RISK5001 Fundamentals of Risk and Risk Management

UNSW SYDNEY · POSTGRADUATE FINANCE · TERM 3, 2026

Full guide + ask Sia about RISK5001

SIDE 1/2 DEFINITIONS · FORMULAS · DECISION RULES · COMPARISONS **EXAM REVISION SHEET** Final Exam **50%** · individual · two hours *[Course data]*

1 · Exam map COURSE DATA · BRIEF

5 | DQ 20% | A 25% | FINAL 50%

COMPONENT	WT	OUTPUT
Tutorial participation + discussion	5%	active, constructive
Discussion questions	20%	8 applied activities
Assignment	25%	case report ≤1,500 words
Final Exam	50%	individual; two hours

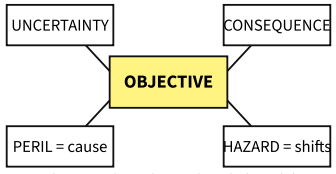
Permitted materials: not confirmed for this offering in the course materials we hold — check the exam instructions on the LMS. *[Brief]*

2 · The answer spine C1 · STRATEGY

USE ON EVERY SCENARIO

```
Objective → uncertainty/loss mechanism → classification → measure (horizon + denominator + units) → treatment → owner → trigger → residual risk.
```

★ ***Risk*** = effect of uncertainty on an objective. Start with the objective; otherwise "risk" becomes a list of generic bad events.



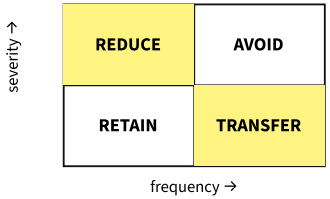
Decision language: the peril causes loss; the hazard changes its frequency or severity. *[C1 fig.1]*

SEPARATE	MEANING	EXAM CONSEQUENCE
Risk / uncertainty	effect on objective / information gap	name objective first
Peril / hazard	loss cause / condition	control the right mechanism
Pure / speculative	loss-or-none / gain possible	insurance fits pure risk more readily
Systemic / specific	broad / idiosyncratic	diversification weak / useful
Static / dynamic	exists without change / arises from change	history is less dependable when conditions shift
Control / financing	changes loss / ensures funds after loss	do not mistake payment for prevention

HIGH-SCORING RISK STATEMENT

"Because **[uncertainty/peril]** can affect **[objective]** through **[consequence]**, **[owner]** should **[control/finance]**, monitor **[indicator]** and reconsider at **[trigger]**; **[residual]** remains." One event may need several statements where service, privacy, regulation and cash flow are different objectives with different owners.

3 · Treatment chooser C1 · C2

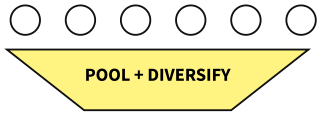


Loss pattern points to a response; feasibility, cost and residual exposure still decide. *[C2 fig.2]*

TOOL	WHAT CHANGES	WHAT REMAINS
Avoid	do not start/stop exposure	lost benefit/opportunity
Reduce	frequency and/or severity	control failure, residual loss
Transfer	specified financial consequence/owner	peril, exclusions, deductible, counterparty
Retain	fund loss internally	volatility + liquidity need

Control changes loss; financing makes funds available. Compare options on the same objective, horizon and boundary; add cost, feasibility, new dependencies and residual risk.

4 · Pooling + insurance C2



more predictable aggregate loss

Many comparable, sufficiently independent exposures stabilise the average—not each outcome. *[C2 fig.1]*

EXPECTED-LOSS BASE

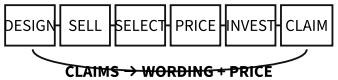
```
E[N] = n × p
E[L] = n × p × severity
Expected-loss contribution = E[L] ÷ n
Premium = expected claims + expenses + contingency + capital/profit loading.
```

POOLING ASSUMPTIONS

TEST	IF WEAK
large enough pool	relative variability stays high
similar/measurable exposures	classification and price distort
sufficient independence	one event hits many; concentration
stable probabilities/severity	history misstates forward loss
defined event/interest/period/amount	claim disputes; uncertain capital

Adverse selection: higher-risk applicants seek/retain more cover when classification is weak. ***Moral hazard***: behaviour changes after protection, raising loss borne by another.

