



Measuring and Managing Credit Risk Volatility – a practitioner's view

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Passion to Perform

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26. April 2013

Deutsche Bank's Risk Management Framework

Sound principles and processes compliant with Basel 2.5/3 Pillar II



Pillar II – A Compliant ICAAP framework

Risk governance and strategy

- Appropriate risk management processes operating
- Clear roles and responsibilities for managing all risk inventories
- Processes and tools for identification of risk concentrations

Risk management processes

- Established infrastructure and operational support
- Principles, policies and procedures in place
- Relevant top-down MI monitors risk exposures and process

Risk and capital methods – Analytics and modeling

- **Risk Appetite:** Integrated strategic planning process resulting in Risk & Capital Plan; monitoring in place
- **Use Test :** Evidence of strong risk culture and robust governance framework which manages on going risk profile
- **Risk Assessment:** Independent function identifies, assesses, manages and reports material risks

Risk infrastructure, policies and documentations

- Regulatory and Internal capital adequacy quantified by risk type
- Top-down comprehensive limits
- **Regular, appropriate stress testing**
- Skilled and dedicated teams
- Models regularly validated
- Tools adapted to entity requirements

Four key principles underpin our risk management framework:

- Risk is taken within the defined risk appetite
- Every risk taken must be approved within the risk management framework
- DB should be adequately compensated for the risk taken
- Risk should be continuously monitored

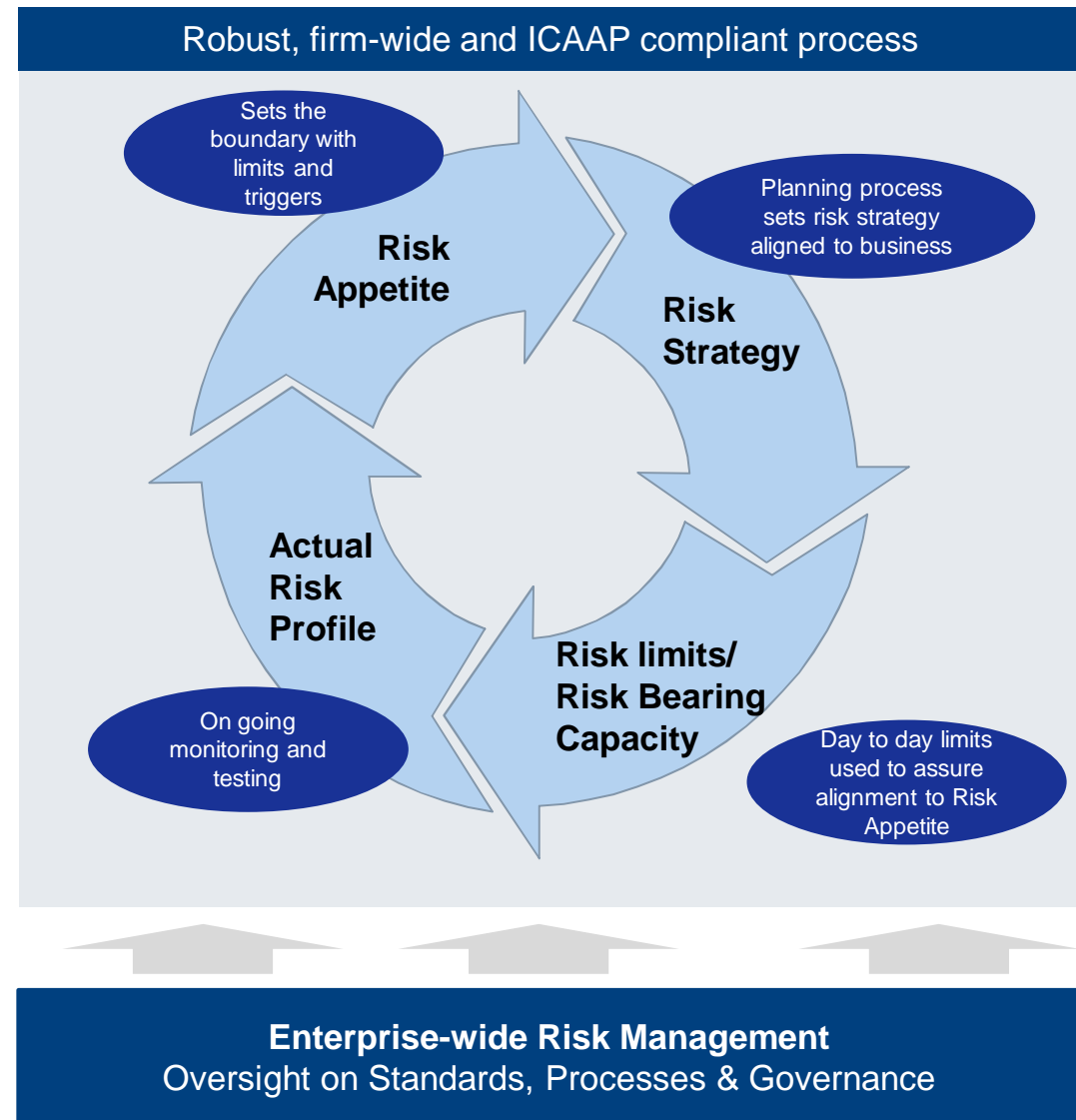
Risk and Capital Management Process

Internal Capital Adequacy Assessment (ICAAP) is a continuous process



In line with MaRisk⁽¹⁾ and Basel II requirements, the key instruments to ensure adequate capitalization on an ongoing and forward looking basis for the Group are:

- A strategic planning process which sets defined capital threshold and risk appetite limit aligned to business objectives
- Translation of Risk appetite to measurable thresholds
- A continuous monitoring process of actual risk profile against approved limits and thresholds



