Lecture

IAQS | INSTITUTE OF ACTUARIAL & QUANTITATIVE STUDIES

Class: TY BSc

Subject : Basel

Subject Code:

Chapter: Unit 2 Chapter 1

Chapter Name: Basel I

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1 History

- With the foundations for supervision of internationally active banks laid, capital adequacy soon became the main focus of the Committee's activities. In the early 1980s, the onset of the Latin American debt crisis heightened the Committee's concerns that the capital ratios of the main international banks were deteriorating at a time of growing international risks.
- Backed by the G10 Governors, Committee members resolved to halt the erosion of capital standards in their banking systems and to work towards greater convergence in the measurement of capital adequacy. This resulted in a broad consensus on a weighted approach to the measurement of risk, both on and off banks' balance sheets.
- Following comments on a consultative paper published in December 1987, a capital measurement system commonly referred to as the Basel Capital Accord was approved by the G10 Governors and released to banks in July 1988.
- The 1988 Accord called for a minimum ratio of capital to risk-weighted assets of 8% to be implemented by the end of 1992. Ultimately, this framework was introduced not only in member countries but also in virtually all countries with active international banks.
- In September 1993, the Committee issued a statement confirming that G10 countries' banks with material international banking business were meeting the minimum requirements set out in the Accord

1 History

- The Accord was amended in November 1991 to more precisely define the general provisions or general loan loss reserves that could be included in the capital adequacy calculation.
- In April 1995, the Committee issued another amendment, to take effect at the end of that year, to recognize the effects of bilateral netting of banks' credit exposures in derivative products and to expand the matrix of add-on factors.
- In April 1996, another document was issued explaining how Committee members intended to recognize the effects of multilateral netting. The Committee also refined the framework to address risks other than credit risk, which was the focus of the 1988 Accord.
- In January 1996, following two consultative processes, the Committee issued the Amendment to the Capital Accord to incorporate market risks (or Market Risk Amendment), to take effect at the end of 1997. This was designed to incorporate within the Accord a capital requirement for the market risks arising from banks' exposures to foreign exchange, traded debt securities, equities, commodities and options. An important aspect of the Market Risk Amendment was that banks were, for the first time, allowed to use internal models (value-at-risk models) as a basis for measuring their market risk capital requirements, subject to strict quantitative and qualitative standards.

1.1 Why was Basel I formulated?

Two events motivated creation of Basel I.

- First, the growth of cross-border finance continued after Her- statt's failure and it was evident that the G10 nations had a common interest in ensuring that banks had enough equity to absorb large losses.

- Second, international banks were competing vigorously in each other's home countries. However, minimum levels of required capital varied significantly across nations, creating a perception that banks headquartered in countries with low minimums had a competitive advantage. In response, members of the BCBS decided to develop a global minimum standard to "level the playing field" and avoid a race to the bottom. That is, while the Basel Accord was partly about ensuring safety and soundness, negotiations also had an element of maneuvering for perceived competitive advantage.

2 Elements of Basel I

The central elements of Basel I:

1. A risk-based capital ratio,
2. A minimum level of this ratio,
3. Definitions of the numerator and denominator.

2.1 Capital and Risk-Weighted Assets

Although it seems simple by today's standards, the real innovation of Basel I was risk weighting bank assets, rather than focusing on capital relative to total assets. Basel I put forth three capital requirements:

1. The bank's total assets-to-capital ratio had to be less than 20 (i.e., capital to total assets had to be greater than 1/20 or 5%). This capital requirement was similar to the requirements in many countries prior to 1988.

1. Tier 1 capital to risk-weighted assets (RWA) must exceed 4%. On- and off-balance sheet items are used to calculate a RWA. RWA is intended to measure a bank's total credit exposure.

