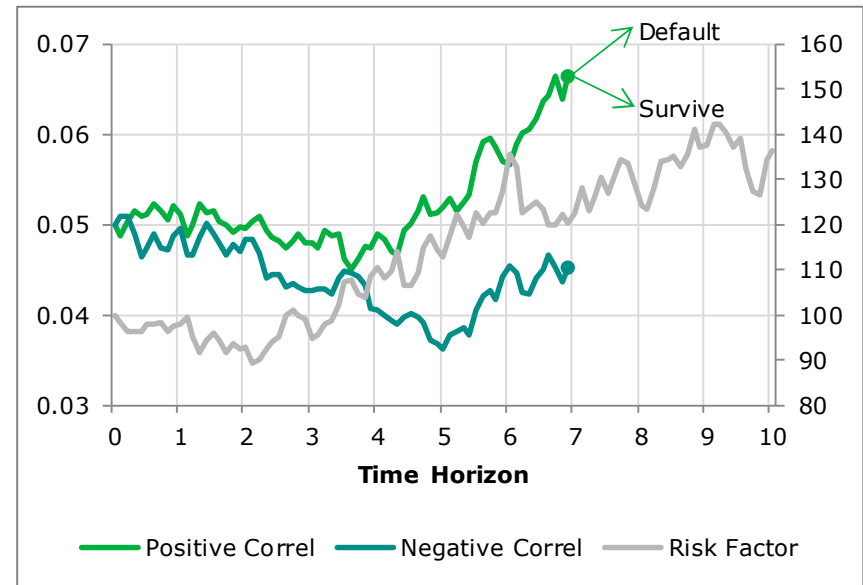
Example: Wrong-Way Risk FX Modelling

- **Model 1**

- Soft WWR model correlating credit spread (~hazard rate) with FX process
- Correlation estimated historically

- **Model 2**

- Hard WWR model where FX rate jumps when the counterparty defaults
- Correlation calibrated from CDS market

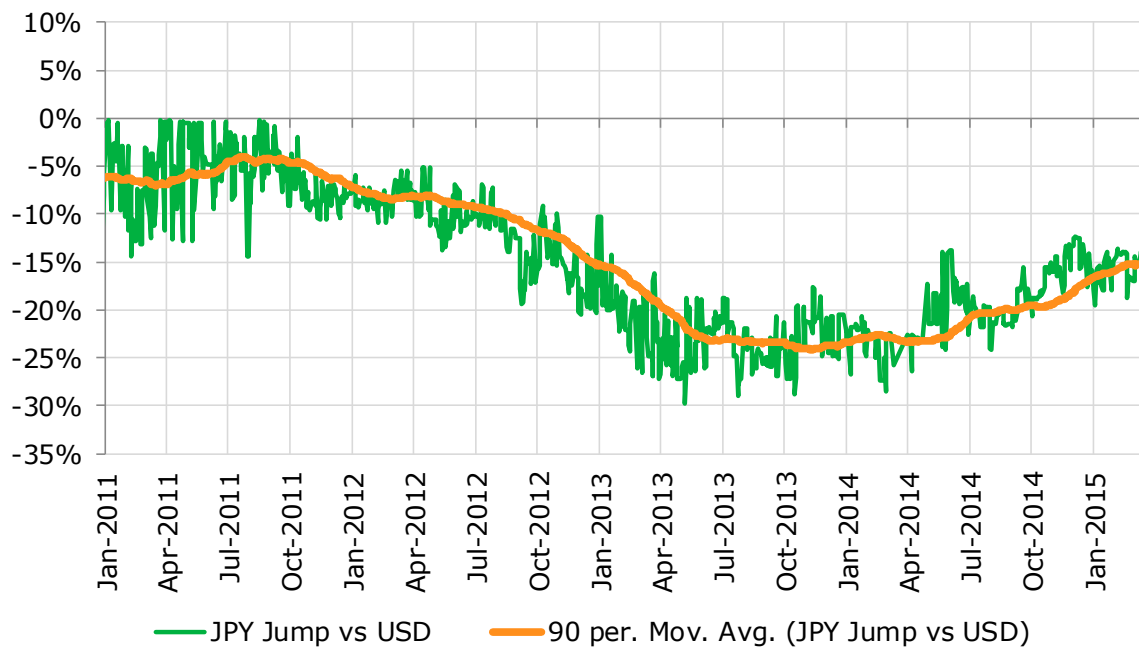


Source: IHS Markit

Implied FX Jump Calibration

- **Hard wrong-way risk model calibration**
 - Implied jump can be calibrated from CDS in local current and USD
 - Levy and Levin (1999), Ehlers and Schönbucher (2006), Jaeckel (2012)
 - Similar jump size can be calibrated from the FX market