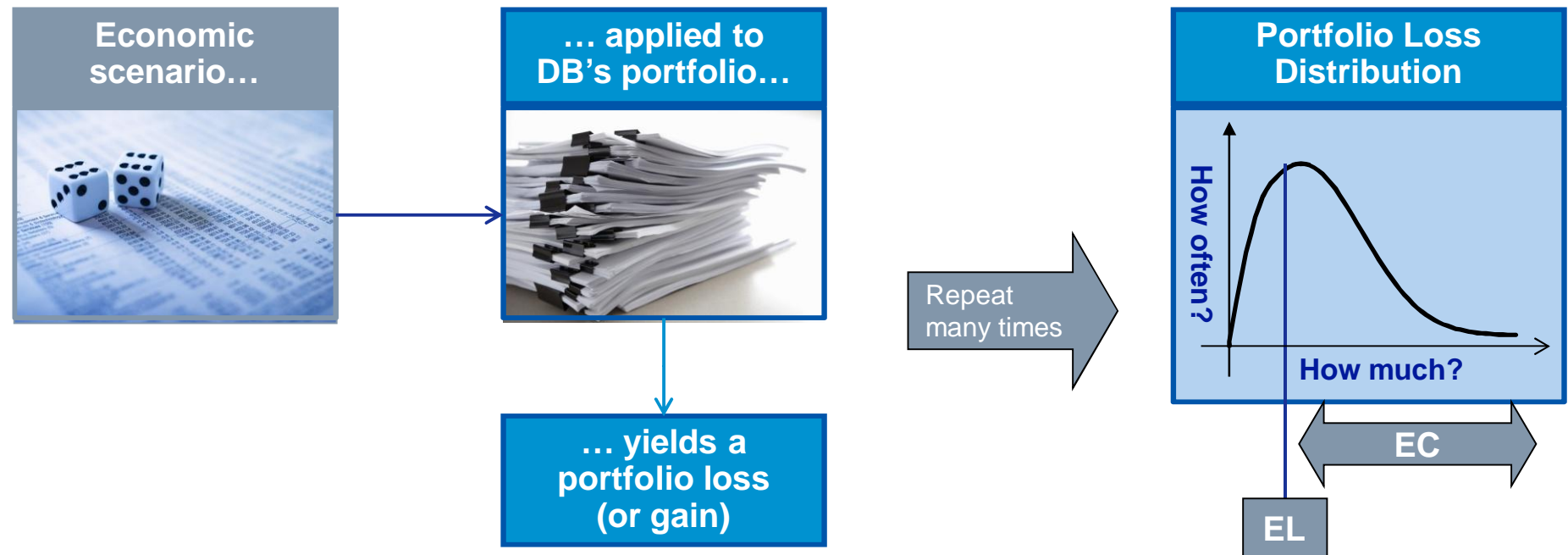
(1) Minimum Requirements for Risk Management for Banks set by the German Federal Financial Supervisory Authority (BaFin)



Risk Measurement: Expected Loss & Economic Capital

Estimates for DB's future loss potential

- Expected Loss (EL) is the average loss over a given period (commonly one year)
- Economic Capital (EC) is the amount of capital needed to cover additional unexpected losses (at 99.98% confidence)
- Calculated via simulation models:



