Financial Risk Forecasting
Chapter 11
Risk Regulations

Jon Danielsson ©2025
London School of Economics

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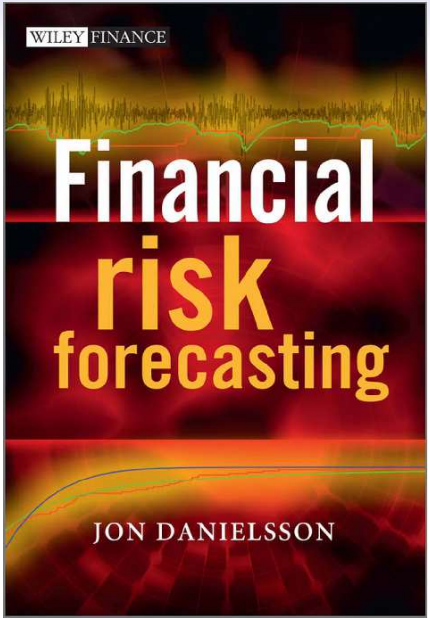
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Capital

Capital

- Capital is the most important regulatory tool
- Fundamental to both MicroPru and MacroPru
- So what is capital?

Capital In Common Usage

- The term "capital" has multiple meanings:
  - Adam Smith: "That part of a man's stock which he expects to afford him revenue"
  - Karl Marx: wealth used to create more wealth through economic exchange
  - Economists: productive assets (factories, equipment) vs labour
  - Finance: market capitalisation (market value of a corporation)
- Banking capital is different — it's a regulatory concept
- Represents the bank's own funds that can absorb losses
- Not to be confused with capital as productive assets or market value

Why Capital?

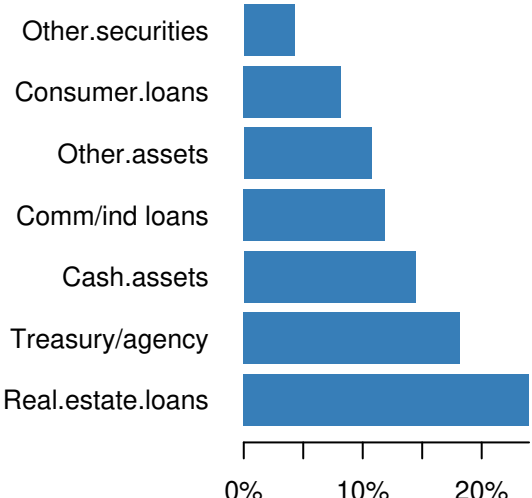
- *Reserves* against unexpected losses (buffer)
- *Limit to leverage* – or credit expansion
- It is not a buffer against expected losses since these are provisioned for elsewhere

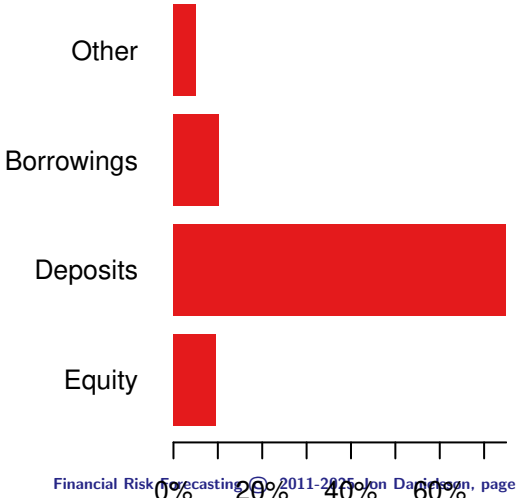
The Balance Sheet Of A Firm

Left-hand side	Right-hand side
Assets	Equity
	Liabilities

Assets - Liabilities = Equity

US banks balance sheet July 2024 — Federal Reserve H.8 statistical release





Equity

- A bank started five years ago
- Assuming the original stock price was 1,000, and there are no dividends or taxes
- Profits in years 1, 2, 3, and 5 were 100, respectively, while the loss in year 4 was 250
- In this case, the shareholders' *equity* is

$$1000 + 100 + 100 + 100 + 100 - 250 = 1150$$

- Known as *Common Equity Tier 1 — CET1*

Criteria for capital instruments

- Loss absorption
- Permanency
- Flexibility and the ability to defer payment
- Default performance and freedom of action

The most common form of capital is equity.
The more equity-like an instrument is, the better protection it provides.

