B

Lecture

INSTITUTE OF ACTUARIAL & QUANTITATIVE STUDIES

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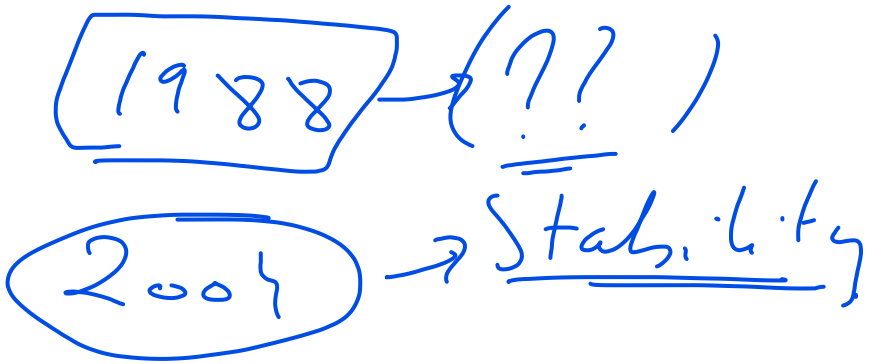
Chapter: Unit 3 Chapter 1

Chapter Name: Basel 2

Today's Agenda

1. Why was Basel II introduced?

2. Three pillars under Basel II
   1. Pillar 1: Minimum Capital Requirement
   2. Pillar 2: Supervisory Review
   3. Pillar 3: Market Discipline
   4. Innovations



1 Why was Basel II introduced ?

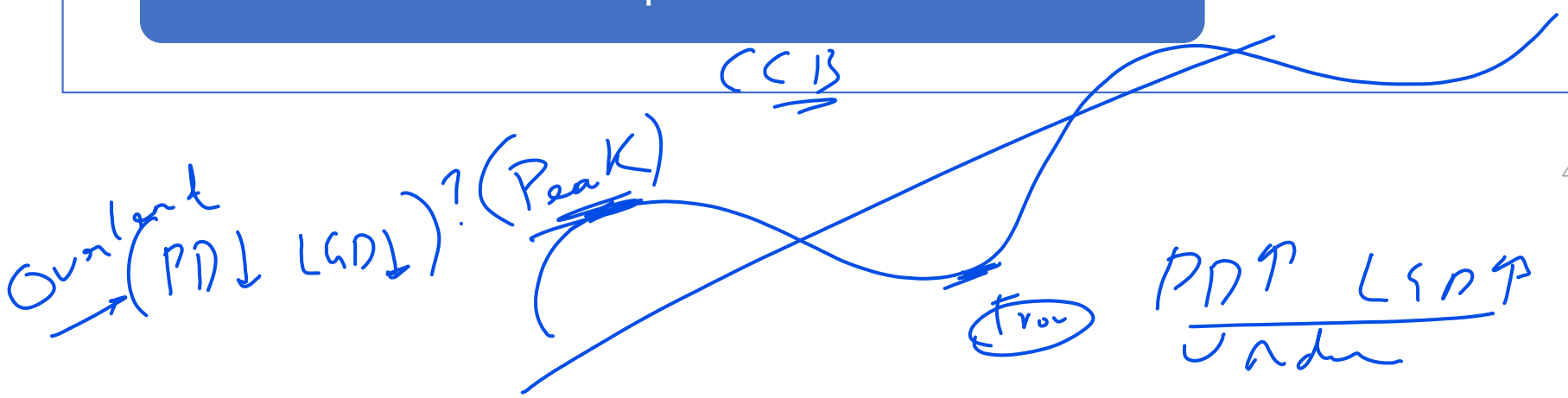
Basel II was the reaction to such concerns like:

- Some supervisors had become concerned by the mid-1990s that Basel I, while more risk-based than capital requirements based on equity-to-asset ratios, was not risk-based enough. The 100 percent risk weight, for example, incorporated exposures posing a wide range of risk, from very safe loans made to highly- rated corporations to very risky loans to commercial real estate development projects.
- Moreover, banking crises in the Nordic countries had demonstrated that systemic problems could occur even in well- capitalized banking systems.
- Meanwhile, there had been several technical advances in market and credit risk measurement and management since 1987, signaling a potential for more precise risk weighting and vastly improved risk management at all levels of banking organizations.

