1. Actual Problems. Operational risk. Integrated Systems

BASEL 2. International Convergence of Capital Measurement and Capital Standards. A Revised Framework, June 2004

Pillars

1. Minimum Capital Requirements
2. Supervisory Review Process
3. Market Discipline

Changes

The June 1988 Accord required from banks to hold total capital equivalent to at least 8% of their risk-weighted assets. The 1996 Market Risk Amendment regarding the treatment of market risk and the definition of eligible capital remain unchanged. The significant changes include:

- the greater use of assessments of credit risk provided by banks' internal systems,
- determining the capital requirements for operational risk.

The ratio of capital to risk weighted assets must be no lower than 8%. In calculating the capital ratio, the denominator or total risk weighted assets is determined by multiplying the capital requirements for market risk and operational risk by 12.5 (i.e. the reciprocal of the minimum capital ratio of 8%) and adding the resulting figures to the sum of risk-weighted assets compiled for credit risk. The ratio is calculated using regulatory capital as the numerator.

$$(1) \qquad \frac{E}{12{,}5 \text{ x } (M + O) + C} > 8\%$$

where
E - regulatory capital (Tier 1 + Tier 2),
M – capital requirements for market risk,
O – capital requirements for operational risk,
C – risk weighted assets compiled for credit risk.

The standardized approach to credit risk

In determining the risk weights in the standardized approach, banks may use assessments by external credit assessment institutions. National supervisors are responsible for determining whether an external credit assessment institution (ECAI) meets the listed criteria (objectivity, independence, international access/transparency, disclosure, resources, credibility).

Credit risk mitigation techniques (CRM) may change risk weights. CRM techniques reduce or transfer credit risk. CRM include collateralized transactions. In the simple approach the risk weighting of the collateral instrument collateralizing or part collateralizing the exposure is substituted for the risk weighting of the counterparty. In the comprehensive approach, banks will calculate their adjusted exposure to a counterparty for capital adequacy purposes to take account of the effects of that collateral. Using haircuts, banks are required to adjust both the amount of the exposure to the counterparty and the value of any collateral received. This will produce volatility adjusted amounts for both exposure and collateral.

Claims on sovereigns

Credit Assessment	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Risk weight	0%	20%	50%	100%	150%	100%

Claims on banks

Option 1

Credit Assessment	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Risk weight	20%	50%	100%	100%	150%	100%

Option 2

Credit Assessment	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Risk Weight	20%	50%	50%	100%	150%	50%
Risk weight for short-term claims	20%	20%	20%	50%	150%	20%

Short-term claims in Option 2 are defined as having an original maturity of three months or less.

Claims on corporations

Credit assessment	AAA to AA-	A+ to A-	BBB+ to BB-	Below BB-	Unreated
Risk Weight	20%	50%	100%	150%	100%

The internal ratings-based (IRB) approach

Banks that qualify for the IRB approach may rely on their own internal estimates of risk components in determining the capital requirement for a given exposure. The risk components include measures of the probability of default (PD), loss given default (LGD), the exposure at default (EAD), and effective maturity (M). In some cases, banks may be required to use a supervisory value as opposed to an internal estimate for one or more of the risk components.

Under the IRB approach, banks must categorize banking-book exposures into broad classes of assets with different underlying risk characteristics, subject to the definitions set out below. The classes of assets are (a) corporate, (b) sovereign, (c) bank, (d) retail, and (e) equity. Within the corporate asset class, five sub-classes of specialized lending are separately identified. The five sub-classes of specialized lending are project finance, object finance, commodities finance, income-producing real estate, and high-volatility commercial real estate. Within the retail asset class, three sub-classes are separately identified.

The Committee has made available two broad approaches: a foundation and an advanced. Under the foundation approach, as a general rule, banks provide their own estimates of PD and rely on supervisory estimates for other risk components. Under the advanced approach, banks provide more of their own estimates of PD, LGD, EAD and M, subject to meeting minimum standards. In both cases, banks must always use the risk weight functions provided for the purpose of deriving capital requirements.