Toyota Par CDS Spread 5Y – Implied FX Jump

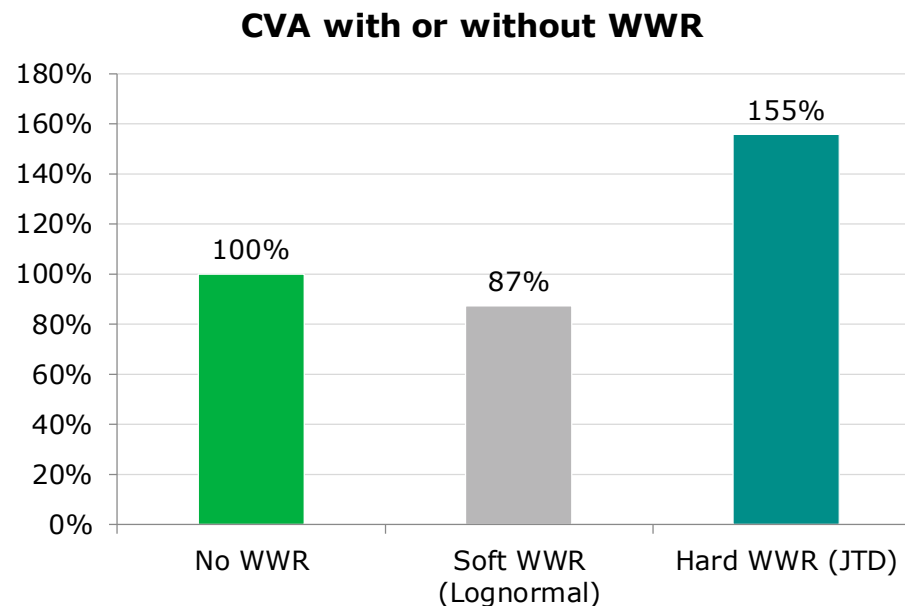


$$\text{Implied Jump} \approx \frac{CDS_{JPY}}{CDS_{USD}} - 1$$

Comparison of Wrong-Way Risk Models

- **Comparison for a directional portfolio**

- Soft WWR model gives lower CVA since historical correlation implies a weakening of JPY will be beneficial for the corporate
- Hard WWR model gives much higher CVA since default of corporate implies devaluation of JPY
- Soft WWR model cannot reproduce market prices



Source: IHS Markit

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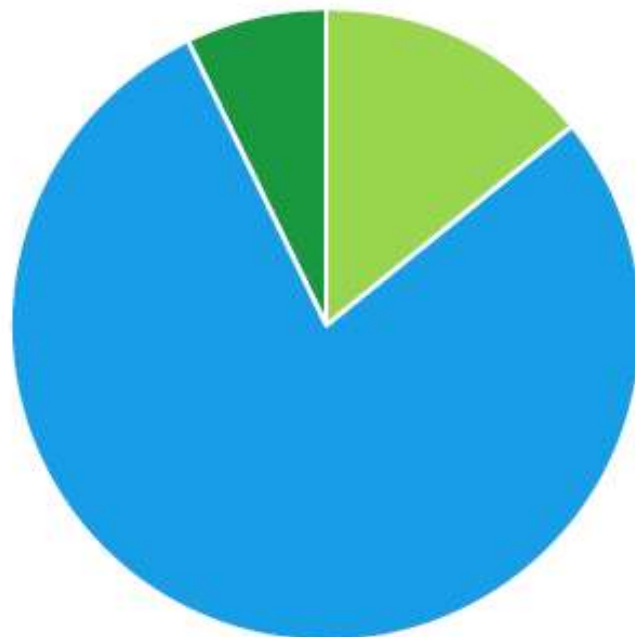
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Framework for CVA, DVA and FVA

“The adjustment this quarter is largely related to **uncollateralized derivatives receivables**, as

- Collateralized derivatives already reflect the cost or benefit of collateral posted in valuations
- Existing DVA for liabilities already reflects credit spreads, which are a significant component of funding spreads that drive FVA”



Source: Deloitte / Solum CVA Survey

- CVA + DVA + symmetric funding
- CVA + symmetric funding
- CVA + DVA + partially asymmetric funding

Symmetric funding
“LIBOR + spread discounting”

$$CVA + \underbrace{FBA}_{\text{Funding benefit}} + \underbrace{FCA}_{\text{Funding cost}}$$

“Transactions secured with collateral are valued using a discount curve based on the overnight index spread. Transactions not secured with collateral are valued using a discount curve based on Euribor/Libor plus a spread that reflects market conditions.”

FVA Shouldn't Exist?

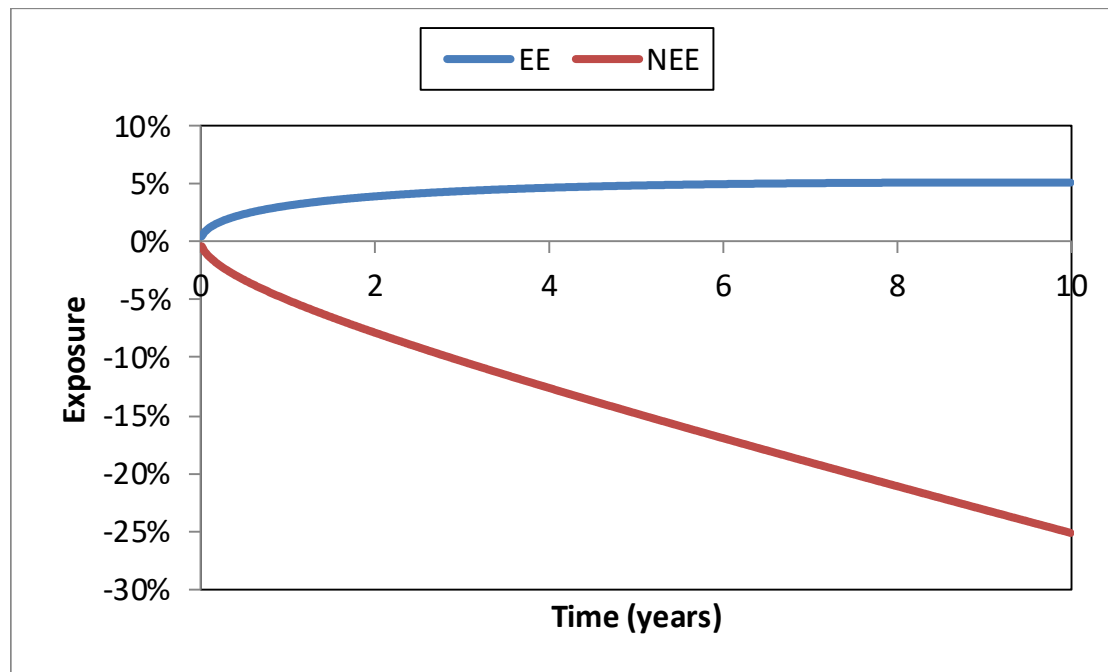
- **Hull and White (2012) – FVA should not be included in pricing and valuation**
 - It is simply a wealth transfer from shareholders to bondholders ($FVA = DVA2$)
 - Internal treasury should lend to trading desks at the risk-free rate

