

Artificial Intelligence for Corporate Finance

AI-Augmented Excel I: Reading and Improving a Financial Model

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Structure of the course

- **Email:** amedeo.andriollo@dauphine.psl.eu
- **Assessment:** 150-minute final in-class examination.
- **Office hours:** feel free to (DO) come: B612.
- Slides/materials are updated regularly. Report mistakes: corrections help the whole class.
- **This session:** the financial model as an **auditable system**:
 - ↪ Excel formula + model risk with AI-assisted inspection, diagnosis and *controlled* editing.
- **Built on:** Rosenbaum & Pearl, *Investment Banking*; Koller, Goedhart & Wessels, *Valuation*.

Session 2: the spreadsheet arrives

Professional question

Before our team forecasts/values TargetCo,
can we rely on the historical Excel model?

Session	What we receive	What we do
1	Target company profile	Understand the business, identify tensions and formulate diligence questions.
2	Associate's workbook	Decode it, test it, classify issues, make controlled corrections and document the result.
3	Valuation materials	Build comparables and a simplified DCF; reconcile the valuation.
4	Excel valuation benchmark	Reproduce, test and extend the analysis transparently in Python.

Session question: how do I understand, audit and safely modify an Excel model with AI?

Deliverables: an auditable historical workbook, a prioritised issue register, two visible EBITDA treatments where judgement remains open, and a completed 06_Audit_Log.

Refresh (1/3): from revenue to NOPAT

Quantity	Economic meaning	TargetCo construction
Revenue	Sales generated by the operating business.	Supplied.
EBITDA	Operating earnings before D&A, financing costs and tax.	Supplied.
D&A	Current-period accounting charge for previously capitalised tangible and intangible investment.	Supplied.
EBIT	Operating profit after D&A.	$EBIT = EBITDA - D\&A.$
NOPAT	After-tax operating profit before financing effects.	$NOPAT = EBIT(1 - t).$

FY2023A example — EUR m

$$62.6 \text{ EBITDA} - 21.4 \text{ D\&A} = 41.2 \text{ EBIT} \implies 41.2(1 - 25\%) = 30.9 \text{ NOPAT.}$$

Audit implication: a number can be numerically correct today and yet structurally wrong: formula dependency vs. typed.

Source basis: Sources: RP-IB Ch. 1 Step III; KGW Ch. 11.

Reference

Refresh (2/3): investment and working capital

Capital expenditure vs D&A

CapEx is cash invested today in long-lived operating assets.

D&A is a non-cash accounting charge today associated with investment capitalised previously.

They are economically related, but they are **not interchangeable**.

$$\text{CapEx}_t \neq \text{D\&A}_t$$

Audit implication

A wrong sign, period or link can alter cash flow while leaving EBITDA and EBIT apparently plausible.

Operating net working capital

For TargetCo:

$$\text{Op. NWC}_t = \text{AR}_t + \text{Inventory}_t - \text{AP}_t.$$

FY2023A, EUR m

Trade receivables 50.0

Inventory 44.1

Trade payables (33.8)

Operating NWC 60.3

$$\Delta \text{NWC}_t = \text{NWC}_t - \text{NWC}_{t-1}.$$

$\Delta \text{NWC} > 0$: cash absorbed.

$\Delta \text{NWC} < 0$: cash released.

Source basis: Sources: RP-IB Ch. 1 Step III; KGW Ch. 11.

Reference

Refresh (3/3): cash flow and leverage

Unlevered free cash flow

$$FCF_t = EBIT_t(1 - t) + D\&A_t - CapEx_t - \Delta NWC_t.$$

FY2023A, EUR m

NOPAT	30.9
add back D&A	21.4
less CapEx	(26.0)
less Δ operating NWC	(3.5)
Unlevered FCF	22.8

Why today? We use this primarily as a **downstream reconciliation**: several upstream quantities must work together.

Debt, cash and leverage

Gross debt: interest-bearing borrowings.

Net debt:

gross debt – eligible unrestricted cash.

Net debt / EBITDA: net debt expressed as a multiple of the specified EBITDA measure.

Critical audit point

A leverage ratio is not fully defined until the EBITDA denominator is named.

Reported EBITDA? Adjusted EBITDA?

The arithmetic may be correct under either basis while the finance judgement remains unresolved.

Source basis: Sources: RP-IB Ch. 1 Step III; KGW Ch. 11.

Reference

Finance controls the model

Financial identities and definitions are the atoms of a model audit.