Economic Capital is Deutsche Bank's Risk Currency

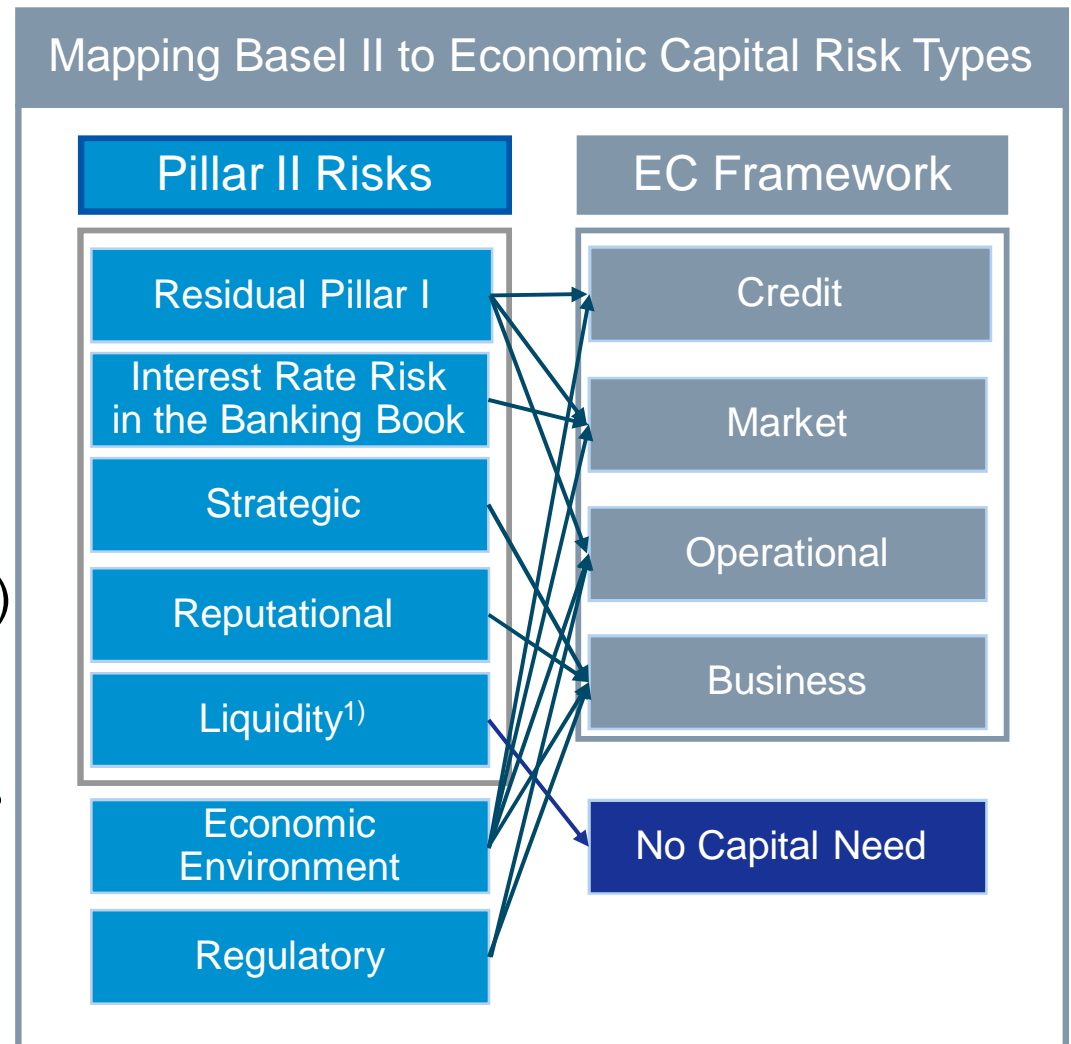


DB calculates Economic Capital for...

- Credit Risk
- Market Risk
- Operational Risk
- Business Risk

... and uses it to ...

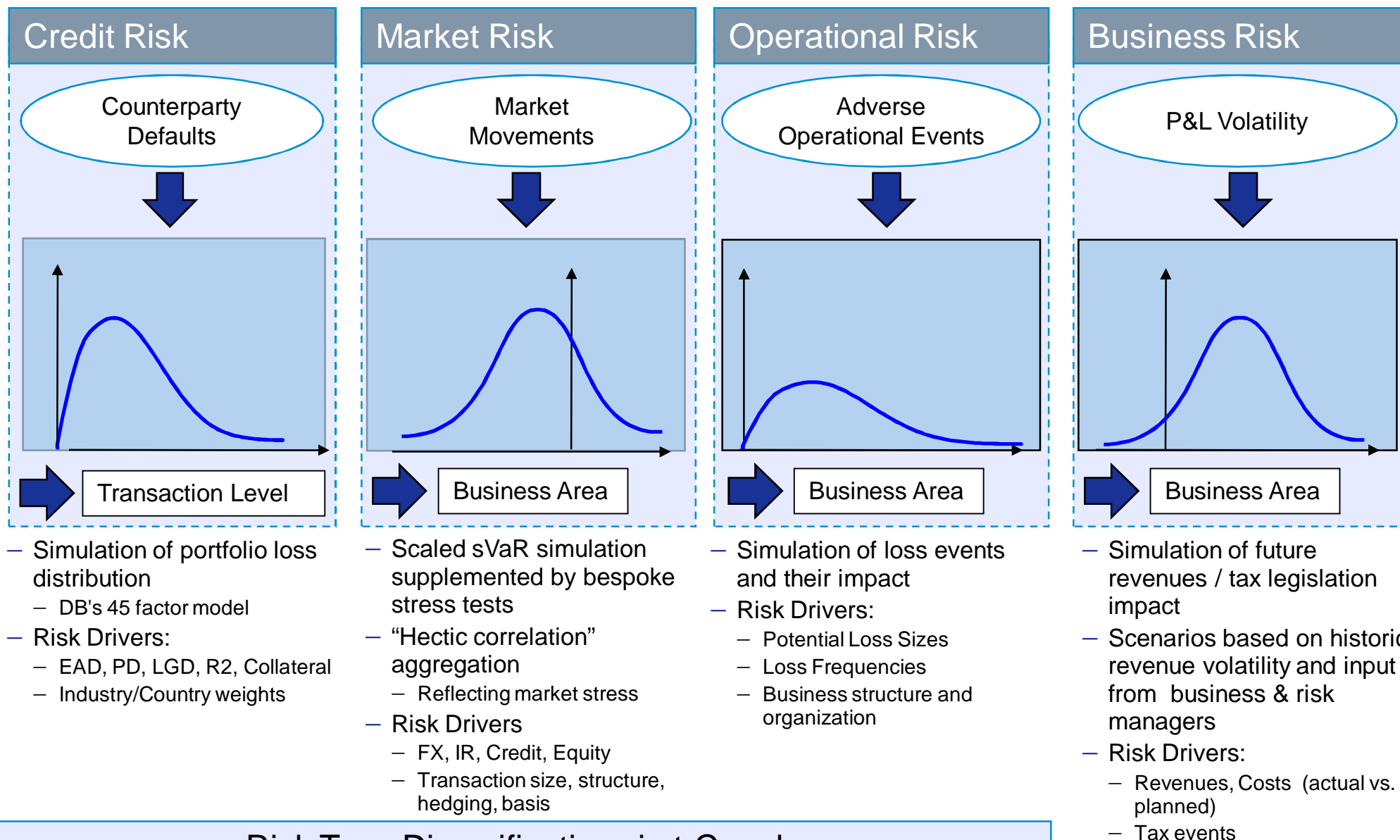
- Assess capital adequacy & plan capital demand
- Measure performance (RoE, RAROC)
- Distribute compensation
- Perform stress tests
- Meet Basel II regulatory requirements
 - Internal Capital Adequacy Assessment Process
 - Modelling alpha and the Incremental Risk Charge
 - "Use test" for ratings, derivatives methodology etc.



1) As per CEBS CP03R definition. Market liquidity of assets is considered in EC.



