Risk Management in Finance - Economic Capital and RAROC

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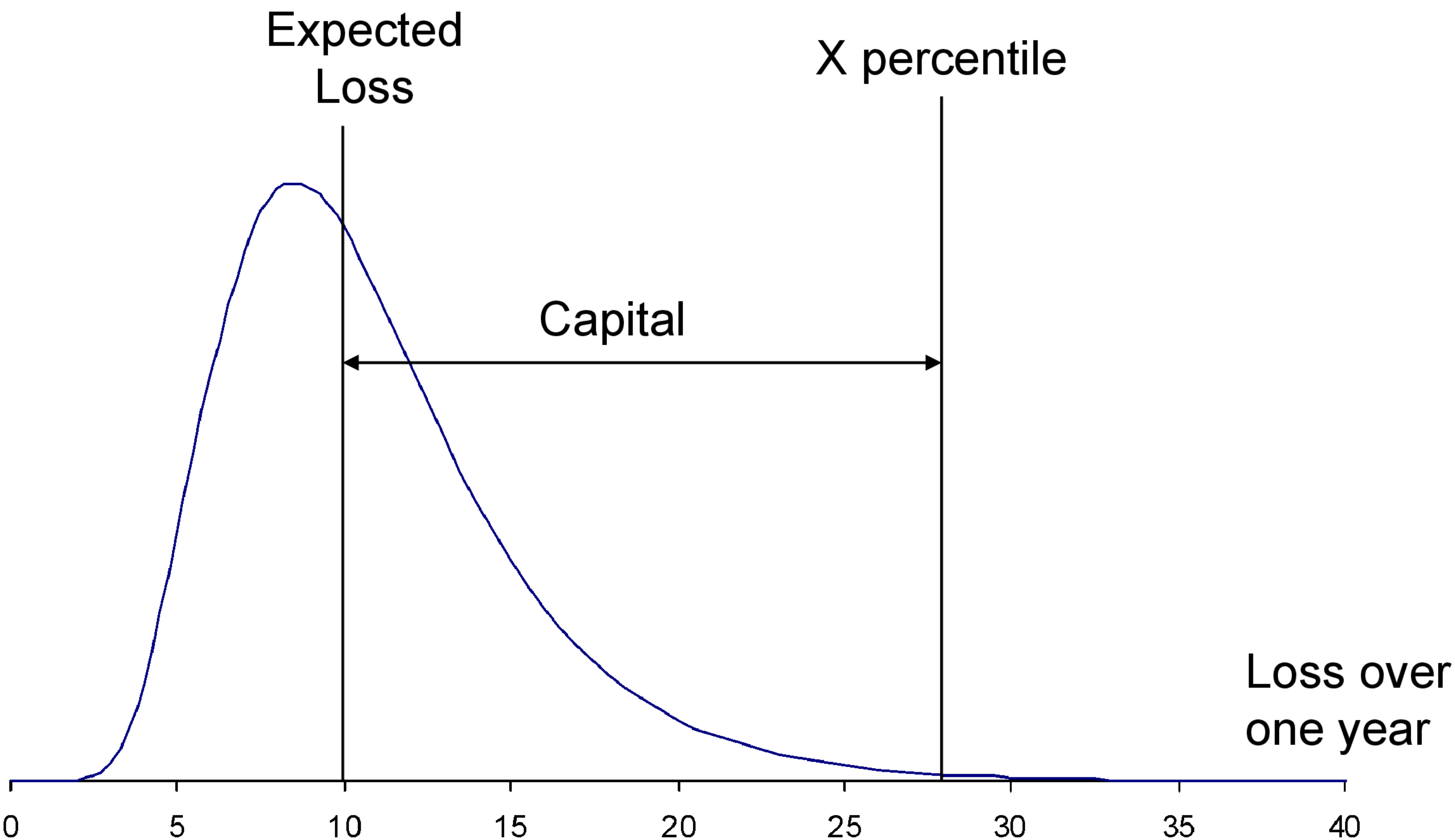
Economic Capital

- A bank's own assessment of the capital it requires

Model Used for Economic Capital (Same as Regulatory Capital)

