

# Internal Models – Key Issues

## **Q-RM's contribution:**

- develop principles and framework for internal models in Solvency II
- use 8 years experience of supervision of internal models in banks

## **timeline:**

- discussion paper France+UK Oct 04, UK+Finland Jan 05
- BaFin White Paper on internal models Feb 05
- 1.draft answer to call for advice Feb 05
- next discussion at CEIOPS WG: 13./14.04.
- final draft answer by CEIOPS WG by end of May

## (1) The guiding principle

BCBS, 1995:

*„The guiding principle of such an approach is the preservation of banks' incentives to measure market risks as accurately as possible and to continue to upgrade their internal models as financial markets and technology evolve.“*

- international mediation of rule-based standard methods for regulatory capital requirements is regularly outpaced by innovations in the financial markets (Basel II)
- internal models = freedom: only way to deal with complexities of changing environments and keep competitiveness
- Ashby's law: "Only variety can destroy variety."
- Mirow's thesis 3: enterprise needs freedom on all levels
- "as accurately as possible" -> "as accurately as necessary"

## (2) The incentive structure

### **benefits:**

1. more adequate for non-linear (derivative) products
  2. supervisors and senior management speak same language
  3. avoid double efforts: IT infrastructure re-used for discussion with supervisors, rating agencies, analysts, shareholders
  4. continual development of the model is in the firm's own interest
- supervisors get access to risk exposure data that is much more timely, risk-adequate and detailed than what is "usually" available in accounting records to external auditors and rating agencies

## (2) The incentive structure

### **benefits (2):**

- common calibration target (e.g. 99.5% VaR): risks from different areas are made comparable
- forecast-quality of internal models is made measurable and thus comparable, using actuarial-statistical techniques: level playing field for both companies and supervisors
- operational risks reduced through standardisation of risk management processes

### **deal between supervisors and firms:**

“lower regulatory capital in exchange for more timely and more detailed information”.

### (3) Structure of internal models

subsidiary	branch/book	flood	storm	interest rates	stock market	defaults or down-grades	...
property & casualty	motor insurance						
	industrial property insurance						
	assets/reserves						
life insurance	life insurance						
	assets/reserves						
bank	trading book						
	banking book						
...							

inputs:

(1) risk exposure data

(2) historical risk driver data

output:

distributional forecast for each portfolio

statistical quality:

How well is the P&L explained?

## (4) Aggregation

### **complexity problem:**

- top-level model not fine-grained enough for lines of business; lob-models cannot explain diversification effects

### **possible solutions:**

- lob-models and top-level model complement each other and re-use IT infrastructure and databases
- aggregation of distributional forecasts of lob-models via a copula assumption
- aggregation of risk numbers via square root formula only in exceptional cases (holding without genuine business; merger of two firms; partial use of standard formula)

## (5) Control loops and processes

**risk control:** uses the model

- collection and verification of data
- regular reporting of risk metrics
- risk limit system; response to limit breaches by mgmt
- risk-sensitive performance measurement and capital alloc.

**model change:** adapts the model to changing environment

- new product process
- new risk driver process
- P&L attribution process ("backtesting")
- sensitivity analyses ("stress tests")

## (6) Approval and certification

### **states or processes?**

- currently in banking supervision: focussed on state of the model
- hinders continual development of models
- need: legal language that allows to license states *and* change processes



## (7) Internal versus regulatory use

### **internal use -> "use test", "statistical quality test"**

- strategic allocation of capital (internal economic capital)
- discussion with rating agencies and analysts (external economic capital)
- risk control (tactical asset allocation, limits on underwriting)
- risk-based price margins (accounting for cost of capital)

### **regulatory use -> "calibration test"**

- computation of the regulatory capital requirement
- ! allows to separate PIT/TTC-discussion from statistical quality test -> separate science and politics

## (A) Challenges

### **How to deal with non-holistic models?**

- partial use of the standard formula
- decentralized risk management

### **How to deal with valuation uncertainty?**

- reserving practices

### **How to deal with estimation uncertainty?**

- Basel II is vague on this issue

### **How to deal with large differences between “statistical expectation” versus “market expectation”?**

- risk models usually based on statistically estimated probabilities