Capital and what it is made of

- The fundamental component of capital is equity
- Equity (or net worth) is known as core equity tier 1 (*CET1*)
- Bank capital is *more than equity*
- Since it includes certain types of debt instruments
  - Like AT1 bonds (discussed below)
  - Certain long-term subordinated bonds
- And other balance-sheet items
- The rules for what is allowed as capital can differ between countries
- We use the term "capital instruments"

Bank capital is what the regulators choose to call bank capital

Basel Accords (BA)
Basel Committee for Banking Supervision (BCBS)

Basel Committee on Banking Supervision (BCBS)

- The BCBS is hosted at, but is distinct from, the Bank for International Settlements (BIS), whose head office is in Basel, Switzerland
- It does not possess any formal powers
- Rather, it is a vehicle for agreeing on common standards and financial regulations
- And it is left up to the member countries to implement the regulations
- BCBS reports to the G20
- But almost all countries with a private sector banking system follow the rules set by the BCBS

Three Main Risk Areas Attracting Capital Charges

- Operational risk — losses from inadequate or failed internal processes, people, systems, or external events
- Banking book — loans and other assets held to maturity
- Trading book — assets held for short-term trading and market-making

Basel Accords

- Basel I (agreed 1988, implemented 1992)
- Basel II (2008) — Not fully implemented, for example, in the US
- Basel III (implemented in stages from 2019)
  - *Basel III endgame*
- Basel IV (in the future)

Menu of Approaches for Risk Calculation

- Banks can choose between approaches for calculating risk-weighted assets:
  - *Standardised approach* — use regulator-provided risk weights
  - *Internal Ratings Based (IRB)* — use own risk models (for sophisticated banks)
- Choice depends on:
  - Bank's sophistication and resources
  - National regulator's approval
- Current trend: Moving away from IRB back to standardised
  - IRB proved unreliable during 2008 crisis
  - Basel III endgame limits IRB benefits

Market Risk Regulations

Origin of VaR

- VaR was developed in response to financial regulations
- And its primary use is in regulated institutions
- Over time, it has become a fundamental part of how we monitor financial institutions
- And the individuals working inside them

Basel II Market Risk (Trading Book)

- Banks are required to measure market risk with $\text{VaR}^{99\%}$ with 10-day holding periods
- They are allowed to use the square-root-of-time rule
- That is, measure daily holding period VaR and multiply it by $\sqrt{10}$

Market Risk Capital

- Capital is obtained from multiplying the maximum of previous day 1%VaR and 60 days average VaR ($\overline{\text{VaR}}_t^{1\%}$) by a multiplicative constant, M_t, and adding constant C_t

$$\text{Market risk capital}_t \geq M_t \max\left(\text{VaR}_t^{1\%}, \overline{\text{VaR}}_t^{1\%}\right) + C_t$$

Market Risk Capital (Cont.)

- The multiplication factor M_t varies with the number of violations, υ_1, that occurred in the previous 250 trading days – the required testing window length for backtesting in the Basel II Accords
- Constant C_t is determined by the authorities based on the subjective judgment of what additional capital might be needed
- This is based on three ranges for the number of violations, named after the three colors of traffic lights:

$$M_t = \begin{cases} 3, & \text{if } \upsilon_1 \leq 4 \text{ (Green)} \\ 3 + 0.2(\upsilon_1 - 4), & \text{if } 5 \leq \upsilon_1 \leq 9 \text{ (Amber)} \\ 4, & \text{if } 10 \leq \upsilon_1 \text{ (Red)} \end{cases}$$

2008 Crisis and Reforms

- The global crisis in 2008 showed that existing methods for measuring and regulating risk were inadequate
- One area they identified was that the Basel II way of measuring VaR did not capture the risks it was supposed to
- Banks failed even though their VaR suggested they were doing quite well (see UBS on next slide)
- In response we got Basel III
- It is a very complicated and I present a highly simplified view of the trading book regulations

The Case of UBS – Bailed Out in 2008

- $19 billion in losses on collateralised debt obligations (CDOs) composed of U.S. sub-prime mortgages
- UBS did not realise that the CDOs were risky
- Use VaR to measure the risk – exactly the wrong type of risk measurement methodology
- The UBS risk managers opted for riskometers tailor-designed not to capture subprime mortgage risk
- Fed into the calculations of the bank's overall riskiness and was dutifully reported to senior management and the authorities
- None of them was concerned, and neither were their auditors, Ernst & Young
- UBS lost sight of the fact that when it thought it was fooling the regulators, it was just fooling itself

Basel III Trading Book

- Measure market risk with $ES^{97.5\%}$
- Use various holding periods (that is, losses that can happen over multiple different time periods)
- Use a *stressed* ES
- That is, identify the highest ES in the previous few years for the same asset/portfolio
- And use the maximum of the stressed ES, or the actual ES on a day to determine the regulatory ES for the day