1. The ratio of total capital (Tier 1 + Tier 2) to RWA must exceed 8%. The ratios are sometimes referred to as the Cooke ratios, after Peter Cooke from the Bank of England. Basel I stipulated that Tier 2 capital must be no more than half of total capital. Excess Tier 1 capital (i.e., greater than 4% of RWA) may be used to satisfy the total capital to RWA ratio.

2.1 Capital and Risk-Weighted Assets

Basel I defined the two components of capital as follows:

Tier 1 capital (or core capital) consists of:

- Equity (subtract goodwill from equity).
- Noncumulative perpetual preferred stock.

Tier 2 capital (or supplementary capital) consists of:

- Cumulative perpetual preferred stock.
- Certain types of 99-year debentures.
- Subordinated debt with an original maturity greater than five years (where the subordination is to depositors).

Equity capital (i.e., Tier 1) absorbs losses. Supplementary capital (i.e., Tier 2) is subordinate to depositors and thus protects depositors in the event of a bank failure. At least 50% of capital must be Tier 1. Half of the Tier 1 requirement has to be met with common equity. Under Basel I, some countries required banks to have more capital than required by the Basel I accord.

2.2 Calculation of Risk-Weighted Assets

The process for calculating risk-weighted assets includes assigning a risk weight that reflects the bank's credit risk exposure to each of the on- and off-balance sheet items. A sample of some of the risk weights assigned to various asset categories is shown below:

Risk Weight	Asset Category
0%	Cash; claims on OECD governments such as bonds issued by the central government; other instruments with a full guarantee from an OECD government
20%	Claims on OECD banks and on OECD public sector entities, such as claims on municipalities or on Fannie Mae and Freddie Mac
50%	Uninsured residential mortgages
100%	All other exposures, such as commercial or consumer loans

2.2 Risk-Weighted Assets

To make the ratio risk-sensitive, the on-balance-sheet amount of each type of asset is multiplied by a percentage weight according to the risk it poses. The RWA is the sum of such products:

$$RWA = \sum_{i=1}^{N} w_i A_i$$

where W_j is the risk weight and A_j is the size of the asset.

2.2 Example

The assets of a Canadian bank consist of C$200 million of loans to corporations, C$100 million of Canadian central government bonds, C$100 million of residential mortgages insured by the central government, and C$100 million of uninsured residential mortgages. Though the book value of assets is C$500 million, the sum of risk-weighted assets is C$250 million since:

Solution:

RWA = 100% x 200 + 0% x 100 –1– 0% x 100 + 50% x 100

= 250

3 Calculating CEA

With respect to derivatives, Basel I offered authorities in each nation a choice between two methods of computing a credit equivalent amount (this structure was revised in 1995 with the addition of a maturity bucket greater than five years)

1. Current Exposure Method
2. Original Exposure Method (only for interest rate and foreign exchange contracts)

3.1 Current Exposure Method

a. First, calculate the current market value of the contract V. If the current market value is negative (making it a liability rather than an asset), set V = 0.

a. Second, add an amount D to account for changes in the contract's future market value. For interest rate swaps, D was
i. zero for for maturities of less than one year,
ii. 0.5% of the notional value of the swap for remaining maturities of five years or less; and
iii. 1.5% for more than five years.

c. For foreign exchange swaps, D was
i. 1 % of notional value for maturities of less than one year,
ii. 5% of notional value for maturities between one and five years, and
iii. 7.5% of notional value for maturities greater than five years.

For the current exposure method, the credit equivalent amount is calculated as:

$$\max(V , 0) + D \times L$$

where: V = current value of the derivative to the bank
D = add-on factor
L = principal amount

3.2 Original Exposure Method

a. Nations could ignore the current market value of the contract and choose whether to use the original or remaining maturity.

a. For interest rate contracts, D was
   i. 0.5% for maturities of less than one year,
   ii. 1 % for maturities between one and two years, and
   iii. 1% + 1% X INT[M — 1] for maturities greater than two years respectively

c. For foreign exchange contracts, D was
   i. 2 %, for maturities of less than one year,
   ii. 5%, for maturities between one and two years, and
   iii. 5% + 3% X INT[M — 1] for maturities of greater than two years