5 · Insurance operations C3



The promise is a loop: errors upstream reappear as selection, complaints, reserves or liquidity pressure. *[C3 fig.1]*

STRUCTURE	CAPITAL / PURPOSE
Mutual	members own; surplus supports members/reserves
Stock	investor equity; shareholders claim result
Government	fundamental risk, compulsion or equity
Lloyd's market	specialist underwriting marketplace

REINSURANCE LAYER

```
Ceded payment = min[max(covered loss - retention, 0), layer limit]
Primary payment = retention + any amount above exhaustion (subject to terms).
```

Reinsurance can expand capacity, reduce capital strain, spread catastrophe exposure and stabilise results. It adds cost, wording/aggregation dependence and counterparty risk.

UNDERWRITING RATIOS

```
Loss ratio = incurred losses ÷ earned premium
Expense ratio = underwriting expense ÷ written premium [course method]
Combined ratio = loss ratio + expense ratio.
```

A combined ratio below 100% indicates underwriting margin for that period before investment/other results. It does **not** prove reserve adequacy, liquidity, asset quality or capital safety. Keep earned and written bases distinct.

RATIO WORSENS	CHECK FIRST	ACTION PATH
Loss	frequency, severity, reserve development, mix, inflation	wording, selection, price, claims, reinsurance
Expense	acquisition/admin cost + denominator	process/channel/scale

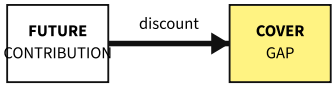
PREMIUM = MEAN + LOADINGS



Pure premium funds expected loss; loading supports operating cost, uncertainty and capital. *[C3 fig.2]*

Invested funds: premiums arrive before many claims. Asset return can support total profitability, but yield-seeking can add market, credit and liquidity risk; persistent underwriting weakness is not safely repaired by volatile investment income.

7 · Life + longevity C4



or: PV needs − available resources

Human-life value begins with lost income; needs analysis begins with obligations and resources. *[C4 fig.1]*

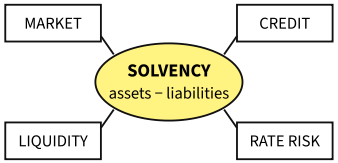
COVERAGE + PRICE

```
Needs cover = PV(identified needs) - available liquid resources - existing usable cover.
PV growing contribution = C₁ × [1 - ((1+g)/(1+r))^n] ÷ (r-g)
One-period net premium = benefit × mortality probability ÷ (1+r), if paid at period end.
```

CHOICE	FIT	TRAP
Term	temporary debt/income horizon	renewal cost and expiry
Permanent	enduring need/estate liquidity/lifelong dependant	complexity, cost, guarantees
Death risk	support ends too soon	under-insurance
Longevity	resources end too soon	survival beyond funding horizon

Use one valuation date; state nominal/real assumptions; do not double-count assets. A net premium is expected claim cost—not the final charged premium.

8 · Financial institutions C5



Different channels hit cash flow, value and ultimately the capital buffer. *[C5 fig.1]*

```
Repricing gap = rate-sensitive assets - rate-sensitive liabilities (within stated horizon)
Approx. Δ net interest income = gap × Δ rate.
```

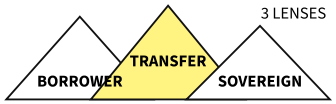
GAP / RATE	INCOME DIRECTION
positive / rates ↑	tends to rise
negative / rates ↑	tends to fall
positive / rates ↓	tends to fall
negative / rates ↓	tends to rise

Liquidity = meet obligations when due without unacceptable cost/loss. ***Solvency*** = economic assets sufficient for liabilities. A solvent institution can still fail when cash is unavailable; forced sale discounts can convert timing pressure into capital loss.