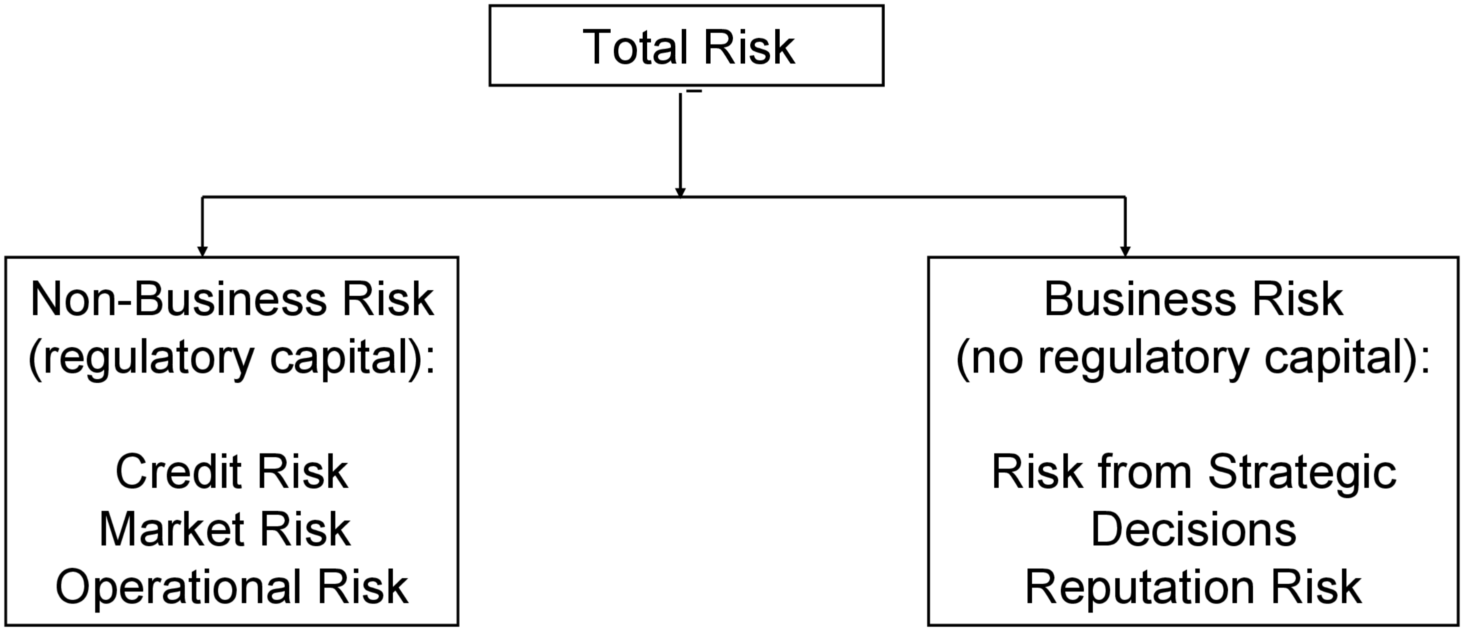
Figure 26.1, page 586



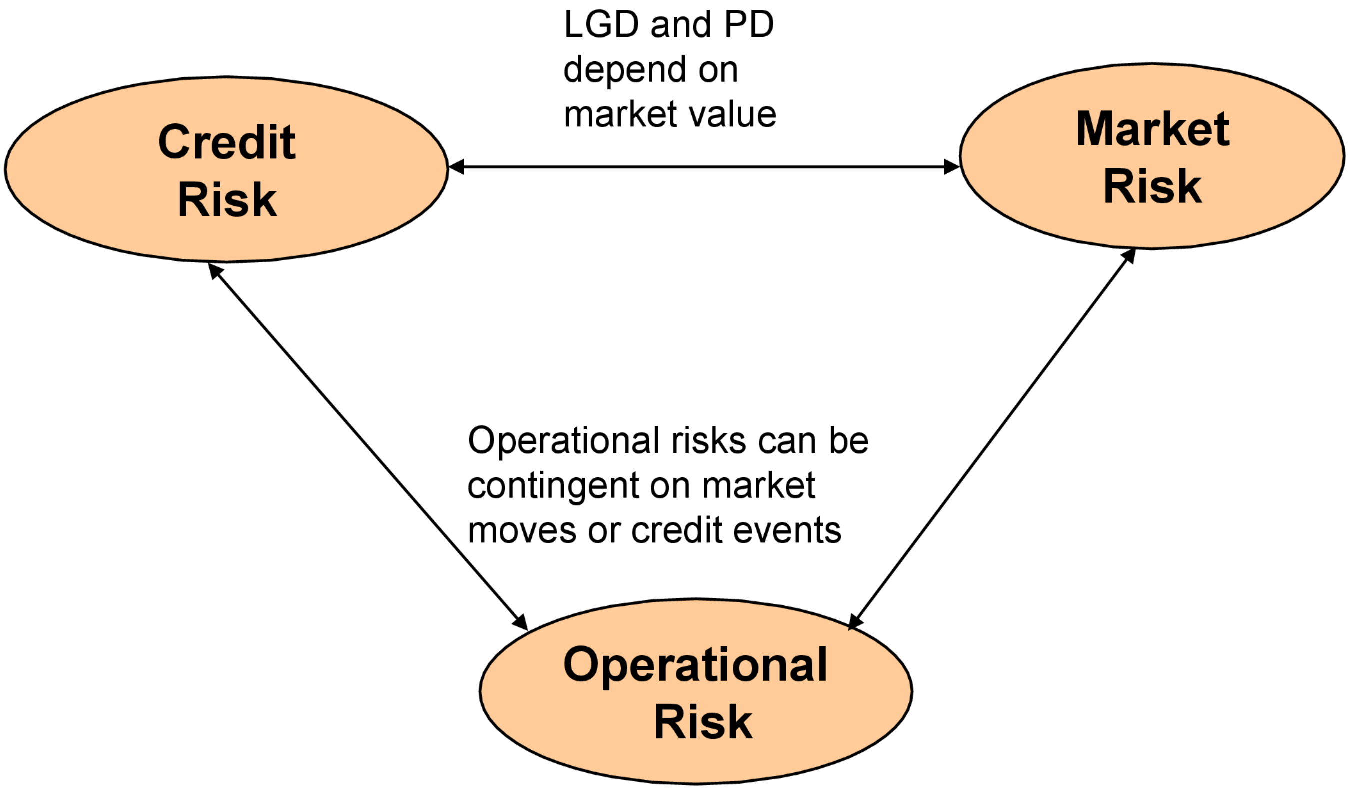
Choice of Parameters

- For a bank wishing to maintain a AA-rating, capital is chosen so that X is about 99.98% and time horizon is one year
- This is because statistics from rating agencies show that an AA-rated company has a probability of only about 0.02% of defaulting in one year

The Basel II Regulatory Environment (Figure 26.2, page 587)



Interactions of Risks



Integrated Risk Management

- Typically a bank calculates economic capital for different types of risk and different units
- It is then faced with the problem of aggregating the risks

Combining the Distributions

- Assume perfect correlation: overstates capital by about 40%
- Assume distributions are normal for the purposes of aggregation: understates capital by about 40%
- Hybrid approach: $E_{total} = \sqrt{\sum_{i=1}^{n} \sum_{j=1}^{n} \rho_{ij} E_i E_j}$ seems to work reasonable well

Example: Economic Capital Estimates (Table 26.2, page 594)

	Business Unit 1	Business Unit 2
Market Risk	30	40
Credit Risk	70	80
Operational Risk	30	90

Correlations

- Market and credit risk within the same business unit: 0.5
- Market and operational risk or credit and operational risk within the same business unit: 0.2
- Market risks across business units: 0.4
- Credit risk across business units: 0.6
- Operational risk across business units: 0.0

Total Economic Capital

- Business Unit 1: 100.0
- Business Unit 2: 153.7
- Whole bank: 203.2

Diversification benefit is 253.7 – 203.2 = 50.5

How should this be allocated to the business units?