Basel II, proposed in June 1999 and, after multiple revisions, published in 2004 and implemented in 2007, corrected a number of the deiciencies in Basel I. The rules applied to “internationally active” banks and thus many small regional banks in the United States were not subject to the requirements but fell under Basel IA, similar to Basel I, instead. All European banks are regulated under Basel II.

2 Three pillars under Basel II

- Pillar 1: Minimum Capital Requirements
- Pillar 2: Supervisory Review
- Pillar 3: Market Discipline

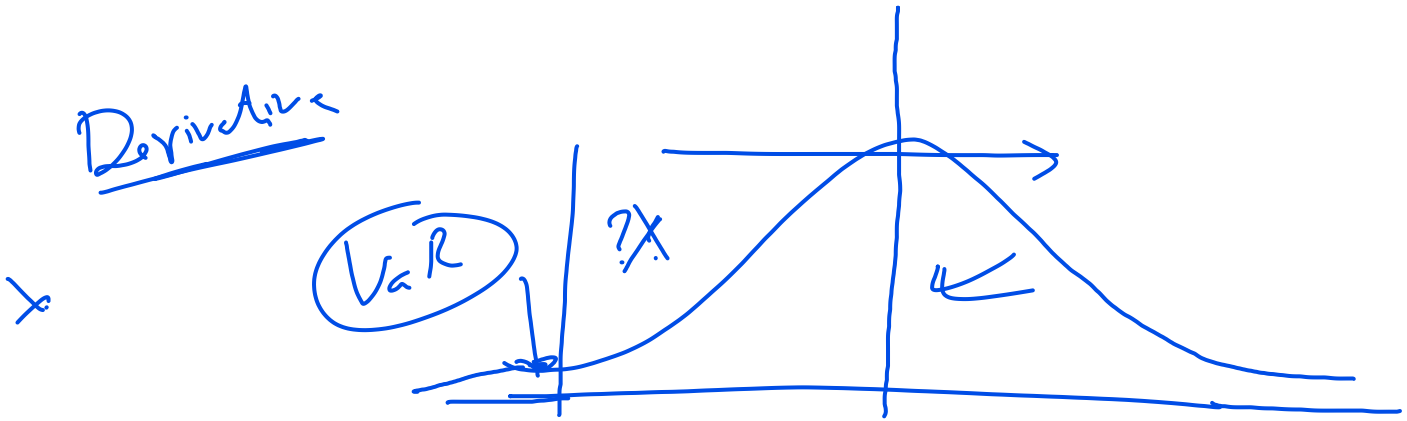


2.1 Pillar 1: Minimum Capital Requirements

The key element of Basel II regarding capital requirements is to consider the credit ratings of counterparties. Capital charges for market risk remained unchanged from the 1996 Amendment. Basel II added capital charges for operational risk. Banks must hold total capital equal to 8% of RWA under Basel II, as under Basel I.

Total capital under Basel II is calculated as:

Total capital = 0.08 × (credit risk RWA + market risk RWA + operational risk RWA)



2.2 Pillar 2: Supervisory Review

- Basel II is an international standard governing internationally active banks across the world. A primary goal of Basel II is to **achieve overall consistency** in the application of capital requirements.
- However, Pillar 2 allows regulators from **different countries some discretion in how they apply** the rules. This allows regulatory authorities to consider local conditions when implementing rules.
- Supervisors must **also encourage banks to develop better risk management functions** and must evaluate bank risks that are outside the scope of Pillar 1, working with banks to identify and manage all types of risk.
- Banks were also required to have Internal Capital Adequacy and Assessment Processes (**ICAAP**) that take their risk profiles into account.

2.3 Pillar 3: Market Discipline

- The goal of Pillar 3 is to **increase transparency**. Banks are required to disclose more **information about the risks** they take and the capital allocated to these risks. Qualitative disclosures such as the bank's corporate structure and quantitative disclosures, such as the bank's capital, risk exposures, and risk measures, were required.

- The key idea behind Pillar 3 is that if banks must **share more information** with **shareholders** (and potential shareholders), they will make **better risk management decisions**. Banks have discretion in determining what is relevant and material and thus what should be disclosed.