$$V = RFV - CVA + DVA + \cancel{DVA2} - \cancel{FVA}$$

- **Andersen, Duffie and Song (2016) support part of this view**
 - For valuation (accounting) $CVA + DVA$ should be used
 - But for pricing, they do advocate $CVA + FVA$ (maximize shareholder value)
- **This views on accounting FVA seem to take the view that:**
 - For accounting purposes, fair value represents the value of the bank and is an expectation over all scenarios (even those where the bank defaults)
 - This is not seemingly inconsistent with exit price (which is someone else's entry price) unless we view exit price as idealistic (e.g. with a counterparty with no funding costs)

CVA and FVA Example

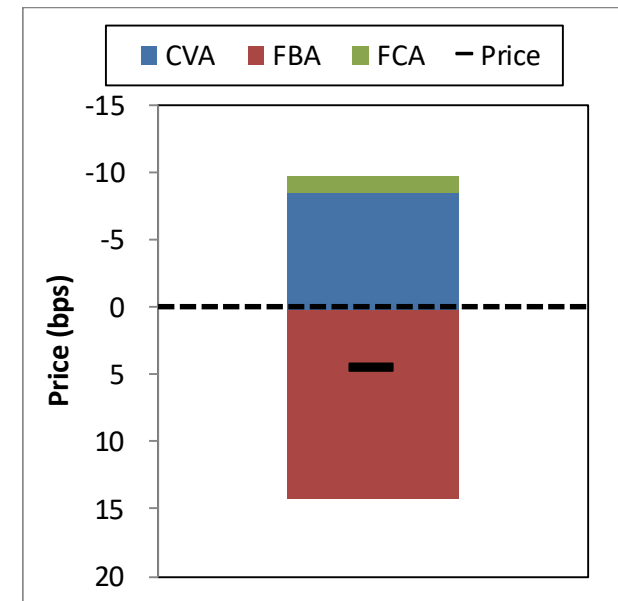
- Cross-currency swap with large IR differential



- Do we pay through mid?

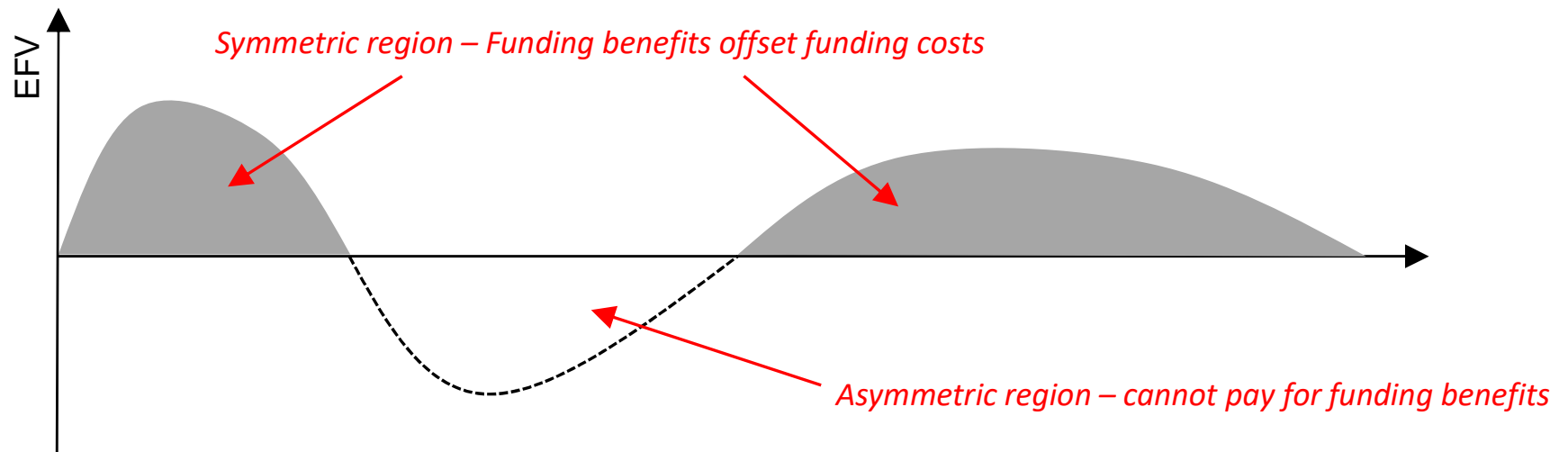
- Ideally need to look at bigger picture (and NSFR etc)

	xVA (bps)
CVA	(8.5)
FCA	(1.2)
FBA	15.2
Total	5.5



FVA Should Be Asymmetric?

- **(Net) funding benefits are not symmetric with (net) funding costs**
 - View of internal treasury in bank (lend funds at unsecured rate but borrow at risk-free rate?)
 - Albanese et al. “Excess collateral is an unstable source of funding”
 - NSFR requirements