Economic Capital by Risk Type



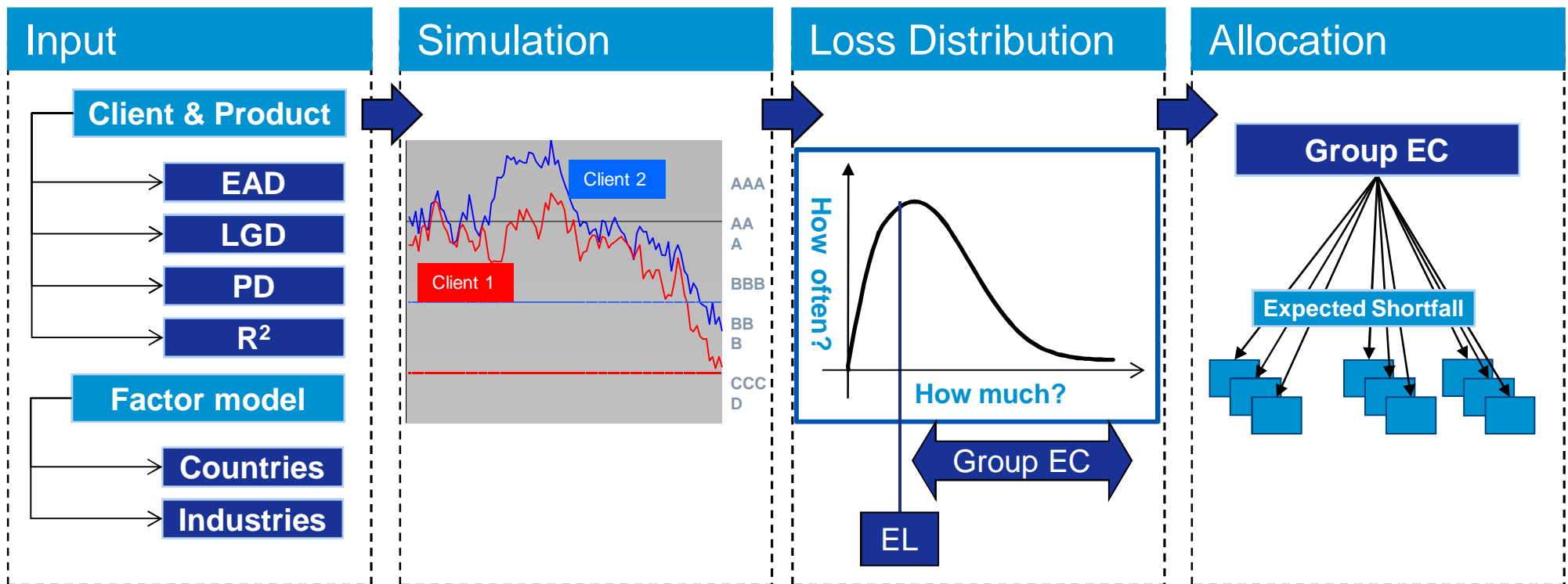
Risk Type Diversification via t-Copula

Base Model: Calculating Credit Risk Economic Capital

In a nutshell



Joint EC calculation for counterparty, transfer, settlement & traded default risk

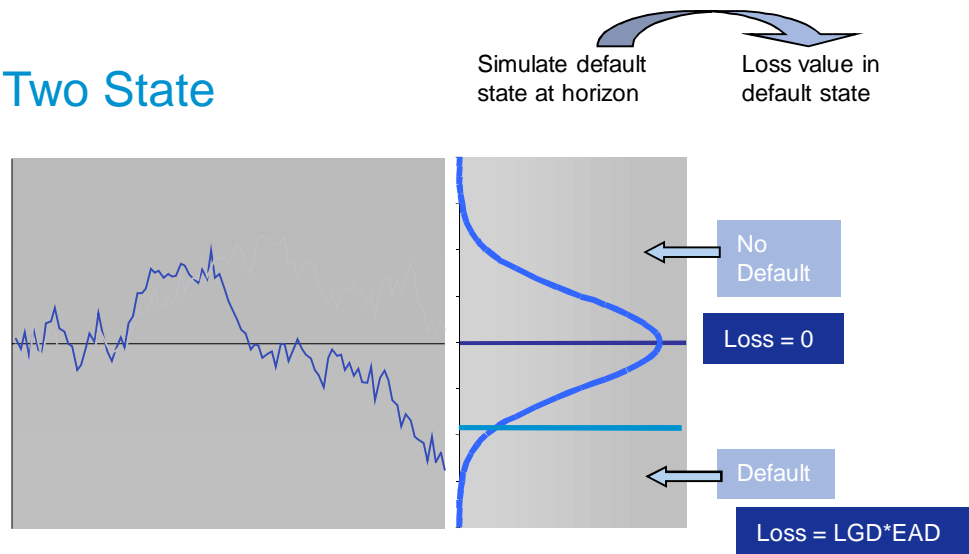




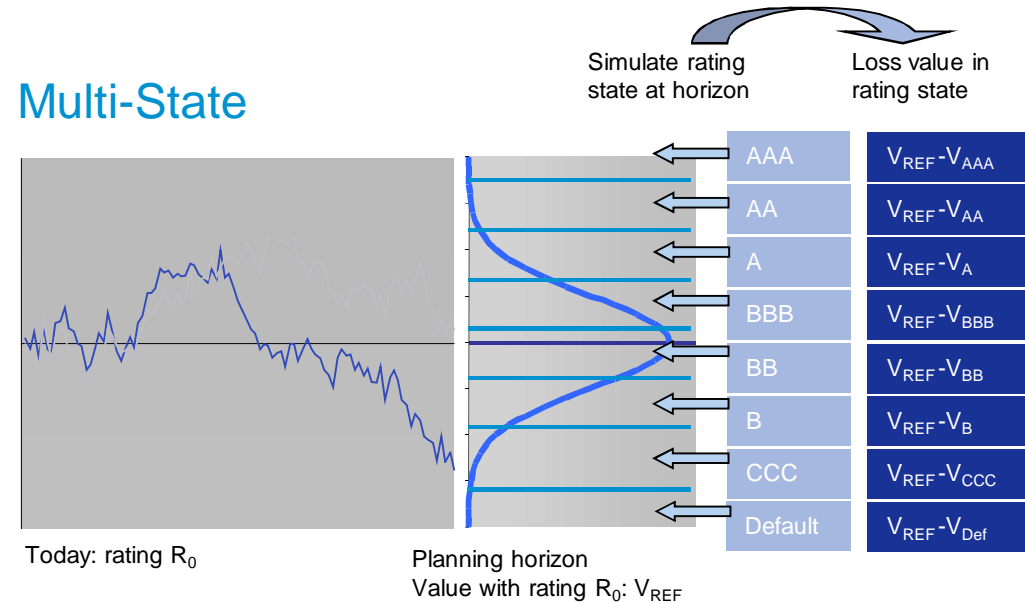
Model Extension: Multi-State Asset Value Simulation