- Also, using data provided by banks, supervisors ine-tuned the design of the Accord, repeatedly conducting quantitative impact studies (QIS).

2.3 Pillar 3: Market Discipline

According to Basel II, banks should disclose:

- The entities (banks and other businesses such as securities firms in Europe) to which Basel II rules are applied.
- A description of the **characteristics, terms, and conditions of all the capital instruments** held by the bank.
- A *list of the instruments* comprising the bank's Tier 1 capital. The amount of capital provided by each instrument should also be disclosed.
- A *list of the instruments* comprising the bank's Tier 2 capital.
- The capital requirements for each type of risk covered under Basel II: **credit, market, and operational risks.**
- Information about other bank risks.
- ***Information about the bank's risk management function, how it is structured, and how it operates.***

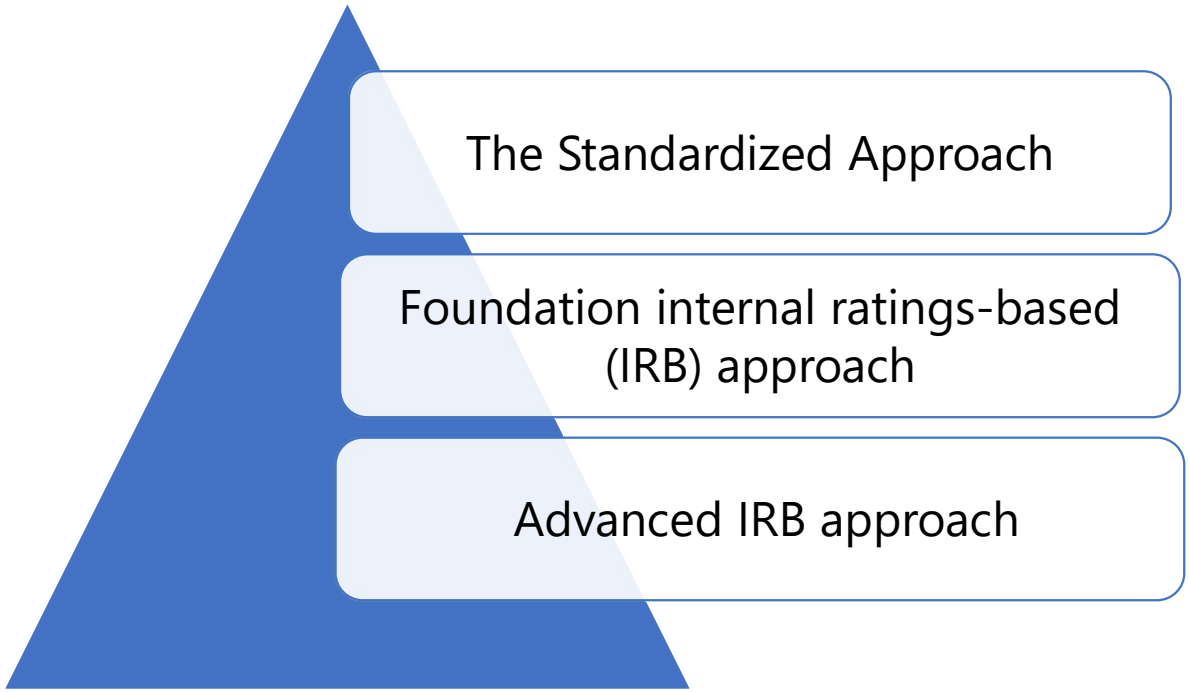
2.4 Innovations

While retaining much of Basel I, Basel II contained four significant innovations:

1. **Risk weight formulas for credit risk** based on modern credit risk management concepts and banks' internal risk measures;
2. **Required capital for operational risk**, in addition to credit risk and market risk.
3. In addition to minimum capital requirements (Pillar 1), **Basel II included specific requirements** for supervision related to capital and risk management (**Pillar 2**) and required public disclosures (**Pillar 3**).
4. Repeated use of **Quantitative Impact Studies** (QIS) to fine- tune the design of the accord. In each QIS, banks contributed detailed data which was then analyzed by supervisors.