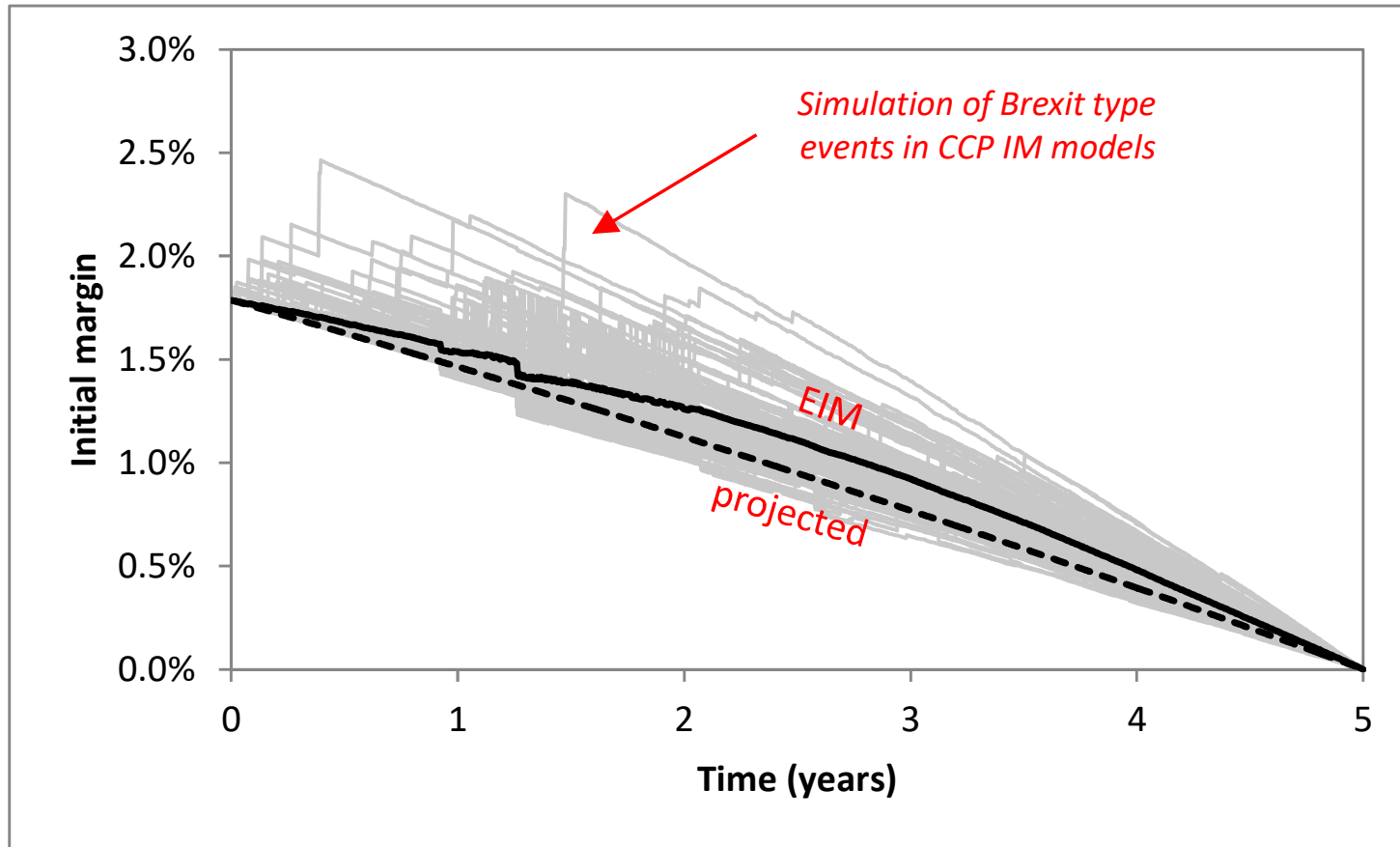


- Pricing can become a portfolio level problem
- Being very asset heavy on derivatives is helpful

Initial Margin and MVA

- **MVA is an increasing problem**
 - Central clearing
 - Bilateral margin requirements
- **What is the cost of funding IM?**
 - Wealth transfer effects – unsecured creditors should charge more (Pirrong 2013, Gregory 2016)
 - Bespoke funding strategies (Albanese et al. 2015)
- **Pricing and accounting**
 - Similar questions arise as for FVA (wealth transfer effects)
 - Portfolio effect
 - Convexity of IM