3.2 Calculating CEA

Credit Conversion Factors for Traditional Off-Balance-Sheet Exposures:

Credit Conversion Factor	Off-balance-sheet Category
100%	Guarantees on loans and bonds, bankers acceptances, and equivalents
50%	Warrantees and standby letters of credit related to transactions
20%	Loan commitments with original maturity greater than or equal to one year
0%	Loan commitments with original maturity less than one year

4 1995 Amendments : Netting

- By 1995, quantitative market risk management was popular, value at risk (VaR) was in widespread use, and the stock market had crashed in 1987. At that point, the “Market Risk Amendment” was put in place allowing for bilateral netting of exposures.
- Before netting was permitted, Basel I disincentivized hedging.
- For example, Bank A could buy protection from Bank B against falling rates and later enter a contract with the same counterparty and same notional value to sell protection. Changes in interest rates in this case would have offsetting effects, but Basel I applied an add-on to each swap.
- The International Swaps and Derivatives Association master agreement allowed positive and negative values to offset one another called **netting.**
- Netting is frequently employed in transactions that generate credit exposure to both sides. When each side has credit risk, we value and net the two to determine which side has the greater obligation.
- The impact of netting was not taken into consideration under the Basel I Accord in 1988. However, by 1995, the accord was modiied to allow for a reduction in the CEA, given that a legal netting agreement was in place. To measure the impact of netting, the net replacement ratio (NRR) was developed. This ratio is equal to the current exposure with netting divided by the current exposure without netting.

4 1995 Amendments : Netting

The NRR value is incorporated into a modiied version of the credit equivalent amount by multiplying it by the product of the add-on factor (D) and the principal amount (L). This modiication can then be used to reduce a bank's RWA.

Credit equivalent amounts are calculated as:

$$\text{CEA} = \max\left(\sum_{i=1}^{N} V_i, 0\right) + \sum_j \left[0.4 \times D_j + 0.6 \times D_j \times \text{NRR}\right]$$

Question

Using the information in the following table regarding a portfolio of five derivatives from two counterparties,

(1) determine which values may be netted against each other,

(2) calculate the NRR,

(3) calculate the CEA.

Counter-party	Type	Maturity	Notional Principal	Market Value	Add-on Factor	D_j (i.e., the add-on amount)
1	Interest rate	2	100	–5	0.5%	100 × 0.005 = 0.5
1	Interest rate	3	100	0	0.5%	100 × 0.005 = 0.5
1	Foreign exchange	2	100	15	5%	100 × 0.05 = 5.0
2	Equity option	6	200	0	10%	200 × 0.10 = 20
2	Soybean option	0.5	200	–10	10%	200 × 0.10 = 20

Solution

(1) With netting, the current exposure portion of the credit equivalent amount is 10 for the first counterparty (i.e., the –5 exposure on the interest rate derivative is netted against the 15 exposure on the foreign exchange derivative). It is 0 for the second counterparty for a total of 10. The current exposure cannot be less than zero and the –10 soybean market value cannot be netted against the 10 from counterparty 1; it may only be netted against positive exposures from the second counterparty.

(1) The NRR = 0.667. The numerator is the current exposure with netting (i.e., 10) and the denominator is the total positive exposure (i.e., 15).

(1) The add-on must be calculated separately for each type of derivative, multiplying the add-on factor by the notional amount to obtain Dj (see column 7 for calculations).

