ECON1202 Quantitative Analysis

UNSW SYDNEY · ECONOMICS · LEVEL 1 · TERM 3 2026

Full guide + ask Sia about ECON1202

SIDE 1/2 DEFINITIONS · FORMULAS · DECISION RULES · CHECKS — **EXAM REVISION SHEET** — **Final Exam 60%** · priorities before chapter order

Quizzes 10% | In-session Tests 20% | Project (Excel Assignment) 10% | Final Exam 60%

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

Source: course.json + BRIEF · 2026-10-25

1 · Cash-flow Clock

CH 1 · FINAL PRIORITY

★ Before calculating, name focal date, rate period and number of those periods. Positive rate + forward time raises value; discounting lowers it. For q nominal compounded k times yearly, r=q/k and n=yk.

SINGLE CASH FLOW

$S=P(1+r)^n$ · $P=S(1+r)^{-n}$

continuous: $S=Pe^{it}$ · unknown n=ln(S/P)/ln(1+r)

EFFECTIVE ANNUAL COMPARISON

$EAR=(1+q/k)^k-1$. Compare offers only on a common horizon; multi-stage value = P × product of each stage factor.

quote q, k years y → r=q/k n=yk → factor $(1+r)^n$

Match rate and clock. Period rate and exponent must use the same interval.

IF ASKED	MOVE	CLOSE WITH
Future value	multiply	S>P if r>0
Present value	divide	P<S if r>0
Target time	logs	test adjacent complete periods
Rate quote	one-year factor	rank EARs

TRANSLATION AUDIT

GIVEN PHRASE	WRITE BEFORE KEYS
nominal annual q, monthly	r=q/12; n=12×years
effective annual	one yearly factor 1+r
continuous annual j	time t stays in years
rate changes part-way	one factor per regime; multiply

For unknown n, logs give the crossing time; if crediting uses complete periods, verify both neighbouring integers. Across rate changes, multiply separate stage factors rather than averaging rates.

2 · NPV & IRR

CH 2 · DECISION

SIGNED VALUATION

$NPV=F_0+F_1/(1+r)+\cdots+F_T/(1+r)^T$

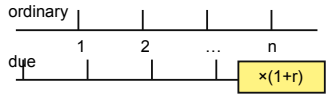
IRR is r solving NPV=0; required return is the external benchmark.

RESULT	DECISION / WARNING
NPV>0	accept at stated required return
NPV<0	reject at stated required return
unusual sign changes	IRR may have several or no meaningful roots

EQUATION-OF-VALUE METHOD

3 · Annuity Recognition

CH 3 · TIMING



First payment decides. End of period = ordinary; immediate = due.

ORDINARY ANNUITY

$PV=R[1-(1+r)^{-n}]/r$

$FV=R[(1+r)^n-1]/r$

TIMING VARIANTS

due value=(1+r)×ordinary value

loan $R=A\cdot r/[1-(1+r)^{-n}]$ · perpetuity PV=R/r

STREAM	RECOGNITION	CHECK
ordinary	equal end payments	first at 1
due	equal start payments	first at 0
loan	principal now; instalments later	PV of payments=A
mixed	lump sum + stream	value separately, then join

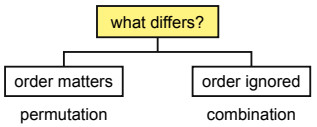
Never combine at different dates. Rate interval must match payment interval; n counts payments, not merely calendar labels.

Method: mark time 0, first and last payments and the valuation date; confirm equal amount, spacing and finite count; choose PV or FV from the requested date. Explain a due shift and decompose mixed streams.

DIRECTION CHECK	EXPECTED RELATION
saving, r>0	final balance exceeds total contributions
loan, r>0	total instalments exceed principal
due vs ordinary, same focal date	due value is larger by factor 1+r
present value of future payments	below their undiscounted total

4 · Counting Chooser

CH 4 · STRUCTURE



Classify first. Then decide repetition and restrictions.

CORE COUNTS

${}^nP_r=n!/(n-r)!$ · ${}^nC_r=n!/[r!(n-r)!]$

non-negative $x_1+\cdots+x_k=n$: C(n+k-1,k-1)

circle with rotations identical: (n-1)!