9 · Governance + country C6

ROLE	ACCOUNTABILITY
Board	oversight; approve appetite and major decisions
Business	owns risks and first controls created by its decisions
Risk function	framework, analytics and independent challenge
Internal audit	independent assurance; does not own risk

Appetite = broad amount/type willingly pursued or retained. ***Tolerance/limit*** = measurable boundary with owner, data, frequency, escalation and breach action. Exceptions need authority, maximum exposure, expiry, compensating controls and active renewal.



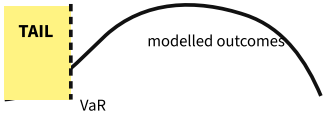
A willing, sound borrower can still miss payment through currency scarcity, transfer restriction or sovereign stress. *[C6 fig.2]*

```
Debt-service ratio = external interest + principal payments ÷ export earnings.
```

Monitor reserves, external debt, exchange-rate pressure, fiscal capacity, political disruption and payment restrictions. A ratio is evidence, not a complete country decision.

Portfolio test: aggregate common geography, currency, supplier, industry and scenario. Standalone-limit compliance can coexist with excess correlated exposure.

10 · VaR + credit loss C7



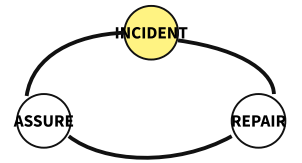
VaR marks a quantile; the tail remains and needs stress, limits and capital. *[C7 fig.1]*

Always attach currency + holding period + confidence + portfolio boundary + modelling assumptions. A one-day 95% VaR of $2m means modelled losses exceed $2m on about 5% of trading days under stated conditions—not that $2m is the maximum.

```
Expected exceptions ≈ observations × (1 - confidence). Back-test count, clustering, magnitude and cause.
LGD = 1 - recovery rate
Expected credit loss = PD × LGD × EAD.
```

Expected loss is a modelled mean for pricing, allowance and planning. Unexpected variation, default dependence and concentration call for limits, stress and economic capital. Keep PD, LGD and EAD on the same horizon/facility basis.

11 · Operational controls C8



Record impact → find root cause → remediate → test operation → update assessment and residual ownership. *[C8 fig.1]*

CONTROL	JOB	EVIDENCE
Preventive	stop error/event before consequence	configuration, approval, validation
Detective	find event/failure promptly	alert, reconciliation, exception log
Corrective	restore service/repair impact	recovery test, verified fix

Separate **event**, **impact**, **root cause** and **control gap**; "human error" is rarely deep enough. Design asks whether a control could achieve its objective; operation asks whether it ran consistently with reliable inputs and follow-up.

Near miss: chance prevented full loss. ***KRI***: timely indicator tied to mechanism, owner, threshold and response. A supplier contract does not remove the organisation's accountability.

CLOSURE TEST ***Implemented action + enough cycles + sampled evidence + exceptions followed up + authorised challenge + updated residual risk. A closed ticket is not proof.***

12 · Regulation + capital C9



Minimum capital, supervisory review and disclosure address different limits. *[C9 fig.1]*

```
RWA = Σ(exposure_i × risk weight_i)
Capital ratio = eligible capital ÷ RWA
Headroom = actual/forecast ratio - applicable threshold.
```

Build the weighted denominator before dividing. Then compare with the relevant minimum, internal target and trigger; name the exposure/capital change that consumes headroom and a feasible action.