Convexity of IM



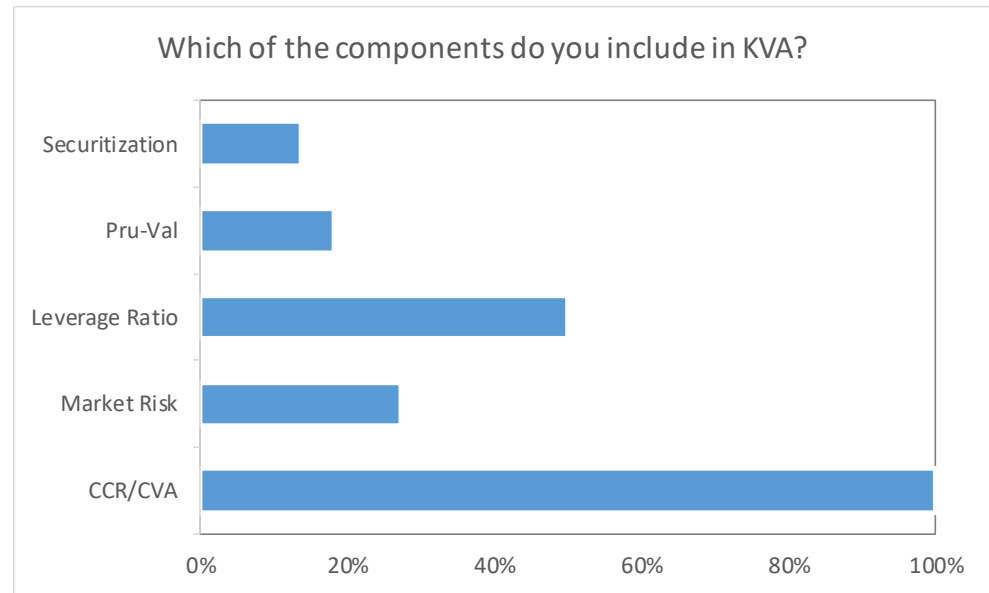
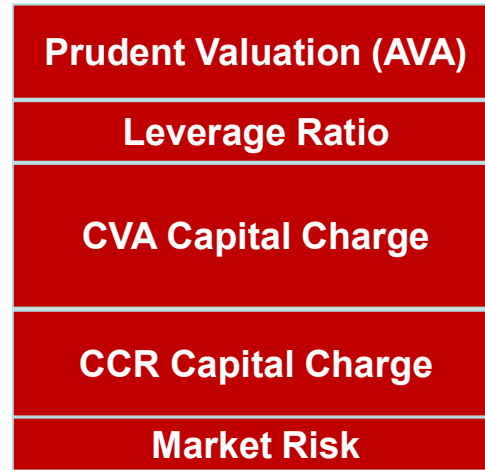
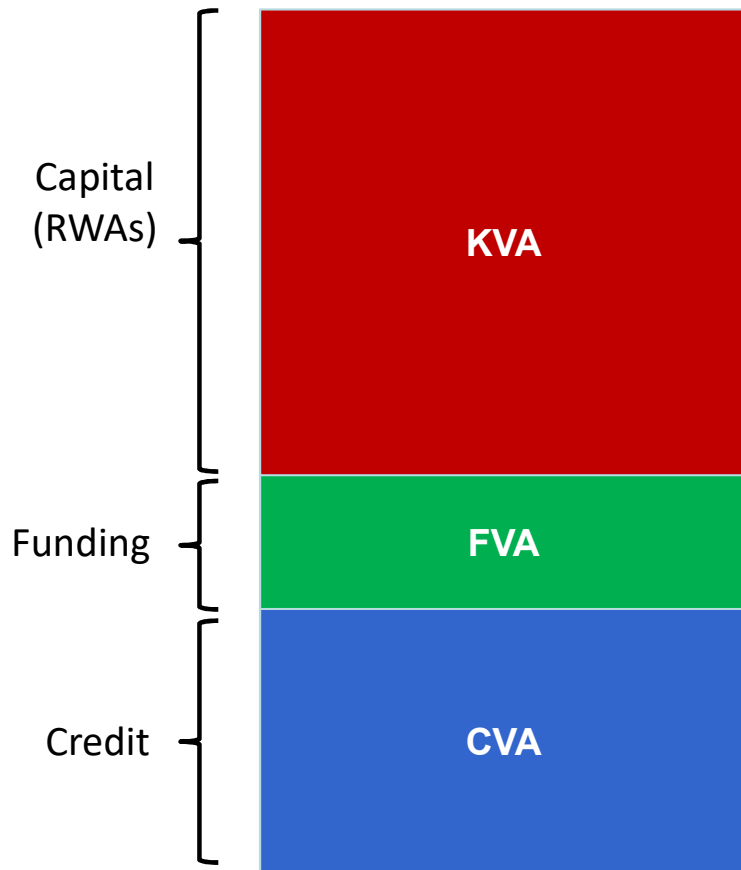
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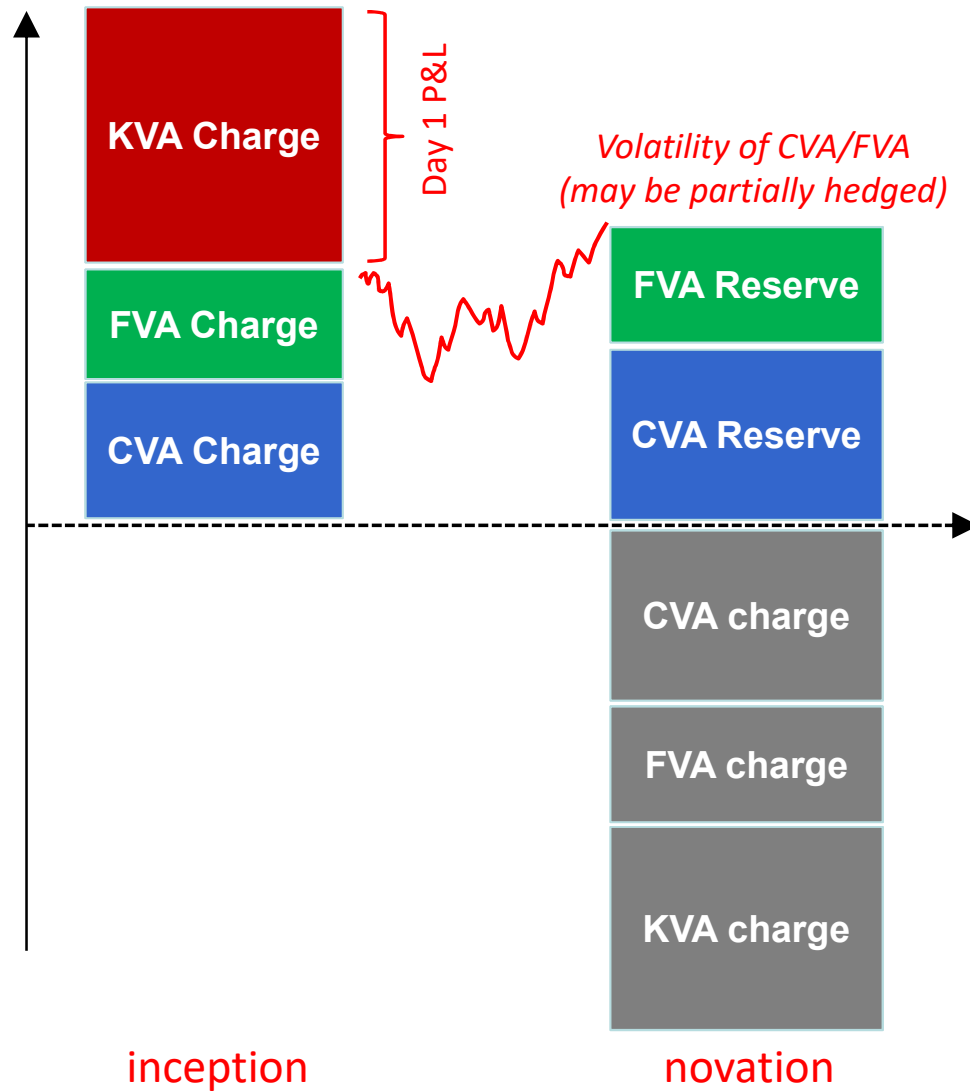
KVA approach