5 · Conditional Probability

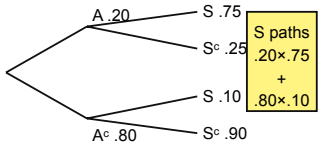
CH 5 · BAYES

DENOMINATOR CHANGES

$P(A|B)=P(A\cap B)/P(B)$, $P(B)>0$

$P(A\cap B)=P(A)P(B|A)$

independence: $P(A\cap B)=P(A)P(B)$



Bayes is path accounting. Multiply down, add evidence paths, divide target path by evidence total.

BAYES REVERSAL

$P(A|S)=P(A)P(S|A)\ /\ [P(A)P(S|A)+P(A^c)P(S|A^c)]$

TASK	VISIBLE WORKING	CHECK
conditional	intersection / conditioned event	denominator is restricted set
tree	multiply path; add endpoints	siblings sum to 1
Bayes	all evidence routes below	posterior direction fits evidence
independence	test equality numerically	not the same as disjoint

Tree discipline: label events and complements; multiply down, add endpoints; for Bayes divide the target path by all evidence paths.

TOTAL PROBABILITY

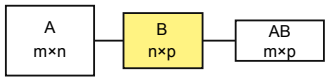
$P(S)=P(A)P(S|A)+P(A^c)P(S|A^c)$

Disjoint positive-probability events are not independent. Compare a posterior with its prior: evidence more likely under A should raise P(A).

BOUND CHECK	REQUIREMENT
branch split	children sum to 1
terminal / posterior	between 0 and 1
weighted mixture	between component rates
independence	conditional equals marginal

6 · Matrix Products

CH 6 · DIMENSIONS



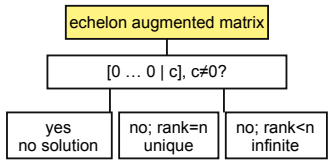
inner match; outer survive

Dimensions explain the product. Each entry is a row–column dot product.

7 · Eliminate, Then Classify

CH 7 · SYSTEMS

Legal row operations: swap rows; multiply a row by a non-zero constant; replace a row by itself plus a multiple of another. Apply each operation across the augmentation bar.



Consistency first. A zero row is harmless unless its augmented entry is non-zero.

ECHELON EVIDENCE	CONCLUSION	CLOSE
contradiction row	no solution	stop
consistent, rank=unknowns	unique	back-substitute
consistent, rank<unknowns	infinitely many	parameterise free variables

Sequence: declare variable order; build [A|b]; choose a non-zero pivot or swap; clear below; move right and down to a staircase; then scan bottom-up for contradiction before counting pivots.

Echelon form: pivots move right, entries below them are zero, and zero rows sit last. Rank is the pivot count; free variables follow only after consistency.

Audit: operations reach the constant; zero pivots trigger a search; only [0…0|c≠0] contradicts; every free column receives a parameter.

For applied systems, add non-negativity, integrality or capacity restrictions *after* the algebraic family. Verify in every original equation.

8 · Determinant & Inverse

CH 8 · SQUARE ONLY

2×2 INVERSE

$A=[a\ b;\ c\ d]$, $\det(A)=ad-bc$

$A^{-1}=(1/(ad-bc))[d\ -b;\ -c\ a]$, only if $\det(A)\neq 0$

ROW ACTION	EFFECT ON DET
replace R_i by R_i+kR_j	unchanged
swap two rows	sign flips
scale row by k	det scales by k
triangular form U	product of diagonal, after ledger

Square A: rank n ⇔ det(A)≠0 ⇔ A^{-1} exists ⇔ Ax=b has one solution for every b. A zero pivot calls for a swap; singularity requires a missing pivot.

CHOOSE THE CHEAPEST ROUTE

9 · Eigenpairs

CH 9 · TWO STAGES

REASONING CHAIN

$Av=\lambda v$, $v\neq 0 \Rightarrow (A-\lambda I)v=0$

non-zero v requires $\det(A-\lambda I)=0$

Solve the scalar characteristic equation first. For each λ, solve the homogeneous system and choose a non-zero representative. Every non-zero scalar multiple is the same eigendirection.

