CREDIT SUISSE

SRA Chapter Event on Model Risk

Model Risk Mitigation in Banking

Patrick Schüepp

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Topics

- Definitions
- Historic Context
- Regulatory Regime
- Model Risk Mitigation
  - Transparency & Model Inventory
  - Validation
  - Oversight Accountability & Governance
  - Active Measures

Model Risk Management in Banking

Definitions

Definition of Model and Model Risk (extracts from SR11-7*)

EXTRACT from July 4,2016 SRA RISK DINNER

A Model is a "quantitative method, system or approach that applies statistical, economic, financial, or mathematical theories, techniques, and assumptions to process input data into quantitative estimates."

Model Risk is "the potential for adverse consequences from decisions based on incorrect or misused model outputs and reports. Model Risk can lead to financial loss, poor business and strategic decision making, or damage to a bank's reputation."

Dimensions of Model Risk (…also on Wikipedia)

1. **Intrinsic uncertainty**. The innate risk from models that reflect theories, judgments and assumptions, even when designed and calibrated to a best practice standard.
2. **Model design risk**. The risk that models may have poor design, be inaccurately calibrated, incorporate outdated or inappropriate assumptions, or implementation errors.
3. **Model use risk**. The risk that models may be used other than for their intended purpose or outside their intended scope, or by users who are not suitably trained

* SR11-7: Supervisory Guidance on Model Risk Management, Federal Reserve Bank Letter 11-7, 4th April 2011, http://www.federalreserve.gov/bankinforeg/srletters/sr1107a1.pdf

To state the obvious: Models permeate any major banking operation

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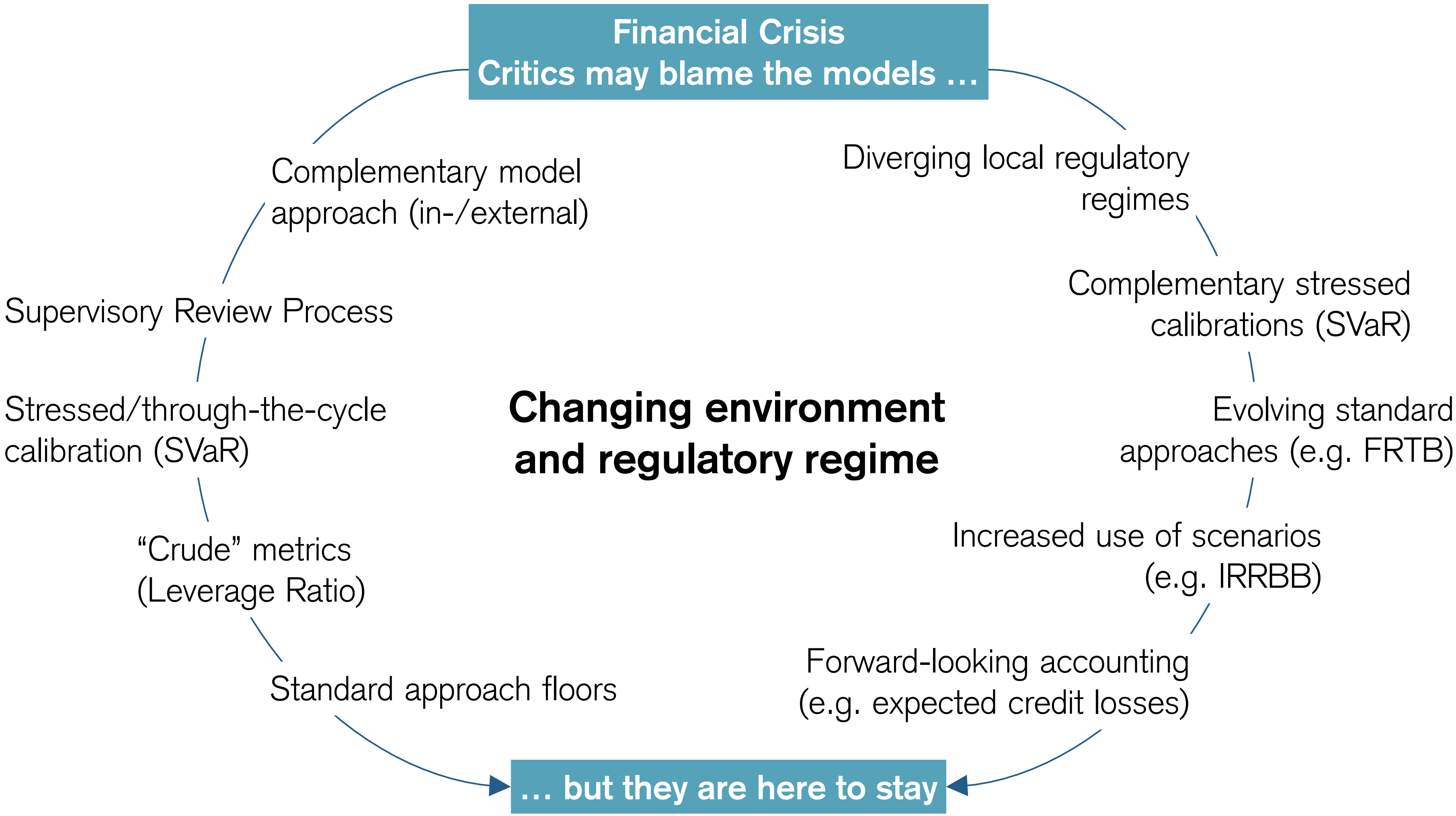
Historic Context