Regulatory Capital for Counterparty Risk*

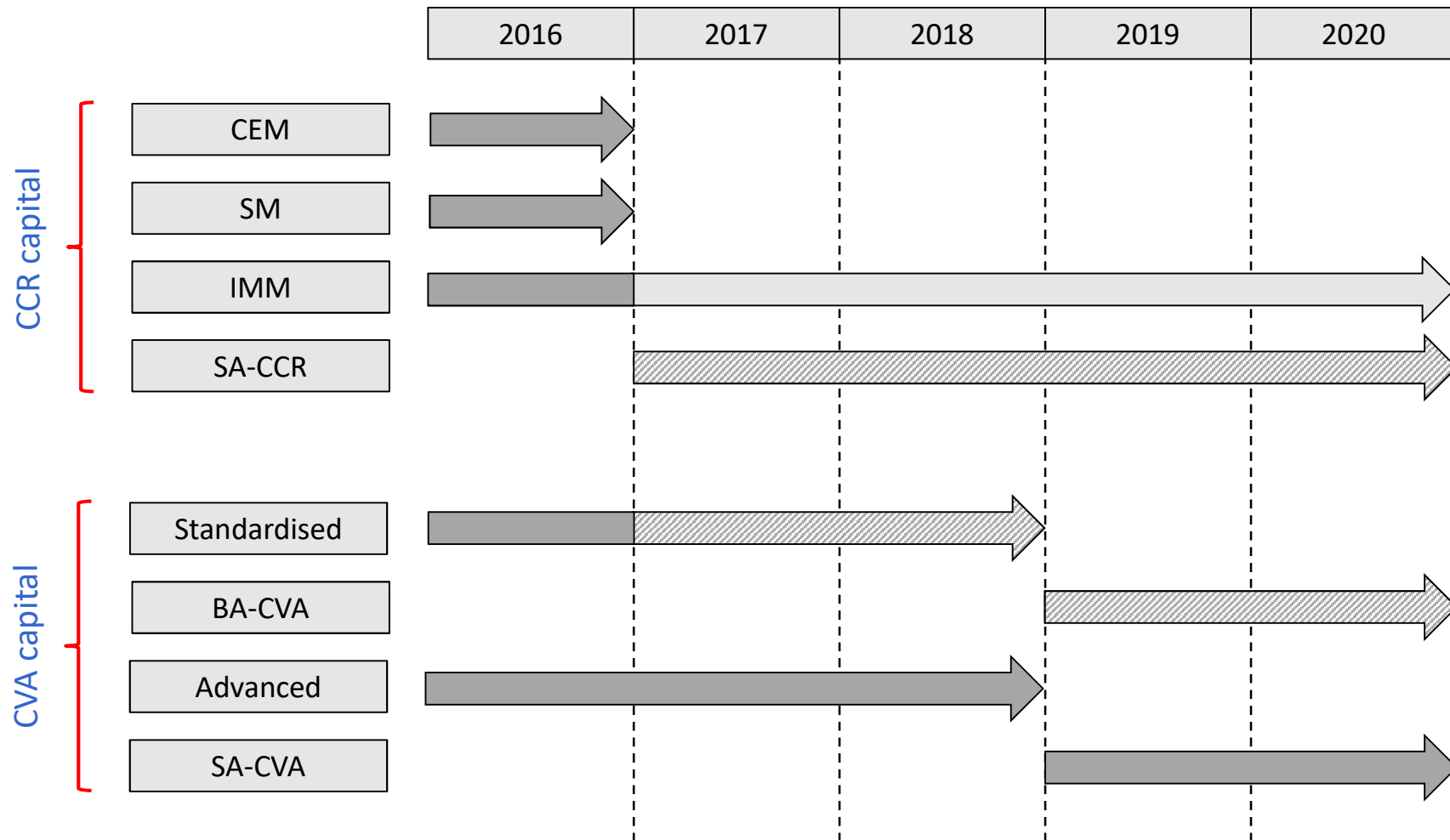


* No clearing or initial margin assumed

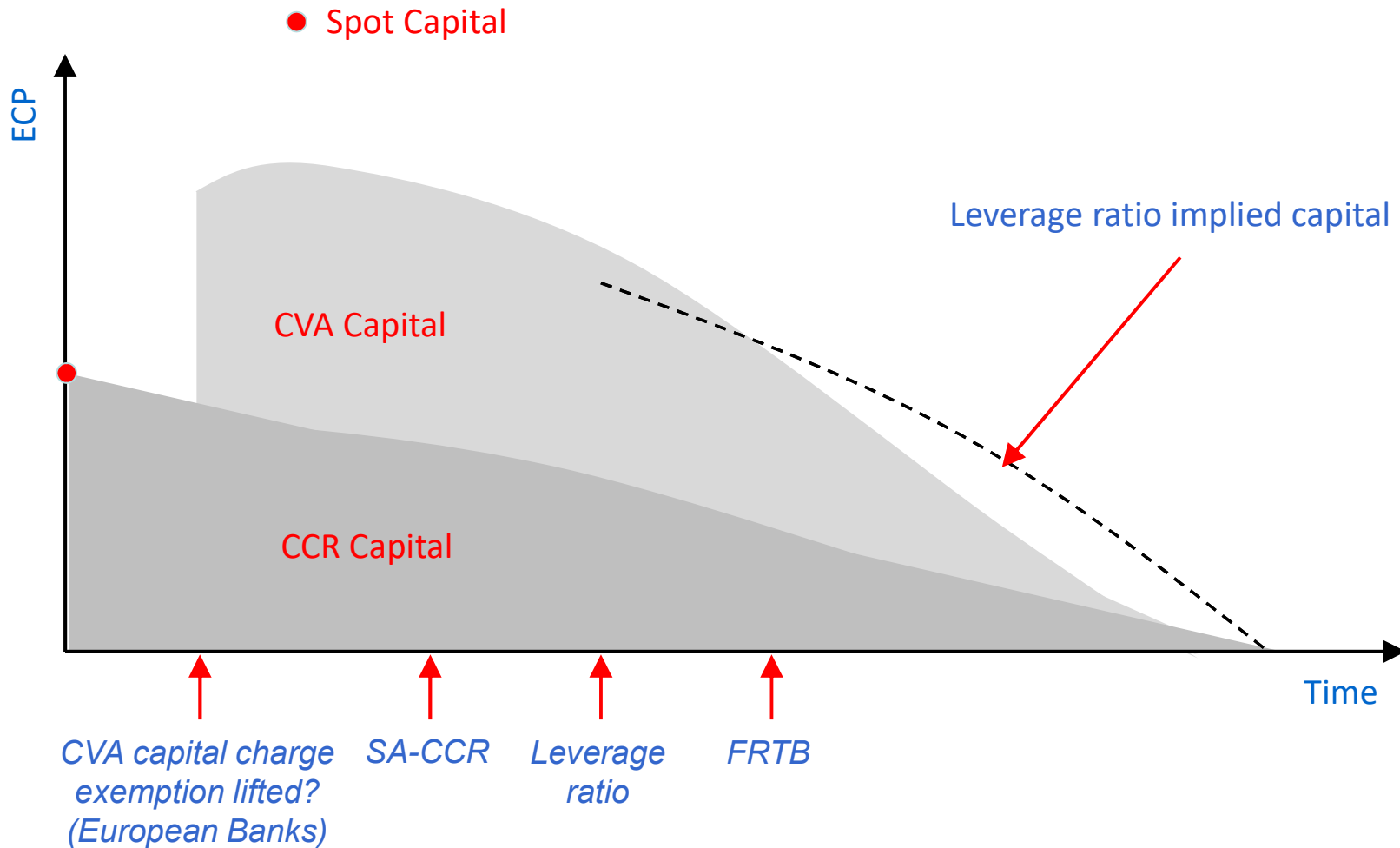