LAYER	WHAT IT ADDS
Minimum	point-in-time quantitative constraint
Buffer/trigger	room and early escalation before breach
ICAAP	full risk profile, strategy, projections and board-approved plan
Stress	severe plausible loss path + timing + second-order effects

RISK5001

Worked drills · judgement cards · traps

ANSWER PATH: SET UP → CALCULATE/CLASSIFY → INTERPRET → DECIDE

Full guide + ask Sia about RISK5001

SIDE 2/2 — 5 WORKED MINI-EXAMPLES · IF X → DO Y · CLASSIC TRAPS · EXAM-MORNING PLAN — SELF-TEST SIDE — Cover answers · show units · finish with a decision

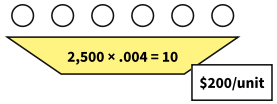
W1 · Pool price

C2 WORKED

Given: 2,500 similar units; claim probability 0.4%; loss $50,000 each.

ANSWER PATH

```
1. E[N] = 2,500 × 0.004 = 10 claims.
2. E[L] = 10 × $50,000 = $500,000.
3. Per unit = $500,000 ÷ 2,500 = $200 before loadings.
```



Expected count is a long-run mean; it need not be an integer in a smaller pool.

Interpret: this is the expected claim base, not a charged premium and not an exact annual forecast. Add expenses, contingency and capital/profit; challenge independence, homogeneity and stability.

ASSUMPTION CHALLENGE	DIRECTION / RESPONSE
positive loss dependence	aggregate volatility stays high; add catastrophe scenarios, geographic spread, limits, capital/reinsurance
probability is changing	historical mean is stale; use prospective judgement and monitoring
event/amount ambiguous	claim verification and pricing weaken; define trigger, interest, period and limit

Insurance decision: compare loaded premium with the mean, a severe plausible outcome and available liquidity. A low mean does not make transfer irrational when one loss can defeat the objective.

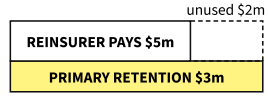
TRAP *0.4% = 0.004, not 0.4. Keep count, aggregate dollars and per-unit dollars on separate lines.*

W2 · Excess layer

C3 WORKED

Given: insurer retains first $3m; buys $7m above; covered claim $8m.

```
Insurer = $3m retention.
Above retention = $8m - $3m = $5m.
Reinsurer = min($5m,$7m) = $5m.
Check: $3m + $5m = $8m; layer not exhausted.
```



Subtract attachment first; then cap the ceded payment at the layer limit.

LAYER CHECKLIST

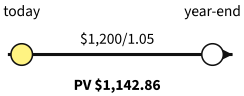
W3 · Net life premium

C4 WORKED

Given: one-year benefit $750,000 paid at year-end; death probability 0.16%; discount rate 5%.

EXPECTED THEN DISCOUNT

```
Expected claim = $750,000 × 0.0016 = $1,200.
PV = $1,200 ÷ 1.05 = $1,142.86 before loadings.
```



Discount only because the expected payment is at period end.

Interpret: expected claim cost under stated mortality and timing assumptions. Gross premium also funds acquisition, administration, contingency, capital and other costs.

COVERAGE BEFORE PRODUCT

BUILD THE GAP	CHECK
immediate costs + debt	timing and liquidity at death
future support less usable resources	discount/growth basis, duration, availability; no double count
remaining cover gap	temporary → term; enduring need may fit permanent cover

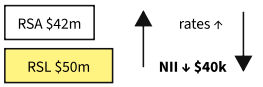
TRAP *0.16% = 0.0016. Do not present the net premium as the customer's final premium.*

W4 · Repricing gap

C5 WORKED

Given: rate-sensitive assets $42m; liabilities $50m; rates rise 0.5 percentage points.

```
Gap = $42m - $50m = -$8m.
Δr = 0.5% = 0.005.
ΔNII ≈ -$8m × 0.005 = -$40,000.
More liabilities reprice: margin tends to fall.
```



State the sign and direction before multiplying; the number alone is half an answer.

Assumptions: stated horizon, balances fixed, simplified parallel move, similar timing/pass-through and no material optionality.