Formula

The derivation of risk weighted assets is dependent on estimates of the PD, LGD, EAD and, in some cases, effective maturity (M), for a given exposure.

(2) $$R = 0{,}12\frac{1-e^{-50PD}}{1-e^{-50}} + 0{,}24\left[1-\frac{1-e^{-50PD}}{1-e^{-50}}\right]$$

(3) $$b = \left(0{,}11852 - 0{,}05478\ln(PD)\right)^2$$

(4)

$$K = \left\{LGDxN\left[(1-R)^{-0{,}5}\,G((PD)) + \left(\frac{R}{1-R}\right)^{0{,}5} G(0{,}999)\right] - PDxLGD\right\}\frac{1}{1-1{,}5\,b(PD)}\left(1+(M-2{,}5)\,b(PD)\right)$$

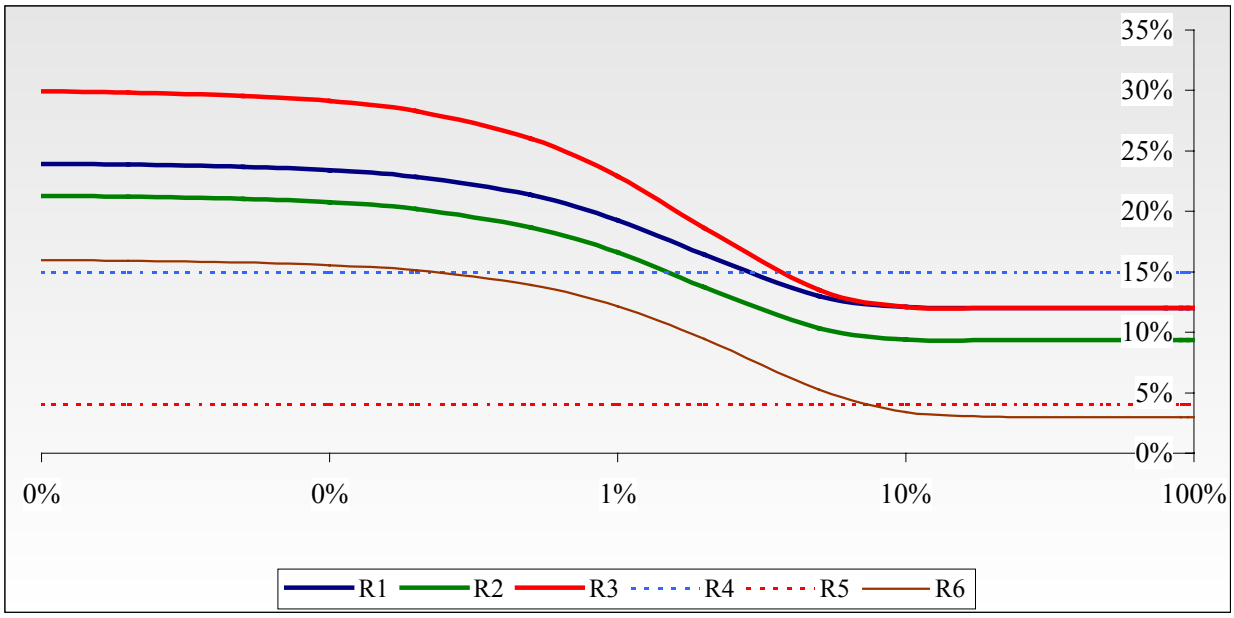
(5) $$RWA = 12{,}5\,K\,EAD$$

where
R - correlation,
b - maturity adjustment,
N(x) - the cumulative distribution function for a standard normal random variable (NORMSDIST in Excel),
G(z) - the inverse cumulative distribution function for a standard normal random variable (NORMSINV in Excel),
K - capital requirement as a percentage of exposure
RWA – risk weighted assets.