3 Credit Risk Capital Requirements

Basel II specifies three approaches that banks can use to measure credit risk:



3.1 The Standardized Approach

The Basel II standardized approach was intended for banks with internal risk measures and risk management practices that were insufficient to support the IRB approaches.
Under the Basel II standardized approach, the headline risk weights depended on obligor type and rating for some obligor types, and on asset type for others.

Although the risk weights appear less generous for banks and sovereigns than was the case under Basel I (e.g., the ratings of many banks and sovereigns were such that risk weights of 20 or 50 percent or more would apply), much of the generosity was restored at national discretion:

- A supervisor could choose to apply risk weight of 0 on a bank's holding of claims on its own sovereign debt that were issued in the nation's own currency. Where a supervisor exercises such discretion, banks in other nations could also risk-weight claims on that sovereign at 0%. This option was widely exercised.
- Claims issued by banks had a risk weight of one category less favorable than the sovereign's (and capped at 100%) or a risk weight based on the bank's own ratings, (or one category more favorable where the obligation had no more than 3 months' original maturity, subject to a floor of 20%). Risk weights on bank obligations could be capped at 100 percent.

3.1 The Standardized Approach

The Standardized Approach included two ways of adjusting for collateral.

1. Under the "simple approach," which was similar to Basel I, the risk weight of a counterparty could be replaced by the risk weight of collateral for the portion of exposure covered by the collateral. A minimum risk weight on the collateral was set at 20 percent, unless the collateral was sovereign debt in the same currency as the exposure.
2. The alternative "comprehensive approach" required changes in exposure and collateral amounts to allow for possible changes in the value. The risk weight of the collateral was applied to the reduced amount of collateral, and the counterparty's risk weight was applied to the remaining exposure. Any netting was applied separately to exposures and collateral, and either Basel rules or (approved) internal models could be used to make the adjustments.

Claims on Sovereigns

Credit Evaluation	Risk Weight
AAA to AA–	0%
A+ to A–	20%
BBB+ to BBB–	50%
BB+ to B–	100%
Below B–	150%
Unrated	100%

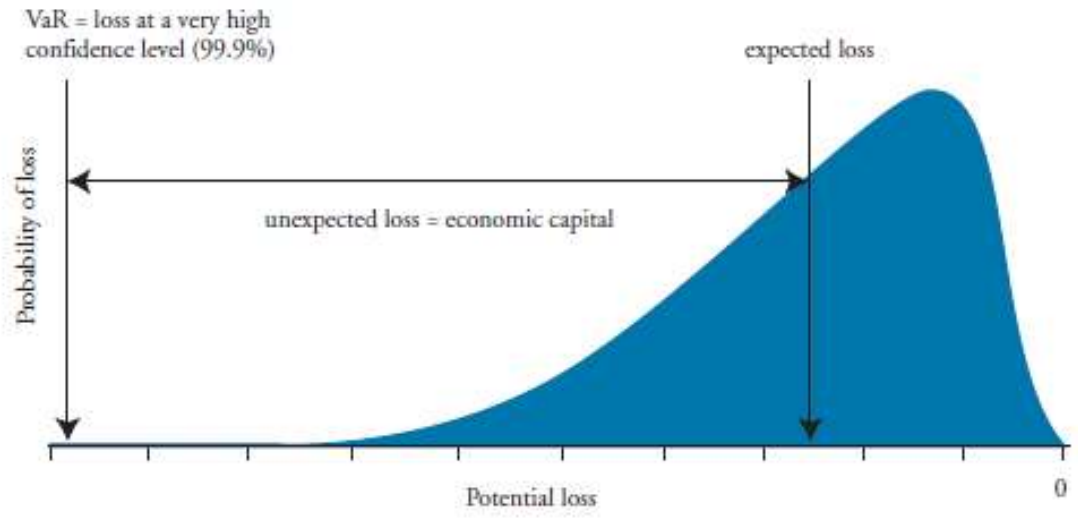
Claims on Corporations

Credit Evaluation	Risk Weight
AAA to AA–	20%
A+ to A–	50%
BBB+ to BB–	100%
Below BB–	150%
Unrated	100%

3.2 The Internal Ratings-Based (IRB) Approach

Under the IRB approach, the capital requirement is based on a VaR calculated over a one-year time horizon and a 99.9% confidence level. The model underlying this approach is shown in the figure below. Any losses beyond the VaR threshold amount are considered stress losses. These losses would not be covered by economic capital.