DO NOT CONFUSE THE LENSES

LENS	QUESTION	EVIDENCE
Gap	near-term income after repricing?	rate-sensitive balances by interval

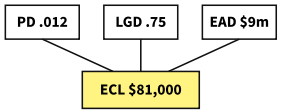
W5 · Expected credit loss

C7 WORKED

Given: EAD $9m; one-year PD 1.2%; recovery 25%.

COMPLEMENT BEFORE PRODUCT

```
LGD = 1 - 25% = 75%.
ECL = 0.012 × 0.75 × $9,000,000 = $81,000.
```



Expected loss supports price/allowance; the tail, dependence and concentration require capital and limits.

Interpret: portfolio/repeated-period mean, not the certain loss on this facility and not a maximum. Challenge future drawings, collateral value, recovery cost/timing and common default drivers.

INPUT RISES	ECL EFFECT	MANAGEMENT QUESTION
PD	linear increase, all else fixed	rating migration, approval and price?
recovery	LGD and ECL fall	is collateral value liquid in default?
EAD	linear increase	future drawings/market movement included?
dependence	mean product may not show tail	concentration limit, stress and capital?

TRAP *Recovery and LGD move in opposite directions. Write LGD = 1 − recovery before entering the formula.*

13 · Fast arithmetic

C3 · C6 · C7 · C9

PROMPT	WORKING	ANSWER + MEANING
Losses $7.2m / earned $12m; expense $3m / written $12.5m	7.2/12; 3/12.5	60%; 24%; combined **84%**, underwriting margin before other results
Debt service $1.8bn; exports $7.2bn	1.8/7.2	**25%**; add reserves, policy, currency and political evidence
250 days; 99% VaR	250×(1−.99)	**2.5 expected exceptions**; one alone ≠ failure

VAR BACK-TEST JUDGEMENT

14 · Classic traps

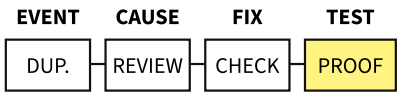
C1–C9 FAQ

IF YOU WRITE...	WHY WRONG	REPAIR
"hazard = outage"	outage is peril/event	hazard is overdue maintenance/redundancy weakness
"insurance removes risk"	physical peril and contractual residuals remain	name transferred consequence + exclusions/deductible
"large pool always diversifies"	dependence/concentration defeats scale	test similarity, independence and stability
"combined ratio proves safety"	omits reserves, assets, liquidity, capital	state period/bases; add balance-sheet checks
"VaR is maximum loss"	tail beyond quantile remains	state horizon/confidence/model; stress tail
"ECL uses recovery"	formula needs loss severity	LGD = 1 − recovery
"solvent means liquid"	value ≠ cash timing	test dated cash flows and stressed sale values
"business shares ownership with risk"	challenge is not ownership	business owns; risk challenges; audit assures
"control action closed"	completion date ≠ operation	test evidence over enough cycles
"capital / total assets"	wrong denominator for risk-based ratio	weight exposures, sum RWA, then divide

15 · Incident judgement

C8 WORKED

Scenario: duplicate payment passes because production folders have similar names and review is not independent.



ASSESS → OWNER → RESIDUAL

Symptom → underlying mechanism → control objective → operating evidence.

- **Record:** payment plus customer, financial and process impact; include near misses.
- **Causes:** environment design and non-independent review—not merely "human error".
- **Controls:** separate environments, file validation, independent approval.
- **Close:** sample evidence, investigate exceptions, update residual exposure.

DESIGN TEST	OPERATING TEST
Would the control, if performed, address the identified cause or consequence?	Did the right person run it, at the required frequency, with reliable inputs?
Does its objective and population cover the failure?	Were exceptions followed up over enough cycles for assurance?