Firm-size adjustment for small- and medium-sized entities (SME):

(6) $$R = 0{,}12\frac{1-e^{-50PD}}{1-e^{-50}} + 0{,}24\left[1-\frac{1-e^{-50PD}}{1-e^{-50}}\right] - 0{,}04\left(1-\frac{S-5}{45}\right)$$

where:
S - total annual sales in millions of euros with values of S falling in the range of equal to or less than €50 million or greater than or equal to €5 million.



Problem 1. Economic Capital Required to Cover Unexpected Loss

Inputs:			
	Probability of default (PD)	3%	
	Loss given default (LGD)	20%	
	Effective maturity (M)	5	years
	Exposure at default (EAD)	100	Euro M
	Sales (S)	20	Euro M
Outputs:			
1	Correlation coefficient (R)	0,12	
2	Maturity adjustment		
	$b = (0{,}11852 - 0{,}05478 \ln(PD))^2$	0,10	
3	Capital requirement (as a percentage of exposure) (K)	4,8%	
	Economic capital = K x EAD	4,8	
4	Risk weighted assets: RWA=12,5 K EAD	59,5	Euro M
	Credit risk weight	59,5%	
	Required regulatory capital: 8% of RWA	4,8	Euro M

Correlation Coefficient

Depends on probability of default

R1 - Risk-weighted assets for corporate, sovereign, and bank exposures

$$R = 0{,}12\frac{1-e^{-50PD}}{1-e^{-50}} + 0{,}24\left[1-\frac{1-e^{-50PD}}{1-e^{-50}}\right] \qquad 0{,}15$$

R2 - small- and medium-sized entities (SME)

$$R = 0{,}12\ \frac{1-e^{-50PD}}{1-e^{-50}} + 0{,}24\ \left[1-\frac{1-e^{-50PD}}{1-e^{-50}}\right] - 0{,}04\ \left(1-\frac{S-5}{45}\right) \qquad 0{,}12$$

R3 - high volatility commercial real estate, HVCRE

$$R = 0{,}12\frac{1-e^{-50PD}}{1-e^{-50}} + 0{,}30\left[1-\frac{1-e^{-50PD}}{1-e^{-50}}\right] \qquad 0{,}16$$

R4 - residential mortgage exposures 0,15

R5 - revolving detail exposures 0,04

R6 - other retail exposures

$$R = 0{,}03\frac{1-e^{-35PD}}{1-e^{-35}} + 0{,}16\left[1-\frac{1-e^{-35PD}}{1-e^{-35}}\right] \qquad 0{,}08$$

Market risk. Trading book issues

A trading book consists of positions in financial instruments and commodities held either with trading intent or in order to hedge other elements of the trading book. To be eligible for trading book capital treatment, financial instruments must either be free of any restrictive covenants on their tradability or able to be hedged completely. In addition, positions should be frequently and accurately valued, and the portfolio should be actively managed.

Operational risk

Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk.

There are three methods for calculating operational risk capital charges in a continuum of increasing sophistication and risk sensitivity: (i) the Basic Indicator Approach; (ii) the Standardized Approach; and (iii) Advanced Measurement Approaches (AMA).

The Basic Indicator Approach

Banks using the Basic Indicator Approach must hold capital for operational risk equal to the average over the previous three years of a fixed percentage (denoted alpha) of positive annual gross income.

The Standardized Approach

In the Standardized Approach, banks' activities are divided into eight business lines: corporate finance, trading & sales, retail banking, commercial banking, payment & settlement, agency services, asset management, and retail brokerage.

Business Lines Beta Factors: Corporate finance 18%, Trading and sales 18%, Retail banking 12%, Commercial banking 15%, Payment and settlement 18%, Agency services 15%, Asset management 12%, Retail brokerage 12%

Advanced Measurement Approaches

Under the AMA, the regulatory capital requirement will equal the risk measure generated by the bank's internal operational risk measurement system using the quantitative and qualitative criteria for the AMA.