Figure 53.6: Capital Requirement



3.2 The Internal Ratings-Based (IRB) Approach

The goal of the IRB approach is to capture unexpected losses (UL). Expected losses (EL) should be covered by the bank's pricing (e.g., charging higher interest rates on riskier loans to cover EL). The capital required by the bank is thus VaR minus the bank's EL.

The VaR can be calculated using a Gaussian copula model of time to default. That is:

$$DR99.9_i = WDCR_i = N\left[\frac{N^{-1}(PD_i + \sqrt{\rho}N^{-1}(0.999)}{\sqrt{1-\rho}}\right]$$

Here,
$WCDR_i$ = the worst case probability of default or the default rate at the 99.9 percentile (DR99.9). The bank can be 99.9% certain that the loss from the ith counterparty will not exceed this amount in the coming year.
PD = the one-year probability of default of the ith obligor given a large number of obligors,
ρ = the copula correlation between each pair of obligors. PROFESSOR'S NOTE The WCDR or worst case probability of

3.2 The Internal Ratings-Based (IRB) Approach

Assuming the bank has a large portfolio of instruments such as loans and derivatives with the same correlation, the one-year 99.9% VaR is approximately

$$\text{VaR}_{99.9\%,1-\text{year}} \approx \sum_i \text{EAD}_i \times \text{LGD}_i \times \text{DR}99.9_i$$

EAD_i = the exposure at default of the ith counterparty or the dollar amount the ith counterparty is expected to owe if it defaults.
LGD_i = the loss given default for the ith counterparty or the proportion of the EAD_i that is expected to be lost in the event of default.

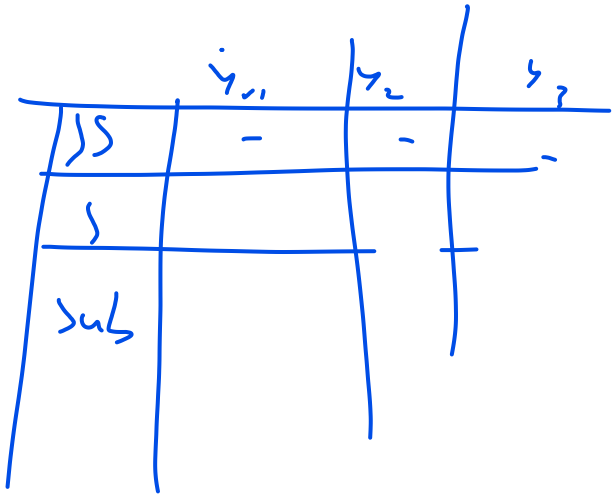
The expected loss (EL) from default is computed as:

$$\text{EL} = \sum_i \text{EAD}_i \times \text{LGD}_i \times \text{PD}_i$$

The capital the bank is required to maintain is:

$$\text{capital} = \sum_i \left[\text{EAD}_i \times \text{LGD}_i \times \text{DR}99.9_i\right] - \sum_i \left[\text{EAD}_i \times \text{LGD}_i \times \text{PD}_i\right]$$

$$\text{capital} = \text{VaR}_{99.9\%,1-\text{year}} - \text{EL}$$



3.2 The Internal Ratings-Based (IRB) Approach

Basel II assumes a relationship between the PD and the correlation based on empirical research. The formula for correlation is:

$$\rho = 0.12 \times (1 + e^{-50 \times PD})$$

Note that there is an inverse relationship between the correlation parameter and the PD. As creditworthiness declines, the PD increases. At the same time, the PD becomes more idiosyncratic and less affected by the overall market, thus the inverse relationship.

From a counterparty's perspective, the capital required for the counterparty incorporates a maturity adjustment

Capital = EAD × LGD × (DR99.9 − PD) × MA

where:
MA = maturity adjustment = [1 + (M − 2.5) × b] / (1 − 1.5 × b)
M = maturity of the exposure
$b = [0.11852 - 0.05478 \times \ln(PD)]^2$

3.2 The Internal Ratings-Based (IRB) Approach

The maturity adjustment, MA, allows for the possibility of declining creditworthiness and/or the possible default of the counterparty for longer term exposures (i.e., longer than one year). If M = 1.0, then MA = 1.0 and the maturity adjustment has no impact.

