Lesson 4.3 Exercises: Institutional Risk Management

Module 4: The Risk Problem

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Digital Finance — BSc Course

Exercise 1: Risk-Weighted Assets Calculation

Scenario: A regional bank has the following asset portfolio (synthetic data):

Asset Class	Exposure ($M)	Risk Weight
Cash and central bank reserves	50	0%
OECD sovereign bonds (AA-rated)	120	0%
Claims on other OECD banks	80	20%
Residential mortgages	300	35%
Investment-grade corporate loans	200	50%
Unsecured consumer loans	150	75%
Sub-investment-grade corporate loans	100	100%

Tasks:

a. Calculate the **RWA for each asset class** and the **total RWA**.

b. The bank has CET1 capital of $28M, AT1 of $5M, and Tier 2 of $7M. Calculate the **CAR** and the **CET1 ratio**.

c. Does the bank meet the Basel III minimum requirements (CET1 $\geq$ 4.5%, CAR $\geq$ 8%)? Does it meet the conservation buffer (CET1 $\geq$ 7%)?

d. If the bank wants a CET1 ratio of 10%, how much **additional CET1 capital** does it need?

Difficulty: Intermediate — requires multi-step arithmetic.

Exercise 2: Liquidity Coverage Ratio

Scenario: A bank holds the following liquid assets and faces these 30-day outflows (synthetic data):

HQLA Portfolio:

Asset	Value ($M)
Gov. bonds (Level 1)	100
Corp. bonds AA (L2A)	40
Equities (L2B)	20

Haircuts: L1 = 0%, L2A = 15%, L2B = 50%.

30-Day Outflows:

Source	Outflow ($M)
Retail deposits (5%)	30
Wholesale unsecured (40%)	50
Committed lines (10%)	20
Total	**100**

Tasks:

a. Calculate the **adjusted HQLA** after applying haircuts.

b. Calculate the **LCR**. Does the bank meet the 100% minimum?

c. The bank loses a major corporate depositor, adding $25M to wholesale outflows. Recalculate the LCR. Does the bank still comply?

d. Propose two actions the bank could take to restore the LCR above 100% if it falls below.

Difficulty: Intermediate — requires arithmetic and reasoning.

Exercise 3: Stress Test Impact on Capital

Scenario: A bank enters a stress test with the following starting position (synthetic data):

- Total RWA: \$800M
- CET1 capital: \$96M (CET1 ratio: 12.0%)
- Credit portfolio: \$600M in corporate loans (100% RW), \$200M in mortgages (35% RW)

Adverse scenario assumptions (over 2 years):

- Corporate loan default rate increases from 2% to 8%; LGD = 45%
- Mortgage default rate increases from 0.5% to 3%; LGD = 25%
- RWA increases by 10% due to rating downgrades
- Pre-provision operating income: \$20M per year (partially offsets losses)

Tasks:

a. Calculate total **credit losses** under the adverse scenario (2-year cumulative).
b. Calculate **CET1 capital at the trough** (starting CET1 − losses + operating income).
c. Calculate the **stressed CET1 ratio** (using the 10%-higher RWA).
d. Does the bank breach the 7.0% combined requirement? What actions should it take?

Difficulty: Advanced — requires multi-step scenario modeling.

Exercise 4: Credit Portfolio Expected Loss

Scenario: A bank's loan book consists of three segments (synthetic data):

Segment	EAD ($M)	PD	LGD
Investment-grade corporates	500	0.5%	40%
SME loans	200	3.0%	55%
Unsecured consumer credit	100	5.0%	70%

Tasks:

a. Calculate the **Expected Loss (EL)** for each segment and the **total portfolio EL**.

b. The bank charges an average spread of 2.5% on its $800M portfolio. Is the total interest income sufficient to cover expected losses? What is the excess?

c. If default correlations between segments increase during a recession, explain qualitatively how this affects **unexpected losses** even if PDs remain the same.

d. Why can the bank *not* simply set provisions equal to the expected loss and consider itself "safe"?