Incorporating duration and rating migration

Two State



Multi-State



- Event = defaulted / not defaulted
- Loss value depends only on EAD and LGD

- Event = Rating change at horizon
- Value in rating class at horizon by cash flow valuation: additional dependence on
 - maturity
 - default curve
 - interest rates

Natural choice to model assets subject to fair value accounting



Model Extension: Multi-period Simulation

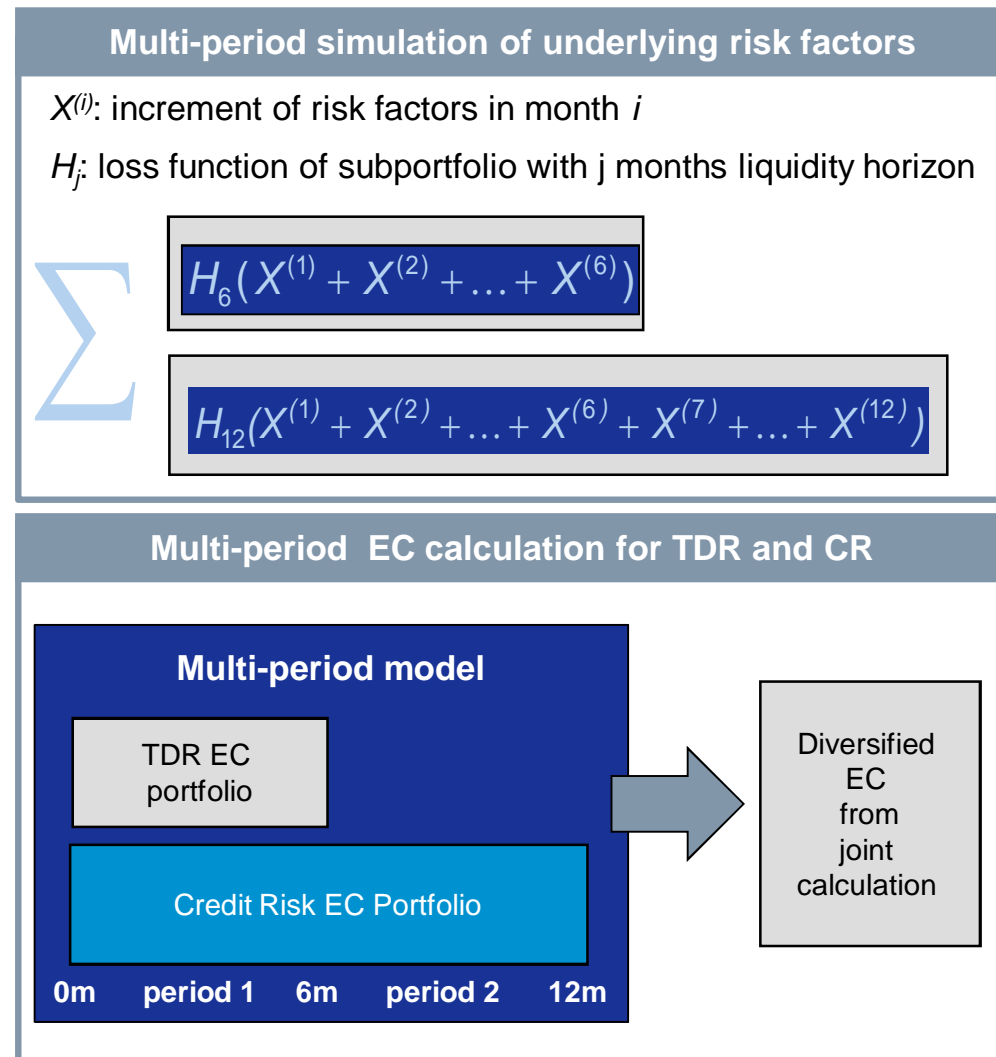
Joint Economic Capital calculation for Traded Default Risk and Credit Risk

Multi-period extension of credit portfolio model

- Appropriate framework for a joint EC calculation for portfolios with different liquidity horizons
- Multi-period simulation of underlying risk factors captures dependence between sub-portfolios with different liquidity profiles

Joint EC calculation for Traded Default Risk and Credit Risk

- Determination of the liquidity horizon
 - Credit Risk: 12m
 - Traded Default Risk: 6m
- Joint EC calculation for TDR and Credit Risk provides correct diversification effects down to transaction level
- Extendable to “Constant Level of Risk” model used for Incremental Risk Charge





Model Extension: Reflection of Wrong-way Risk

Incorporation of alpha factor

Regulatory alpha parameter is a joint product of DB's credit portfolio model (dbCDE) and derivatives exposure engine (MATRIX)