SHORTCUT / CHECK	USE
triangular A	eigenvalues are diagonal entries
2×2 roots	sum=trace(A); product=det(A)
candidate pair	compare Av with λv componentwise
repeated λ	solve null space; do not infer directions from multiplicity

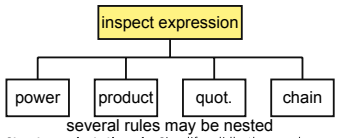
Workflow: form A−λI; solve det(A−λI)=0; for each root solve the homogeneous system; choose a non-zero representative; verify Av=λv. Preserve diagonal signs and keep roots separate.

Λ	ACTION ALONG EIGENLINE
λ>1	stretch, same direction
0<λ<1	shrink, same direction
λ<0	reverse direction and scale
λ=0	map that non-zero vector to zero

The zero vector is never an eigenvector; non-zero scalar multiples represent the same direction.

10 · Differentiate by Structure

CH 10 · RULE CHOICE



Structure selects the rule. Simplify validly, then mark moving factors and inner functions.

RULES TO PRINT

$(fg)'=f'g+fg'$

$(f/g)'=(f'g-g'f)/g^2$, $g\neq 0$

$d[f(g(x))]/dx=f'(g(x))g'(x)$

BASIC DERIVATIVES

$d(x^n)/dx=nx^{n-1}$ · $d(e^g)/dx=e^g g'$

$d(\ln g)/dx=g'/g$, with g>0 in the real logarithm used here

POINT ELASTICITY

$\eta=(p/q)(dq/dp)$. It is unit-free; sign gives direction, $|\eta|$ gives local responsiveness at the stated point.

FAILURE SIGNAL	REPAIR
product derivative has one term	differentiate each factor in turn

ANSWER PATH

11 · Integrate & Model Growth

CH 11 · VERIFY TWICE

ANTIDERIVATIVES

$\int x^n dx=x^{n+1}/(n+1)+C$, $n\neq -1$

$\int 1/x\ dx=\ln|x|+C$

$\int e^{ax}dx=e^{ax}/a+C$, $a\neq 0$

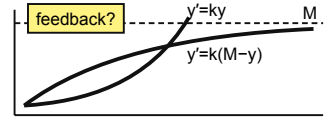
$\int_a^b f(x)dx=F(b)-F(a)$

QUESTION	MUST SHOW	CHECK
indefinite	family + C	differentiate
definite	F(b)−F(a), bracket lower value	sign + accumulated units
total area	split at zeros if needed	add magnitudes

DIFFERENTIAL EQUATIONS

$dy/dt=ky \Rightarrow y=y_0e^{kt}$

$dy/dt=k(M-y) \Rightarrow y=M-(M-y_0)e^{-kt}$



Different feedback, different shape. Current stock accelerates; the remaining gap shrinks toward M.

Verify twice: substitute t=0 to recover y_0; differentiate to recover the rate law. With k>0, limited growth approaches M rather than reaching it in finite time.

MODEL CUE	CONSTANT / UNITS	BEHAVIOUR
rate proportional to level	k has reciprocal-time units	percentage pattern
rate proportional to M−y	$M-y_0$ sets initial gap	slows near capacity
proposed solution	same time unit in kt	check initial + derivative

12 · Optimisation

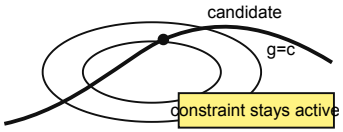
CH 12 · CLASSIFY

UNCONSTRAINED

solve $f_x=0$ and $f_y=0$.

$D_1=f_{xx}$; $D_2=f_{xx}f_{yy}-f_{xy}^2$

D_2	D_1	LOCAL CLASS
>0	<0	maximum
>0	>0	minimum
<0	any	saddle
=0	any	test inconclusive



Constraint and contour meet. Lagrange conditions locate candidates while enforcing feasibility.