KVA is still a Day 1 profit



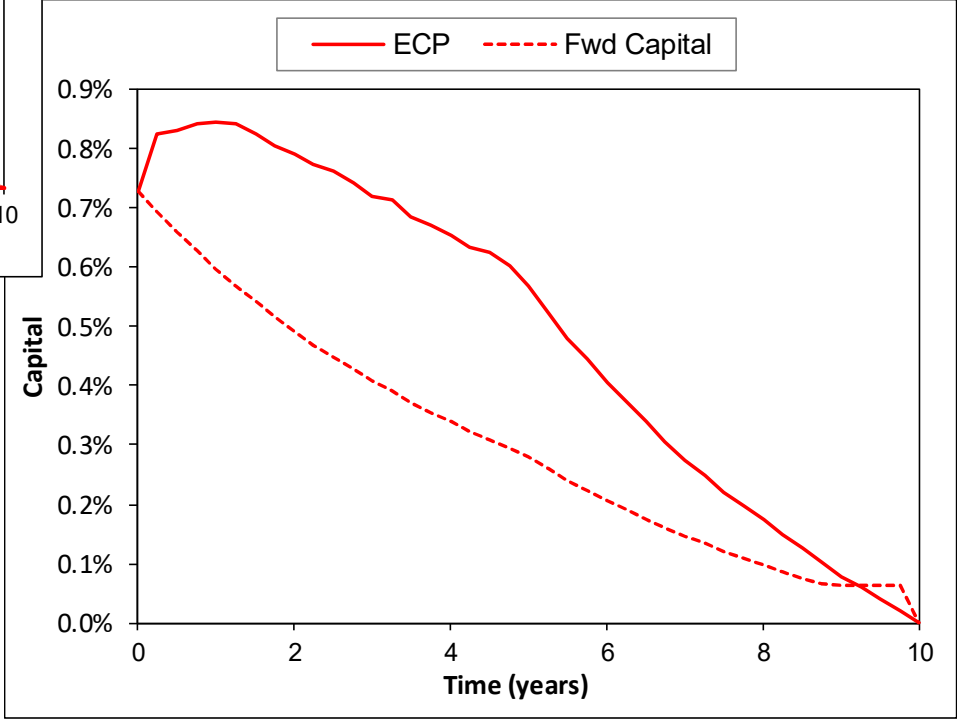
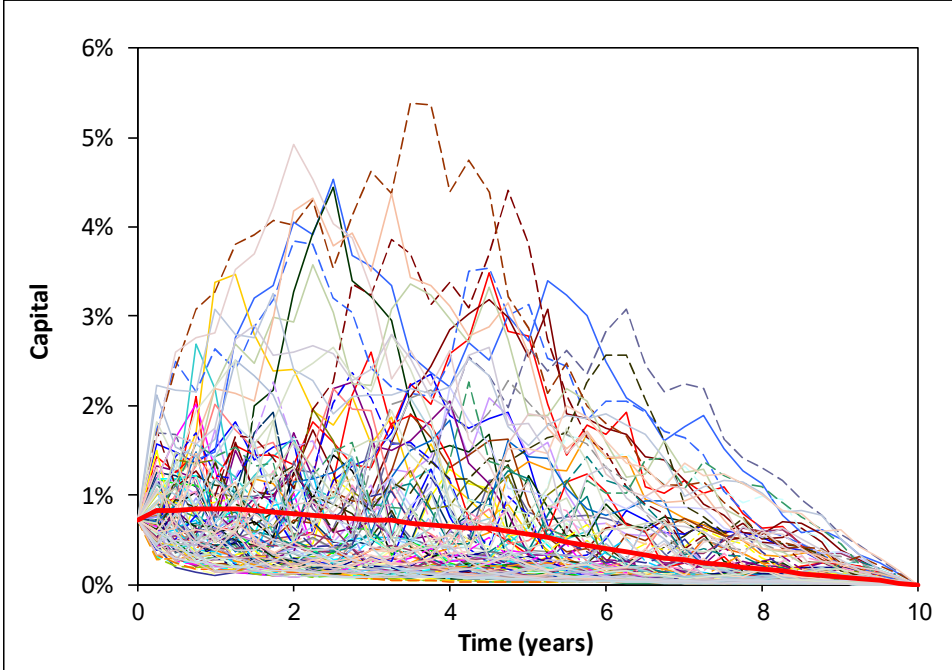
Capital Methodologies and Timescales