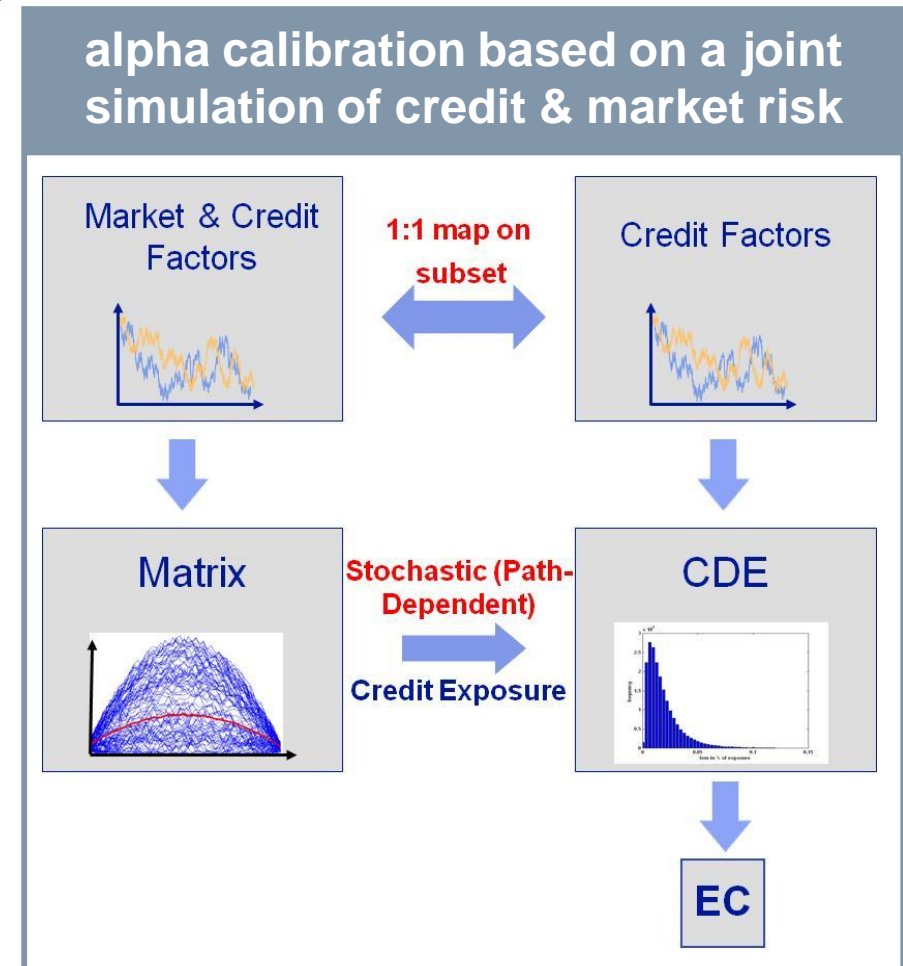
- α captures “wrong-way” risk through a joint simulation of credit and market risk

$$\alpha = \frac{\text{EC based on joint simulation of CR and MR drivers}}{\text{EC based on Average Expected Exposure}}$$

- This makes it a natural component also for EC

Approximative implementation in Deutsche Bank's EC methodology

- Monthly calibration of α
- Scale exposure for derivatives and securities financing transactions
 - $\text{EAD} = \text{AEE} * \alpha$
 - by latest α (i.e. previous month's)



Credit Risk Volatility – How Relevant is It?

