

AIM 5

Operational Risk

- 1• Calculate the regulatory capital using the basic indicator approach and the standardized approach.
- 2• Explain the Basel Committee's requirements for the advanced measurement approach (AMA) and their seven categories of operational risk.
- 3• Explain how to get a loss distribution from the loss frequency distribution and the loss severity distribution using Monte Carlo simulations.
- 4• Describe the common data issues that can introduce inaccuracies and biases in the estimation of loss frequency and severity distributions.
- 5• Describe how to use scenario analysis in instances when there is scarce data.
- 6• Describe how to identify causal relationships and how to use risk and control self assessment (RCSA) and key risk indicators (KRIs) to measure and manage operational risks.
- 7• Describe the allocation of operational risk capital and the use of scorecards.
- 8• Explain how to use the power law to measure operational risk.
- 9• Explain the risks of moral hazard and adverse selection when using insurance to mitigate operational risks

AIM 5-1

Calculate the regulatory capital using the basic indicator approach and the standardized approach

three options available for the calculation of operational risk regulatory capital

1. **Basic Indicator Approach**
2. **Standardized Approach**
3. **Advanced Measurement Approach**

Basic indicator approach (BIA):

- - An aggregate measure of business activity: fee income, operating costs, or assets. The capital charge equals a **fixed percentage (alpha factor)** of the exposure indicator (**EI**, currently defined as gross income under BIA and SA):
- - Currently, α has been set at approximately 15%. $ORC^{BIA} = \alpha \cdot EI$
- - Advantage: Simple, transparent, and uses readily available data.
- Problems:
 - (i) Understate the ORC if the bank reported a weak profitability performance.
 - (ii) Does not account for the quality of controls. As a result, this approach is expected to be mainly used by **non-sophisticated banks**.

Standardized approach (SA):

- This divides the bank's activities into a number of standardized business units. Each business line is then characterized by an exposure indicator, taken as gross income for simplicity. The capital charge is obtained by multiplying each exposure indicator by a fixed percentage (beta factor) and summing across business lines.

$$ORC^{SA} = \sum \beta_i \cdot E_i$$

Business line	Beta factor (set by supervisors)
Corporate finance	18%
Trading & sales	18%
Retail banking	12%
Commercial banking	15%
Payment & settlement	18%
Agency services	15%
Asset management	12%
Retail brokerage	12%

- Advantage: Still simple but better reflects varying risks across business lines.

AIM 5-2

Explain the Basel Committee's requirements for the advanced measurement approach (AMA) and their seven categories of operational risk

Advanced measurement approach (AMA):

- AMA as the **most flexible** approach for operational risk quantification allows the bank to build its own internal operational risk model and measurement system in the estimation of required capital, comparable to market risk standards.

Additional "**Qualitative criteria**" need to be met for banks planning to use AMA:

- (i) Banks must have an **independent risk management function** for operational risk.
- (ii) The financial institution's internal operational risk measurement system shall be closely **integrated into its day-to-day** risk management processes.
- (iii) There must be **regular reporting** of operational risk exposures and loss experience. Financial institution shall have procedures for taking appropriate corrective action.

- (iv) The financial institution's risk management system must **be well documented**. The financial institution shall have routines in place for ensuring compliance and policies for the treatment of non-compliance.
- (v) The operational risk management processes and measurement systems shall be subject to **regular reviews** performed by internal and/or external auditors.
- (vi) The **validation** of the operational risk measurement system by the competent authorities shall include the following elements: (a) Verifying that the internal validation processes are operating in a satisfactory manner; (b) Making sure that data flows and processes associated with the risk measurement system are transparent and accessible.

Additional "**Quantitative criteria**" need to be meet:

- (i) **Internal data**: The financial institution must track internal loss data measured over a minimum period of five years.
- (ii) **External data**: The financial institution must external data.
- (iii) **Scenario analyses**: The financial institution must use scenario analyses to evaluate their exposure to high severity event.
- (iv) Bank must take into account the business environment and internal control systems.
- (v) **Insurance** can be used to offset up to 20% of ORC.

Seven categories of operational risk

1. Internal fraud
2. External fraud
3. Employment practices and workplace safety
4. Clients, products, and business practices
5. Damage to physical assets
6. Business disruption and system failures
7. Execution, delivery, and process management

Explain how to get a loss distribution from the loss frequency distribution and the loss severity distribution using Monte Carlo simulations

Structure/steps of LDA:

- **Step (1):** Organize and group loss data into a “**BL/ET matrix**” that corresponds to LDA model. Basel II requires that all internal loss data be clearly mapped into seven operational risk ET and eight BL, which produces **56 units of measure**.
- **Step (2): Assign an equal weight** on every data point in the matrix, except for split losses (losses are assigned to more than one business line), old losses, and external losses and scenario.
- **Step (3): Model a loss distribution** in each cell of the matrix based on actuarial approach by separately deriving “distribution for event **frequency**” and “distribution for **severity**” and then combining them using the **Monte Carlo simulation**. The loss distributions for various types of operational risk events are then aggregated through the modeling of their dependence structure to generate the **aggregate loss distribution**.
- **Step (4):** Determine **capital requirement** at the required confidence level. Then allocated capital for each business line by combining empirical distributions and parametric distributions.

BL/ET matrix

<p>8 business lines (BL)</p>	<ul style="list-style-type: none"> ○ Corporate Finance ○ Trading and Sales ○ Retail Banking ○ Commercial Banking ○ Payment and Settlement ○ Agency Services ○ Asset Management ○ Retail Brokerage
<p>7 event types (ET)</p>	<ul style="list-style-type: none"> ○ Internal Fraud (IF) ○ External Fraud (EF) ○ Employment Practices and Workplace Safety (EPWS) ○ Clients, Products & Business Practices (CPBP) ○ Damage to Physical Assets (DPA) ○ Business Disruption and System Failures (BDSF) ○ Execution, Delivery & Process Management (EDPM)

Describe the common data issues that can introduce inaccuracies and biases in the estimation of loss frequency and severity distributions

Dominance of high-severity, low-frequency losses

- - **LFHS** losses tend to dominate when one estimates high quantiles of the total annual loss distribution in the LDA computation, not only in terms of the value of the estimate, but also in terms of the uncertainty around this estimate.

Negative diversification benefits

- - When using quantiles of the loss distribution (often referred to as Value-at-Risk) to measure risk, negative diversification benefits are often observed in **heavy-tailed losses**. Value-at-Risk is an incoherent risk measure and therefore can exhibit negative diversification benefits.
- - This effect can occur even when the losses in different units of measure are independent. The **heaviness of the tail** of the loss distributions has much more to do with the overall diversification benefit than does the correlation and dependence structure.
- - **The heavier-tailed that the distributions are, the smaller the diversification benefit will be.**
- - LFHS losses not only dominate the capital estimates, but the presence of one or more such distributions among the units of measure may further inflate the overall capital estimates by reducing the overall diversification benefit.

Sensitivity to loss categorization

- - LDA can be sensitive to how the losses are pooled. Units of measure may be organized according to business line and event type categories as described in the Basel II regulation. However, there is typically a very uneven distribution of losses across the BL/ET matrix.
- - For example, two units of measure that appear to have similar distributions will typically give lower capital values when pooled than if they are modeled separately

While the LDA is conceptually appealing and straightforward, there are numerous issues in implementing the method. These issues may be classified into four main areas:

- - Data sets.
- - Annual loss distributions.
- - Dependence modeling.
- - Simulation (computational issues)