16 · Method chooser

TOPIC MAPS · FAQ

IF YOU SEE...	DO THIS	FINISH WITH...
uncertain bad event	objective → peril/hazard → classification	treatment + residual owner
many similar exposures	n×p×severity; test dependence	base cost vs loaded premium
frequency/severity facts	place on treatment matrix	control/finance mix
retention + layer	subtract attachment; cap at limit	allocated total + contract risks
loss/expense data	preserve earned/written denominators	underwriting vs balance-sheet view
future life cash flows	align timing; discount; subtract resources	need horizon/product fit
rate-sensitive balance sheet	gap × decimal rate move	sign, horizon and assumptions
cross-border borrower	borrower + transfer + sovereign layers	limit, indicator, trigger
loss threshold	label VaR horizon/confidence/boundary	tail + back-test/stress
PD/recovery/exposure	LGD=1−recovery; multiply decimals	mean vs unexpected loss
incident/control	event/impact/cause/gap/action/evidence	verified closure + residual
exposure weights/capital	Σ exposure×weight; capital/RWA	target, headroom, trigger, stress

17 · Judgement cards

C2 · C5 · C6 · C9

IF DEPENDENCE RISES →

Pool less confidently; aggregate common event/geography/supplier; add scenarios, limits, capital and possibly reinsurance. More observations do not cure common-cause loss.

IF LIQUIDITY PRESSURE APPEARS →

Build dated inflows/outflows, collateral calls and facilities; value assets at stressed monetisation prices; trace forced sales into earnings/capital. Do not infer cash from eventual collection.

IF A LIMIT IS NOT BREACHED BUT EVIDENCE SHIFTS →

Escalate when assumptions/data/structure weaken the measure: clustered exceptions, rating migration, unusual drawings, falling collateral or concealed concentration. Name the decision that cannot wait.

IF A STRESS ACTION IS PROPOSED →

Test approval time, execution capacity, liquidity, market access and signalling in the same scenario. If headroom disappears before execution, revise starting buffer, growth or limits.

IF INSURANCE LOOKS "TOO EXPENSIVE" →

Compare premium with expected loss *and* solvency/liquidity impact of a severe event. A loading can be rational when untransferred loss threatens an essential objective.

TRAP *A standalone limit can be met while correlated exposure is excessive. Aggregate common geography, currency, supplier, industry and scenario; then state owner, trigger and action.*

18 · Exam-morning plan

STUDY STRATEGY · BRIEF

GOAL | CLASS | CALC | READ | ACT

units · horizon · base · residual

The course's repeated decision process: diagnose, measure, interpret, govern.

BEFORE STARTING

1. Recall the five formula families: pool; ratios/layers; PV; gap; VaR/ECL/RWA.
2. Recite four boundaries: peril/hazard; control/financing; liquidity/solvency; expected/unexpected loss.
3. Check current LMS instructions and confirmed arrangements.

FOR EVERY QUANTITATIVE PART

1. Write the formula in words/symbols; convert percentages to decimals.
2. Show substitutions with currency/time units; preserve the required denominator.
3. Sense-check sign, order of magnitude and allocation total.
4. Interpret as mean/threshold/ratio—not as certainty—and name the decision.

FOR EVERY JUDGEMENT PART

1. Name objective and loss mechanism; select only classifications that change the answer.
2. Compare options on consistent boundary/horizon; state trade-off and new dependency.
3. Assign owner, monitoring indicator, threshold/escalation and residual risk.

LAST FORMULA SWEEP

METHOD	FORMULA / BOUNDARY
Pool	n × p × severity; per unit = aggregate ÷ n; loading comes after mean
Layer	min[max(loss−retention,0), limit]; allocated parts must equal claim
Ratios	losses/earned; expenses/written; state course denominator convention
Life price	benefit × mortality probability; discount only for payment timing
Gap	RSA−RSL; multiply by decimal rate change; state sign/direction
VaR	expected exceptions = observations×(1−confidence); threshold ≠ maximum
Credit	PD×(1−recovery)×EAD; expected mean ≠ unexpected tail
Capital	Σ exposure×weight; eligible capital/RWA; compare with target/trigger

19 · 60-second recall

C1–C9

PROMPT	SAY ALOUD
Risk	effect of uncertainty on an objective

Forward this to your tutorial group

SHARED BY _____