CEA = 10 + (0.4 × 0.5 + 0.6 × 0.5 × 0.667) + (0.4 × 0.5 + 0.6 × 0.5 × 0.667) + (0.4 × 5.0 + 0.6 × 5.0 × 0.667) + (0.4 × 20.0 + 0.6 × 20.0 × 0.667) + (0.4 × 20.0 + 0.6 × 20.0 × 0.667)
= 10 + 0.4 + 0.4 + 4.0 + 16.0 + 16.0
= 46.8

5 The 1996 Amendment: Market Risk and Trading Activities

- Market risk is the risk associated with changes in the market values of trading book assets.
- The 1995 amendment requirements did not capture market risk. The goal of the 1996 Amendment to the 1988 Basel Accord was to require banks to measure market risks associated with trading activities and maintain capital to back those risks. Banks must mark-to-market (i.e., fair value accounting) bonds, marketable equity securities, commodities, foreign currencies, and most derivatives that are held by the bank for the purpose of trading (referred to as the trading book).
- Banks do not have to use fair value accounting on assets they intend to hold for investment purposes (referred to as the banking book). This includes loans and some debt securities.

- The 1996 Amendment proposed two methods for calculating market risk:

1. Standardized Measurement Method
2. Internal Model Based Approach

5.1 Standardized Measurement Approach

The standardized approach details separately for five categories of positions:

- fixed income securities and interest rate derivatives other than options, for which remaining maturity was a key driver;
- equity securities and equity derivatives other than options;
- foreign exchange;
- commodities; and
- all types of options.

These approaches were relatively simple for some categories, while for others there were many operational complexities (e.g., the separate treatment of specific risk and general market risk, where the latter is due to general movements in market prices and the former is driven by idiosyncratic changes in a specific position's value).

5.2 Internal Model Based Approach

- The internal models-based approach embodied a major change in philosophy by permitting banks to use internally developed risk measures as the inputs to formulas specified by regulators.
- To limit manipulation of the internal measures, monitoring was built in. In contrast, the standardized approach specified most of the details and was based on observable characteristics of positions (e.g., remaining maturity).
- Under both approaches, capital charges were calculated separately for specific risk (SR) and general market risk (MR) for each of the five categories. These were summed and multiplied by 12.5 so that the usual multipliers on risk weighted assets could also be applied to them

$$\text{Total capital for trading assets} = 0.08 * 12.5 \sum_{j=1}^{5} (MR_j + SR_j)$$

- To measure market risk, a bank using the internal models-based approach must calculate value-at-risk (VaR) for each asset category. A 10-day VaR at the 99th percentile was required, based on at least one year of daily data, usually using a scaled one-day VaR multiplied by \/10.
- Correlations within a category of position were considered by the internal model, whereas adjustments for correlations across categories were allowed at the discretion of the national supervisor

5.2 Internal Model Based Approach

- Thus, market risk was given by

$$MR = \max(VaR_{t-1}, m*VaR_{avg})$$

- where VaR avg was the average VaR over the past 60 days and m was a multiplier that was never less than 3 (and could be larger if national supervisors found deficiencies in the bank's models or other systems, or if monitoring implied other deficiencies.) Given a multiplier of 3, the second term was usually larger than the 10-day VaR computed for the preceding business day (i.e., t — 1).
- Capital for specific risk, which was required for fixed income, equity instruments, and derivatives, could be determined using either the standardized approach or the bank's internal models. In the latter case, the approach was similar to that for market risk, but the multiplier was 4 rather than 3 and capital for specific risk could not be less than half of capital calculated using the standardized approach.

5.2 Example

A bank calculates the previous day's market risk VaR as $10 million. The average VaR over the preceding 60 trading days is $8 million. Assuming a multiplicative factor of three, calculate the market risk capital charge.

Solution:

$$\text{market risk capital charge} = 0.08 \times [12.5 \times (3 \times \$8 \text{ million})]$$
$$= \$24 \text{ million}$$

6 Limitations

1. First, all corporate loans were treated the same (i.e., a risk weight of 100%) regardless of the creditworthiness of the borrower. A firm with an AAA credit rating was treated the same as a borrower with a C rating.

1. Basel I also ignored the benefits of diversification (i.e., there was no model of default correlation).