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Regulatory Regime

U.S. Supervisory Guidance SR11-7

Comprehensive guidance for banks on effective model risk management describing principles and best practice for model development, implementation and use, and model governance including validation.

Global industry implications

- Firm-wide model risk management approach
- Board of Directors responsibility
- Initial US focus
- Increasingly adopted by other regulators

Requirements

- Scope: all impactful models
- Firm-wide Model Inventory
- Model Risk Management Framework
- Model Risk Reporting

- **Raising bar over last 5 years**
- **Initial 2nd line of defense focus**
  - Model validation
  - Internal model risk mgt function
  - Model risk governance
- **Increasing engagement of wider organization**
  - Model owners (1st line of defense)
  - Model users (1st line of defense); and
  - Local businesses/entities

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Model Risk Mitigation (I): Transparency & Model Inventory

Model Category	Description	Examples	CS Group	whereof CS CH) relevant
Pricing	Models feeding daily P&L and risk	• Derivatives pricing • Market data e.g. yield curve construction • Sensitivities for listed products	~600	10%
Risk Capital	Models feeding regulatory and internal capital	• Market, credit and OpRisk regulatory capital • Internal capital	~400	50%
Stress Testing	Scenarios, stress tests, economic and business projection modelling	• Firm-wide stress testing • Regulatory stress tests (LPA, CCAR, ICAAP)	~300	5-10%
Others	All other business-impactful models	• Liquidity • Investment suitability • Electronic trading • AML • Trader tools • M&A	~1,000	5%
Total			**~2,200**	**~300**

Focused trading book franchise (only)

Regulatory models in credit (AIRB), market (IMA) and op. risk (AMA)

Internal economic risk capital models (Pillar II)

Primarily internal stress testing models

Key areas include
- Treasury modelling,
- Investment suitability
- Liquidity
- Expected credit losses (2018 onwards)

Transparency on and monitoring of status /use across all businesses (not IB-only) and entities is key

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Model Risk Mitigation (II): Validation

Main Validation Focus (including view on overall SR11-7 compliance)

Model Design	Calibration	Perform-ance	Input Data	Document-ation	Governance	Model Use	Implement-ation

Model Design Risk | **Model Use Risk** | **Intrinsic Uncertainty**

Can be controlled

to some extent through validation reviews with corresponding mandatory actions to mitigate identified model risks.