DB favours PD-based over spread-based Economic Capital modelling

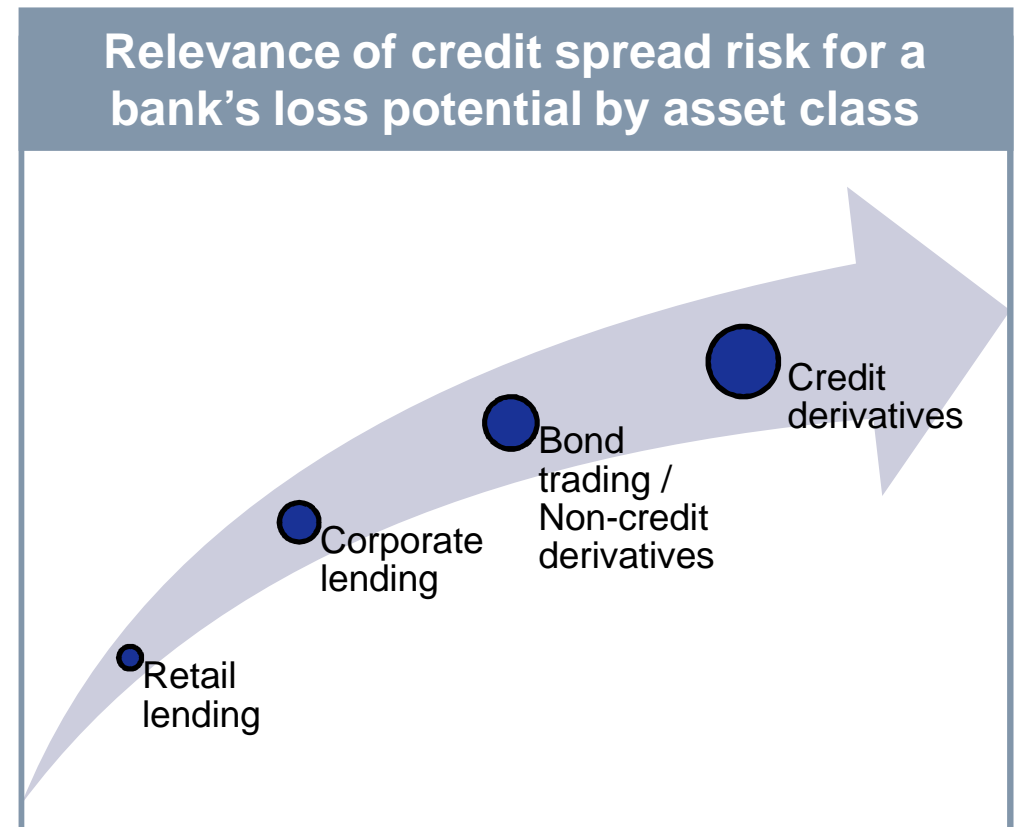


Market-driven credit spreads combine pure credit risk with other aspects

- Overweight of systemic drivers
- Market sentiment
- Liquidity

True threat for a bank's P&L and capital is driven by other criteria

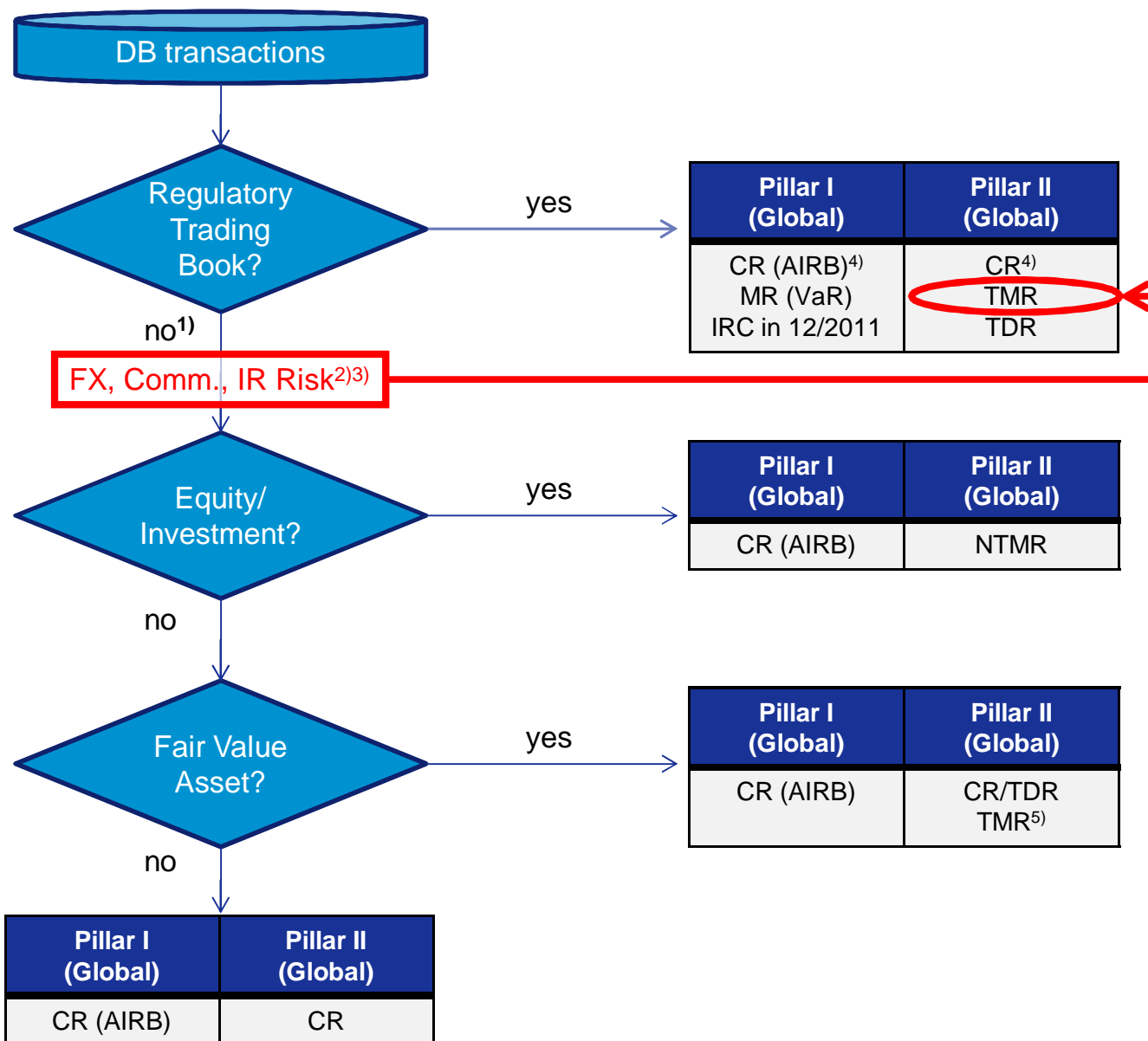
- Credit risk type
 - Default
 - Transfer
- Accounting treatment (e.g. fair value vs. hold to maturity)
- Time horizon (e.g. default vs. settlement risk)



But regulators push for comprehensive credit-spread based capital demand modelling

Dual Processing of Assets Subject to Spread Risk

Risk considerations prevail over accounting and regulatory treatment



Pillar I (Global)	Pillar II (Global)
CR (AIRB) ⁴ MR (VaR) IRC in 12/2011	CR ⁴ TMR TDR

Pillar I (Global)	Pillar II (Global)
CR (AIRB)	NTMR

Pillar I (Global)	Pillar II (Global)
CR (AIRB)	CR/TDR TMR ⁵⁾

Pillar I (Global)	Pillar II (Global)
CR (AIRB)	CR

- 1) Incl. "held for sale" and securitization assets in the ramp up phase if they cannot be sold within 180 days
- 2) Interest rate, commodity and foreign exchange risk is transferred to the trading book
- 3) Some retail subsidiaries have their own limits for Interest Rate risk and don't transfer it to the trading book.
- 4) Credit Risk for derivatives in AEE, EPE, PFE (average expected exposure, expected potential exposure, potential future exposure)
- 5) Spread and basis risk

CR credit risk
 TMR trading market risk
 NTMR non-trading market risk
 TDR traded default risk
 AIRB Advanced Internal Ratings Based
 IMM Internal Model Method
 IRRBB Interest Rate Risk Banking Book
 IRC Incremental Risk Charge