ECON1202 Quantitative Analysis

UNSW SYDNEY · WORKED DRILLS · TRAPS · EXAM-MORNING PLAN

Full guide + ask Sia about ECON1202

SIDE 2/2 FIVE WORKED DRILLS · IF-X-THEN-Y CARDS · CLASSIC TRAPS · EXAM-MORNING PLAN

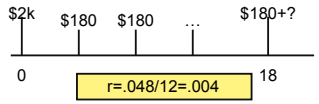
SELF-TEST, THEN COVER ANSWERS

Keep intermediate values unrounded

13 · Drill 1: Mixed Account

COURSE WORKED EXAMPLE

Q. Start with $2,000; deposit $180 at each month end for 18 months; 4.8% nominal compounded monthly. Balance immediately after the final deposit?



One focal date. Accumulate the lump sum and ordinary stream separately.

1. r=0.048/12=**0.004**; n=18 monthly periods.
2. Lump sum: 2000(1.004)^{18}=**$2,149.00**.
3. Annuity: 180[(1.004)^{18}−1]/0.004=**$3,352.55**.
4. Same date: 2,149.00+3,352.55= $5,501.55 .

SELF-CHECK	EVIDENCE
timing	month-end deposits → ordinary
scale	result exceeds $2,000+18($180)
rounding	retain factors until cents

14 · Finance Judgement Deck

CH 1–3 SELF-TEST

date + sign every flow → move to one focal date → NPV / IRR compare

Decision sequence. The final sign matters only after all dated amounts share a valuation basis.

IF YOU SEE	WRITE FIRST	CLOSE WITH
nominal compounded k times	r=q/k; n=yk	rate and count share a clock
unknown time	isolate factor; take logs	test neighbouring complete periods
rate comparison	one-year growth factors	rank effective returns
changing rates	separate stage factors	multiply; never average
unequal dated receipts	one discounted term per flow	rebuild the timeline

NPV VERSUS IRR

NPV ASKS	IRR ASKS
value left at a chosen required return	which rate makes NPV zero
benchmark is an input	rate comes from the cash-flow stream
sign supplies the stated decision	compare admissible root with benchmark

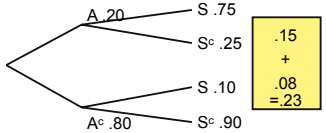
Cover the right column and recite the move. Payment-plan totals cannot be compared before timing is adjusted. A positive future receipt discounts below its nominal amount when r>0. Unusual sign patterns can create multiple or missing meaningful IRRs, so the defining equation and a root screen remain visible.

ANNUITY BOUNDARY

15 · Drill 2: Bayes

CH 5 WORKED

Q. 20% of items come from A. Signal rates: 75% for A, 10% otherwise. Find P(A|signal).



Circle the observed endpoints. Their sum is the denominator.

1. Target joint path: 0.20×0.75=**0.15**.
2. All signal paths: 0.15+0.80×0.10=**0.23**.
3. P(A|S)=0.15/0.23= 0.6522 = 65.22% .
4. Direction: signal lifts the 20% prior because it is more likely under A.

IF YOU SEE	DO
"given B"	restrict denominator to B
reverse conditioning	draw causes → evidence
"independent?"	test joint = product; do not guess
weighted mixture	check it lies between component rates

COVER-AND-RECITE CHECKS

PROMPT	REQUIRED SENTENCE
P(A|B)	"among B cases, what share also lie in A?"
P(A∩B)	"reach A, then follow the B branch"
P(B)	"add every mutually exclusive route ending in B"
P(A|B) by Bayes	"target A-and-B path divided by all B paths"

Write event labels beside every decimal. The probability on a second-stage branch is conditional on its parent. Sibling branches leaving one node sum to 1; terminal path weights need not. A posterior must stay in [0,1], and its movement away from the prior should match which cause makes the evidence more likely.

Independence test: compare P(A∩B) with P(A)P(B), or P(B|A) with P(B). Equal conditional shares support independence even when group sizes differ. Disjoint positive-probability events are dependent because observing one makes the other impossible.

16 · Counting Micro-test

CH 4 METHOD

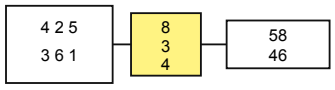
Named jobs, ranks and positions make order matter; a committee depends only on membership. Use the swap test before any factorial.