Equivalently how should the total economic capital of 203.2 be allocated?

Alternatives

- Allocate economic capital in proportion to the stand alone economic capitals
- Allocate economic capital in proportion to marginal contribution of business units to total economic capital
- Set economic capital for business unit i equal to $x_i \frac{\partial E}{\partial x_i}$ where x_i is the size of business unit i

Deutsche Bank：Allocation of EC (millions of euros)

Division	Allocated Economic Capital
Global Markets	15,587
Corporate & Investment Banking	5,015
Private Wealth & Commercial Clients	2,473
Deutsche Asset Management	2,480
Postbank	3,976
Non-core Operations Unit	735
Consolidations & Adjustments and Other	5,172
Total	35,438

RAROC (page 598-600)

- RAROC is the return on economic capital for a business unit
- The denominator is the economic capital allocated to the business unit
- The numerator is the expected profit. This can be before or after tax and can include a interest at the risk-free rate on the economic capital
- It is sometimes also referred to as RORAC

Example 26.5 (page 599)

- When lending in a certain region of the world an AA-rated bank estimates its average losses from defaults as 1% of outstanding loans per year
- The 99.97% worst case loss is 5% of outstanding loans
- Economic capital per $100 of loans is therefore $4

Example continued

- The bank's spread between cost of funds and interest charged is 2.5% and administrative costs are 0.7%

$$RAROC = \frac{0.025\times 100 - 0.01\times 100 - 0.007\times 100}{4.0} = 20\%$$

If interest on the economic capital is included and the risk free rate is 2% this becomes

$$\frac{0.88}{4.0} = 22\%$$