Difficulty: Intermediate — requires computation and interpretation.

Exercise 5: Capital Stack and Buffer Requirements

Scenario: A globally systemically important bank (G-SIB) has:

- Total RWA: \$2,000M
- CET1: \$220M; AT1: \$40M; Tier 2: \$60M
- G-SIB surcharge: 2.0%
- Countercyclical buffer (currently): 1.0%

Basel III combined requirements:

Requirement	CET1 (% of RWA)
Pillar 1 minimum	4.5%
Capital conservation buffer	2.5%
Countercyclical buffer	1.0%
G-SIB surcharge	2.0%
Total combined CET1 requirement	**10.0%**

Tasks:

a) Calculate the bank's CET1 ratio and CAR.

b) Does the bank meet all combined CET1 requirements?

c) The countercyclical buffer is raised to 2.5%. How much additional CET1 must the bank raise?

d) Explain why regulators impose **higher** capital requirements on G-SIBs compared to smaller banks.

Difficulty: Intermediate–Advanced — requires buffer stacking and reasoning.

Exercise 6: Operational Risk and Key Risk Indicators

Scenario: A bank's operational risk dashboard shows the following KRI trends over the last four quarters:

KRI	Q1	Q2	Q3	Q4
IT system outages (hours)	2	5	12	18
Failed trades (#)	15	22	35	48
Compliance breaches (#)	1	2	3	5
Staff turnover in risk (%)	8%	12%	18%	25%
Cyber incidents (#)	3	5	8	14

Tasks:

a) Identify the **three most concerning trends** and explain why each is worrying.

b) For each concerning KRI, propose a **concrete remediation action**.

c) The risk committee asks: "Is this just noise, or should we escalate to the board?" Write a brief (3–4 sentence) recommendation.

d) Explain how rising staff turnover in the risk function could **amplify** the other KRI trends.

Difficulty: Advanced — requires interpretation and recommendation.

Exercise 7: Reverse Stress Test Design

Scenario: You are the CRO of a mid-size bank with the following characteristics:

- 60% of the loan book is concentrated in commercial real estate (CRE)
- CET1 ratio: 10.5%
- LCR: 115%
- Heavy reliance on wholesale funding (NSFR: 95%)

Tasks:

a. Design a **reverse stress test scenario** that would cause the bank's CET1 ratio to fall below 4.5%. Specify at least 3 simultaneous shocks with quantitative magnitudes.

b. Explain why your scenario is **plausible** (not purely hypothetical). Reference a historical precedent for at least one of the shocks.

c. Identify **two mitigating actions** the bank should take *now* (before any crisis) to reduce the probability or impact of your scenario.

d. How does the bank's low NSFR (95%) interact with a CRE downturn to create a **combined solvency–liquidity crisis**?

Difficulty: Advanced–Integrative — requires synthesis and evaluation.

Exercise 8: Comprehensive Case – Comparing Two Banks

Scenario: An analyst compares two banks (all data synthetic):

Metric	Bank Alpha	Bank Beta
Total assets	$50B	$50B
RWA	$25B	$35B
CET1 capital	$3.0B	$3.5B
CET1 ratio	12.0%	10.0%
LCR	145%	105%
NSFR	112%	92%
NPL ratio	1.2%	3.8%
Stressed CET1 (trough)	8.5%	5.2%
IT outage hours (last year)	4	52
Revenue concentration: top 3 sectors	30%	65%

Tasks:

a. Which bank has a **riskier asset mix**? Justify using the RWA-to-assets ratio.

b. Which bank is **more resilient under stress**? Cite at least 3 metrics.

c. Bank Beta argues: "Our CET1 ratio is 10% — well above minimums." Write a 4–5 sentence rebuttal identifying the bank's vulnerabilities.

d. As an investor, which bank would you prefer, and what **risk premium** (in basis points of credit spread) would you demand for lending to the weaker bank? Justify your reasoning.

Difficulty: Advanced–Integrative — combines all lesson concepts into a holistic assessment.