STRUCTURE	ENGINE	WHY
sequential slots	multiply stage counts	one choice from every stage
ordered selection	^nP_r	swapping creates a new outcome
unordered subset	^nC_r	internal orders are duplicates

17 · Drill 3: Matrix Meaning

CH 6 WORKED

Q. Quantity rows [4,2,5], [3,6,1]; price vector [8,3,4]^T. Find each store total.



(2×3)(3×1) → 2×1

Rows survive. Each store row meets the common price column.

1. Dimensions: (2×3)(3×1) ⇒ 2×1.
2. Store 1: 4(8)+2(3)+5(4)=**58**.
3. Store 2: 3(8)+6(3)+1(4)=**46**.
4. Answer: [$58,$46]^T, in original store order.

JUDGEMENT	REASON
AB exists?	inner dimensions match
BA too?	recheck; never infer from AB
entry (i,j)	row i · column j only
applied output	restore row labels and units

MATRIX ERROR AUDIT

CLAIM	TEST BEFORE ACCEPTING
sum A + B	same dimensions; entrywise operation
product AB	A columns = B rows; inner labels align
rearranged product	only parentheses moved, never factor order
transposed product	order reversed: (AB)^T=B^{T}A^T
system Ax=b	unknown order fixed; zero coefficients retained

Dimensions alone do not guarantee meaning: inner category labels must align. Expand one dot product and restore units.

18 · Drill 4: Inverse

CH 8 WORKED

A=[3 1;1 2], b=[10,8]^T. det(A)=3(2)−1(1)=**5**, so A^{-1}=(1/5)[2 −1;−1 3].