Assessing the Impact of Future Regulatory Change



ECP and Forward Capital



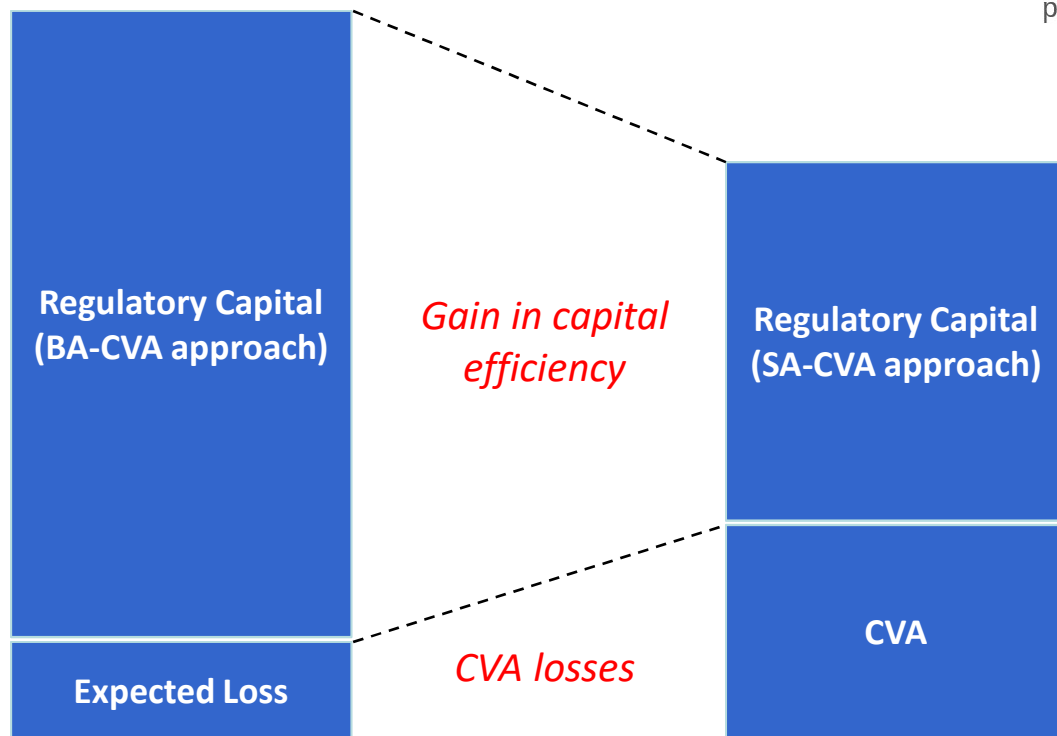
KVA Management

- We can rationalize the trend towards active CVA management as price optimization in light of regulatory changes

- But for many banks CVA losses will feel “wrong”

ANZ's CVA loss flags challenge for regional banks

Many smaller dealers thought to be out of step with market practice and new capital rules



Warehousing Approach

Risk-neutral approach

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Three Japanese banks consider new CVA approach

Industry working group formed to discuss introducing accounting adjustment

Need for KVA desk?

The Next Steps in the xVA Journey

- **Huge progress in xVA over the last few years**
 - Challenge standard assumptions and approach to modelling, pricing and risk management
 - Modelling of complex hybrid payoffs with potential path-dependency
 - Understanding of xVA terms from an economic, accounting and regulatory point of view
 - Implementation of all details inherent in regulatory formulas
 - Technological advances to tackle convexities, portfolio effects etc.
 - xVA opens more general debates around treatment of funding and capital costs in banks
- **Some remaining challenges**
 - Framework and assumptions (E.g. close-out, discounting)
 - Wrong-way risk models
 - MVA and KVA not yet treated with same rigour as CVA
 - Portfolio effects: how to do them efficiently, when are they really necessary for pricing?
 - How to deal with cliff edge regulation such as NSFR and the LR
 - Business model for KVA

The Next Steps in the xVA Journey (cont)

If we were asked to price an exotic option with features similar to the xVA of a cross-currency swap would we think it possible?

- **We need to embrace the challenge of being more rigorous with respect to xVA modelling whilst keeping in mind the qualitative aspects such as:**
 - Soft credit models sometimes tick the boxes but offer very little otherwise
 - Misaligned Accounting and regulatory requirements
 - The benefit of efficient American style Monte Carlo is somewhat negated by regulatory change
 - Lack of market observables and no-arbitrage restrictions
 - Inability of banks to fully represent balance sheet impacts (e.g. Treasury vs. xVA desk)