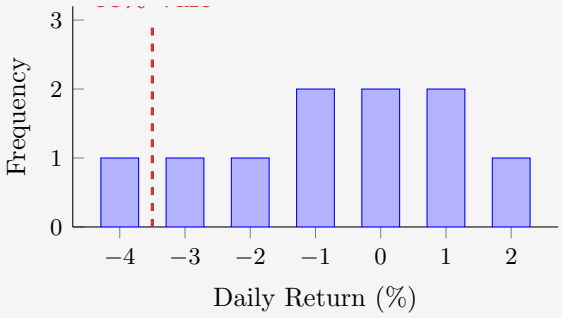
Pre-Class Discovery Handout: Risk Management & Regulation

Activity 1: VaR by Hand

Scenario: Your portfolio produced the following 10 daily returns (%):

$$-3,\ -1,\ 0,\ +1,\ -2,\ +2,\ -4,\ +1,\ 0,\ -1.$$



Q1: Sort the returns from worst to best. What is the 5th-percentile return (i.e., the worst return such that only 5% of observations are worse)?

Q2: Express the 95% VaR in plain English: "There is a 95% chance that daily losses will not exceed _____."

Q3: What is the main limitation of historical VaR with only 10 observations?

Activity 2: Basel Capital Puzzle

Scenario: A bank has risk-weighted assets (RWA) of CHF 100 million. Basel III requires a minimum total capital ratio of 8%.

Q1: How much capital must the bank hold at minimum?

Q2: If 10% of loans default with a loss-given-default (LGD) of 50%, what is the total loss? Does the capital buffer survive?

Q3: Why might the *actual* capital requirement exceed 8%? (Hint: capital conservation buffer, countercyclical buffer.)

Activity 3: Risk Type Classification

Scenario: Classify each event as **market**, **credit**, **operational**, or **liquidity** risk.

#	Scenario	Risk Type
1	Hackers steal customer data	
2	Interest rates spike 200 bps overnight	
3	A major counterparty goes bankrupt	
4	A rogue trader hides losses	
5	The CHF appreciates 15% in one day	
6	The trading system crashes for 4 hours	

Q1: Classify each scenario as market, credit, operational, or liquidity risk.

Q2: Which risk type appears most frequently in the table? Why?

Q3: Can a single event trigger multiple risk types simultaneously? Give an example.

Solutions

Activity 1: VaR by Hand

A1: Sorted returns: -4, -3, -2, -1, -1, 0, 0, $+1$, $+1$, $+2$. With 10 observations, the 5th percentile corresponds to the worst 0.5 observations. Using linear interpolation between the 1st observation (-4%) and the 2nd (-3%), the 5th-percentile return is approximately -3.5%. A simpler approach: the single worst return below which 5% of data falls is -4% (1 out of 10 = 10%, so the 95% VaR is conservatively 3% to 4%).

A2: "There is a 95% chance that daily losses will not exceed approximately 3–4%." More precisely, with this small sample, the 95% historical VaR is around 3% (using the second-worst observation as the threshold).

A3: Ten observations provide extremely poor statistical reliability. The distribution of returns is poorly estimated — tail events are almost certainly underrepresented. A single additional extreme observation would drastically change the VaR estimate. In practice, hundreds or thousands of observations are needed for robust historical VaR.

Activity 2: Basel Capital Puzzle

A1: Minimum capital = $8\% \times$ CHF 100M = CHF 8M.

A2: Total loss = $10\% \times 50\% \times$ CHF 100M = CHF 5M. Since CHF 5M $<$ CHF 8M, the capital buffer absorbs the loss and the bank survives. However, remaining capital (CHF 3M) would be below the 8% minimum, triggering supervisory intervention.

A3: Basel III adds buffers on top of the 8% minimum: a 2.5% capital conservation buffer (mandatory), a 0–2.5% countercyclical buffer (set by national regulators), and for systemically important banks, a 1–3.5% surcharge. In practice, large Swiss banks must hold 13–15% total capital, nearly double the base requirement.

Activity 3: Risk Type Classification

A1: (1) Operational risk — a cyber-attack is a failure of internal controls and IT security. (2) Market risk — interest rate movements directly affect portfolio valuations. (3) Credit risk — the counterparty cannot fulfill its financial obligations. (4) Operational risk — internal fraud and inadequate controls. (5) Market risk — FX rate movements affect cross-currency exposures. (6) Operational risk — system failure disrupts business processes.

A2: Operational risk appears three times (scenarios 1, 4, 6). This reflects the broad scope of operational risk, which encompasses all non-market, non-credit losses including technology failures, human error, fraud, and external events.

A3: Yes. For example, a counterparty default (credit risk) can trigger a fire sale of assets at depressed prices (market risk) and force the bank to find replacement liquidity on short notice (liquidity risk). The 2008 Lehman Brothers collapse simultaneously triggered credit, market, liquidity, and operational disruptions across the financial system.