Managing Credit Risk Volatility

Additional tools to mitigate credit risk loss potential



Single-name concentration hedging

Dedicated loan pricing and hedging function established in 2003

Scope: Large Corporates & MidCap

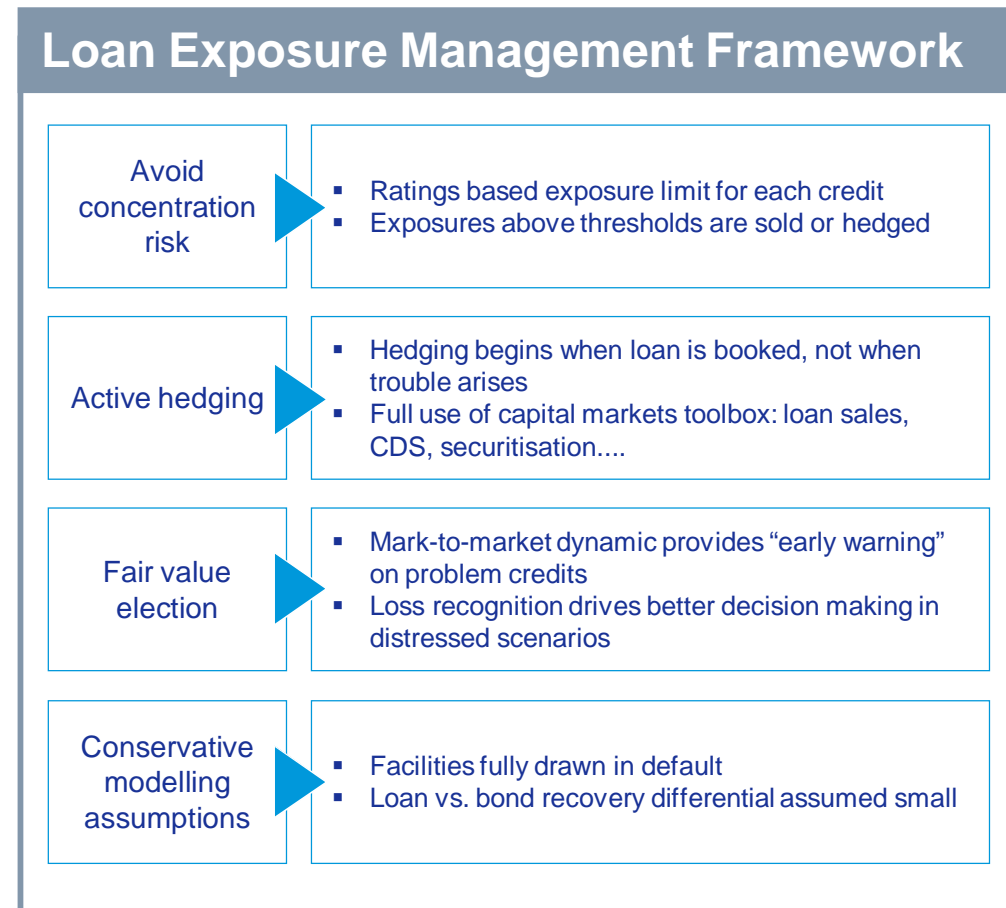
Centralised dynamic hedging

Derivatives exposure

Traded default risk

Central counterparts

An additional (partially mandatory) option – but not risk free!





Appendix



Exposure Profiles for Derivatives

Integration of market risk drivers into credit risk EC

Exposure calculation for derivatives

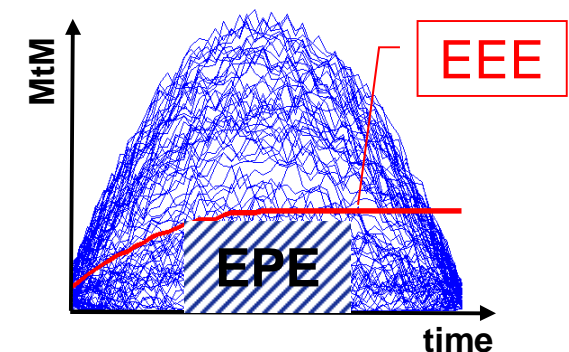
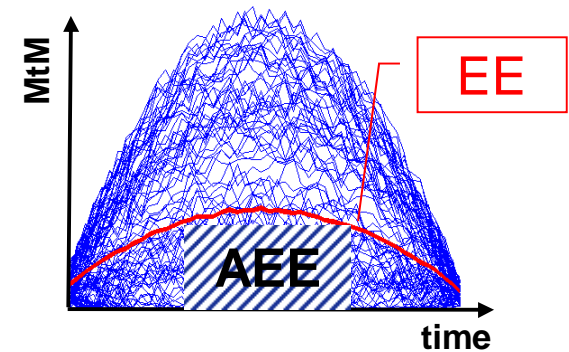
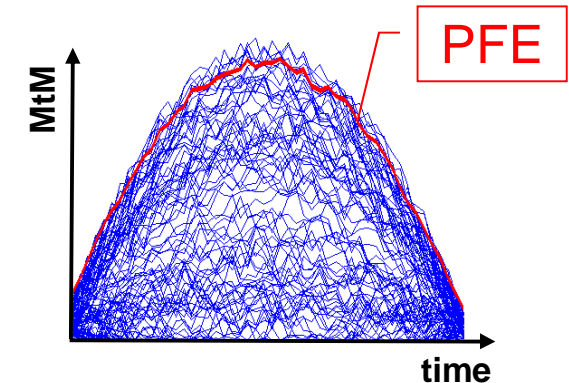
- Current MtM does not reflect value change potential over time horizon
- Requires simulation of market factors and revaluation of derivatives over time

Various exposure measures

- Average Expected Exposure (for EC)
- Expected Positive Exposure (for RC)
- Potential Future Exposure (for limit monitoring)

alpha-factor

- Internal Models Method under Basel II: $EAD = EPE * \alpha$
- α is a scaling factor for “wrong-way risk”, ranging from 1.2 (regulatory floor) to 1.4 (standard)
- Consideration for RC (floored) and EC (plain)



Basel II vs. Economic Capital Model

Fundamental Conceptual Differences



	EC Framework	Basel II Framework	
Credit Risk	LGD, PD, etc. calibrated and validated on same data In most cases identical		Comparability improved
	Use of best estimate for EAD	Process-driven netting set split	
	99.98 % quantile	99.90% quantile	
	Portfolio context considered, i.e. concentration risk	Capital calculated & allocated in isolation – “one size fits all”	
	Full diversification through country/industry correlation	“Asset correlation” is counterparty specific	
OR	Identical loss distribution		Basel II/2.5 building block approach = No risk type diversification
	99.98 %-ile	99.90%-ile	
MR	Scaled sVar 99.98%-ile for Tr. Default Risk	99%-ile for VaR+sVar; MRSA 99.90%-ile for IRC & CompRM	
BR	Earnings simulation		