The risk-weighted assets are calculated as 12.5 times capital required:
$RWA = 12.5 \times [EAD \times LGD \times (DR_{99.9} - PD) \times MA]$

The capital required is 8% of RWA. The capital required should be sufficient to cover unexpected losses over a one-year period with 99.9% certainty (i.e., the bank is 99.9% certain the unexpected loss will not be exceeded). Expected losses should be covered by the banks product pricing.

3.3 Types of IRB Approach

Foundation IRB Approach

- The **bank supplies the PD estimate**. For bank and corporate exposures, there is a 0.03% floor set for PD.
- The **LGD, EAD, and M are supervisory values** set by the Basel Committee. The Basel Committee set LGD at 45% for senior claims and 75% for subordinated claims. If there is collateral, the LGD is reduced using the comprehensive approach described earlier.
- The EAD is calculated similar to the credit equivalent amount (CEA) required under Basel I. It includes the impact of netting.
- M is usually set to 2.5.

Advanced IRB Approach

- **Banks supply their own estimates of PD, LGD, EAD, and M.**
- PD can be reduced by credit mitigants such as credit triggers subject to a floor of 0.03% for bank and corporate exposures.
- LGD is primarily influenced by the collateral and the seniority of the debt.
- With supervisory approval, banks can use their own estimates of credit conversion factors when calculating EAD.

3.3 Example

Assume Blue Star Bank has a $150 million loan to an A-rated corporation. The PD is 0.1% and the LGD is 50%. The DR99.9 is 3.4%. The average maturity of the loan is 2.5 years. Calculate the RWA using the IRB approach and compare it to the RWA under Basel I.

Answer:

$b = [0.11852 - 0.05478 \times \ln(0.001)]^2 = 0.247$

$MA = 1/ [1 - (1.5 \times 0.247)] = 1.59$

Risk-weighted assets $= 12.5 \times 150 \times 0.5 \times (0.034 - 0.001) \times 1.59$

$= \$49.19$ million

Under Basel I, the RWA for corporate loans was 100% or $150 million in this case. Thus, the IRB approach lowers the RWA for higher-rated corporate loans, in this case from $150 million to $49.19 million.

4 Operational Risk Capital Requirements

Basel II requires banks to maintain capital for operational risks. Operational risks include failures of the bank's procedures that result in loss (e.g., fraud, losses due to improper trading activities such as experienced at Barings Bank in the mid-1990s). External events that result in loss, such as a ire, are also considered operational risks.

Under Basel II, there are three approaches banks may use to calculate capital for operational risk:

1. Basic indicator approach.
2. Standardized approach.
3. Advanced measurement approach

4.1 Basic Indicator Approach (BIA)

- This is the simplest approach and is used by banks with less sophisticated risk management functions. The required capital for operational risk is equal to the bank's average annual gross income (i.e., net interest income plus noninterest income) over the last three years multiplied by 0.15.

- In other words, capital for operational risk must equal 15% of three-year average annual gross income, ignoring years with negative gross income.

- Also, positive capital may be offset by negative capital within a year. However, if the total year's capital is expected to be negative, the year is ignored in the average. For example, a bank with gross income of $20 billion in year one, –$2 billion in year two, and $12 billion in year three would have a capital requirement of ($20 + $12)/2 × 0.15 or $2.4 billion because the year with negative gross income is ignored from the calculation.

4.2 The Standardized Approach (TSA)

- This method is similar to the basic indicator approach. The primary difference between the two approaches is that a different multiplier is applied to the bank's gross income for different lines of business.

- For example, gross earnings generated from retail banking might have a 12% multiplier, from commercial banking a 15% multiplier, and from payments and settlement activities an 18% multiplier.

4.3 Advanced Measurement Approach (AMA)

- Like the IRB approach discussed for credit risk, the capital requirement for operational risk under the advanced measurement approach is based on an operational risk loss (i.e., VaR) calculated over a one-year time horizon with a 99.9% confidence level.

- The approach has an advantage in that it allows banks to consider risk mitigating factors such as insurance contracts (e.g., ire insurance).