Proper review and approval governance bodes to foster "effective challenge" among model stakeholders as well as to define mitigating actions / monitor according implementation

Cannot be eliminated
hence conditionally accept if model design risk and model use risk are properly controlled

Quantification and communication to model stakeholders & governance[1)]

Validation process and scope consistent across model categories and businesses

1) More accentuated if working with high quantiles or in case of no possible historic backtesting like in stress testing; quantification may be quantitative (benchmarking, confidence intervals etc.) or qualitative (assessment of conservatism/aggressiveness in model assumptions)

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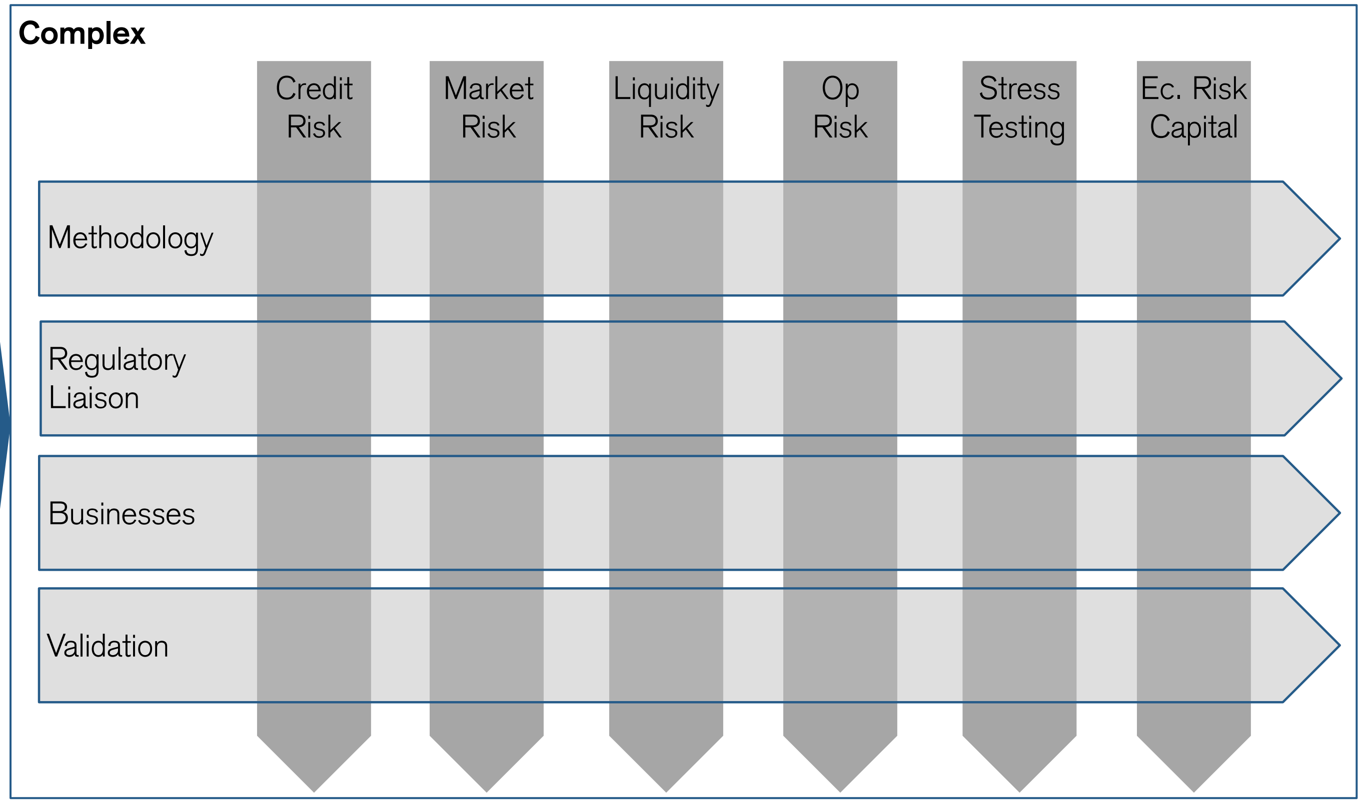
Mitigation (III): Oversight Accountability & Governance

Massive increase of risk methodology- and model-decisions (CS 2016 vs. 2014)

- Number of formal approvals more than doubled
- Documentation of approval requests doubled to tripled

Model risk management as considerable cost of doing business should not be underestimated



Strike the right balance between
- Cross-functional exchange and challenge
- Cross-regional alignment and/or harmonization
- Expert focus and model user involvement
- Formal documentation and “effective challenge”

Different solutions for different organizations

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