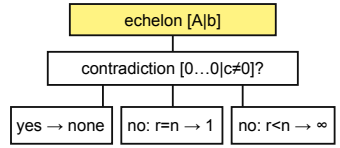
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x=A^-1b=(1/5)[20-8; -10+24]=
[2.4,2.8]^T
```

Verify: 3(2.4)+2.8=10; 2.4+2(2.8)=8. The check returns the original b.

INVERSE CHECKPOINT	EVIDENCE
shape	A is square

18b · Row-Reduction Judgement

CH 7 METHOD

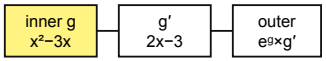


Read bottom-up. Consistency comes before pivot count and parameterisation.

19 · Drill 5: Chain Rule

CH 10 WORKED

Q. f(x)=e^(x²−3x). Find f′ and f′(2).



outer derivative × inner derivative

Expose the inner function. Its derivative must survive as a factor.

1. g=x²−3x, so g′=2x−3.
2. f′(x)=(2x−3)e^(x²−3x).
3. At x=2: (4−3)e^(4−6)=e^{-2}= 0.1353 approximately.

IF YOU SEE	DO	AUDIT
u·v	u′v+uv′	two contributions
u/v	(u′v−v′u)/v²	sign + domain
outer(inner)	outer′ × inner′	inner factor present
elasticity	(p/q)dq/dp	same point; unit-free

DERIVATIVE ANSWER AUDIT

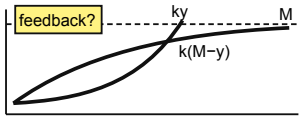
Preserve the domain; label the expression parts; write the symbolic rule; differentiate generally; evaluate last and attach units or elasticity meaning.

Products need both contributions; quotients preserve numerator-prime × denominator minus denominator-prime × numerator; chains retain the inner derivative.

QUANTITY	INTERPRETATION	CHECK
f′(x)	local output change per input unit	nearby secant has similar sign/size
η=(p/q)dq/dp	local proportional response	unit-free; same evaluation point
downward demand	quantity falls as price rises	η usually negative

20 · Growth Judgement Card

CH 11



Read the right-hand side. Current stock accelerates; remaining gap slows near M.

RATE LAW	SOLUTION CUE	LONG RUN
y′=ky	y_0e^{kt}	growth if k>0; decay if k<0
y′=k(M−y)	M−(M−y_0)e^{-kt}	approaches M if k>0

INTEGRATION SELF-TEST

PROMPT	ANSWER MUST CONTAIN	FAST CHECK
indefinite integral	antiderivative family + C	differentiate it
definite net accumulation	F(b)−F(a), lower value bracketed	sign follows net area
geometric total area	split where sign changes	add positive magnitudes

DIFFERENTIAL-EQUATION VERIFICATION

21 · Classic Traps

ALL CHAPTERS

TRAP	WHAT FAILED	REPAIR
annual q with monthly n	clocks differ	r=q/12 and count months
ordinary treated as due	first date hidden	draw payment at 0 or 1
P(A|B)=P(B|A)	denominator reversed	name event after bar
combination for named jobs	order discarded	swap test
AB changed to BA	factor order lost	write dimensions + labels
zero row ⇒ no solution	constant ignored	look for [0… 0|c≠0]
det=0 ⇒ no solution	consistency unknown	reduce augmented matrix
v=0 reported	eigen definition broken	choose non-zero vector
stationary ⇒ maximum	no classification	D_2 test + boundaries
∫ without C	family omitted	add C if indefinite

square: rank n ⇔ det≠0 ⇔ inverse ⇔ unique Ax=b for every b

rank<n ⇔ det=0 ⇔ singular none vs infinite needs consistency

Do not skip the boundary. Singularity alone does not choose between none and infinitely many solutions.

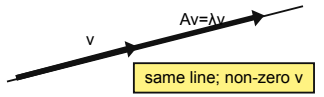
Convert every trap into a check: one clock; correct conditional denominator; dimensions plus labels; consistency before rank; differentiation or substitution back; feasibility plus classification. Record the first incorrect line and the check that would have caught it.

DETERMINANT LEDGER

DURING ELIMINATION	REMEMBER
row replacement	det unchanged
one row swap	det sign flips
row scaled by k	det scaled by k
triangular finish	diagonal product belongs to transformed matrix until ledger reversed

22 · Eigenpair Audit

CH 9



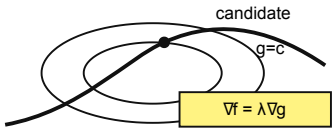
Fast check. Compute Av and λv separately; equality verifies scale and direction together.

λ SIGN / SIZE	GEOMETRIC MEANING
λ>1	same direction, stretch
0<λ<1	same direction, shrink
λ<0	reverse along the same line
λ=0	maps eigenvector to zero

23 · Method Chooser

FAST RECALL

PROMPT SIGNAL	FIRST MOVE	FINAL CHECK
dated money	draw focal date; match r,n	direction + scale
equal payments	locate first payment	ordinary/due shift
ordered / selected	swap test; repetition?	integer + bound
given / posterior	define events; tree	bounds + evidence direction
matrix product	write dimensions + labels	outer size + units
linear system	augment; row-reduce	consistency before rank
inverse / det	confirm square	AA^{-1}=I or Ax=b
eigenpair	characteristic equation	Av=λv, v≠0
derivative	inspect expression tree	domain + nearby slope
accumulation	antiderivative; bounds?	differentiate
growth law	current stock or gap?	initial value + derivative
optimum	FOCs; list candidates	classification + feasibility



Constraint stays visible. Solve all Lagrange conditions, then recheck feasibility and compare values.

24 · Exam-Morning Plan

COURSE STRATEGY

1. **Recite the decision boundaries:** ordinary/due; permutation/combination; conditional/reversed; AB/BA; redundant/contradictory; stationary/classified.
2. **Warm up once per family:** one timing translation, one Bayes denominator, one dot product, one row classification, one chain rule, one Hessian branch.
3. **Use a four-line answer path:** define structure → formula/rule → substitution → interpretation + check.
4. **Keep precision:** retain intermediate calculator values; round only at the requested final precision.
5. **Run the audit:** direction, probability bounds, dimensions, original equations, derivative, initial condition or constraint.
6. **Check current instructions:** duration, sections, date, calculator/tool conditions and permitted materials on the LMS.

FOUR-BOX ERROR LEDGER

BOX	QUESTION AFTER EACH PRACTICE ITEM
model choice	Did timing, event, dimension or constraint select the right method?