Relationship	Control	Why it matters later
EBIT dependency	$EBIT_t = EBITDA_t - D\&A_t$	A correct typed value can lose the link to operating earnings.
Operating NWC	$AR_t + Inventory_t - AP_t$	A construction error changes ΔNWC and historical cash flow.
Net debt and leverage	$Debt_t - \text{eligible cash}_t$, divided by a <i>named</i> EBITDA basis	The numerator and denominator definition must match the label.
Historical FCF control	$EBIT(1 - t) + D\&A - CapEx - \Delta NWC$	A downstream reconciliation tests several components together.
Reported vs adjusted EBITDA	Two analytical treatments, not an identity	The model must preserve the bases until evidence supports a decision.

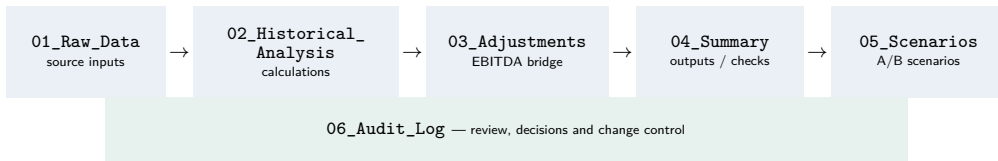
Growth and same-period margin remain useful calibration checks in the workbook. They are not the intellectual centre of the audit.

Source basis: Sources basis: RP-IB Ch. 1; KGW Chs. 11–13.

Reference

The workbook is a dependency system

OPEN NOW: TargetCo_historical_model.xlsx



Classify cells by role

Source constant: supplied input.

Calculation: formula deriving a result.

Cross-sheet link: formula retrieving another sheet's result.

Output: value consumed downstream.

Then map relationships

Dependency: which cells feed which others?

Formula family: which cells should implement the same structural rule?

Pattern break: where does construction differ from that family?

Do not infer purpose from colour, label or sheet name alone: verify construction!

Source basis: KGW Ch. 13 sheet discipline.

Reference

A pattern break is evidence, not a verdict

The rule

A structural difference tells us **where to investigate**. By itself, it does not tell us whether the cell is wrong.

Possible error

A calculated row contains formulas in every period except one typed value.

Question: was lost any dependency?

Possible exception

The first observable period uses a bridge because no prior-year balance exists.

Question: is the different construction documented?

Possible open control

A cell is blank because the evidence required to populate it has not been supplied.

Question: is the blank deliberate?

Mind the gap

pattern break $\neq$ error.

The next step is to establish the expected rule and perform an independent check.

P0: broad audit and fix

Canonical P0

Audit this Excel workbook, find the errors and fix them.

That single sentence grants the AI four conclusion rights:

1. decide what is wrong;
2. decide what is missing;
3. choose the finance treatment;
4. edit the workbook.

Run only as a controlled demonstration. Do not allow a live tool to save the workbook. Use the benchmark if the response does not expose the intended failure.

Source basis: Exact prompt and benchmark.

Reference

Why P0 is under-specified

What P0 authorises

The AI may implicitly decide:

1. what each cell is supposed to represent;
2. which unusual constructions are errors;
3. which missing values should be filled;
4. which EBITDA basis is economically preferable;
5. which workbook cells should be changed.

What P0 never requires

1. trace formulas and dependencies;
2. identify declared source inputs;
3. distinguish exceptions from errors;
4. independently recompute finance controls;
5. separate management claims from analyst judgement;
6. preserve the original workbook.

The problem

A plausible answer is not enough: AI can treat correctly a *workbook interpretation that was never verified*.

P1: decode before judging

1. Open ChatGPT or Claude in a fresh chat. 2. Upload the workbook. 3. Paste full P1 from the prompt card. 4. Do not authorise an edit.

Canonical P1, abbreviated

Map the workbook from **formulas and dependencies**, not from names or appearance.

Distinguish:

- declared source constants;
- same-sheet calculations;
- cross-sheet links;
- outputs;
- blanks.

Identify formula families, stated definitions, documented exceptions, assumptions and open questions.

For each blank, ask whether the workbook supplies the evidence necessary to calculate it.

Conclusion boundary

Map only.

No correctness conclusion.

No missing-value inference.

No finance-treatment choice.

No edit.

Deliverable

One record for each of the six sheets plus the dependency map.

Source basis: Full canonical prompt on the prompt card.

Reference

Reading the P1 map

What should come back

1. sheet purpose from construction;
2. declared inputs, formulas, links and outputs;
3. dependencies across all six sheets;
4. formula families and their ranges;
5. stated definitions and documented exceptions;
6. assumptions and open questions.

Where maps go thin

A sheet name substitutes for a dependency trace.

Every constant becomes an error.

A governance sheet disappears because it has no finance formula.

A blank evidence control becomes missing data.

A summary label becomes the metric definition.

Nothing has been evaluated or changed. We now hold a representation that can be tested.

Correct arithmetic can still rest on an unsupported assumption

label → AI assigns meaning → meaning becomes an assumption → ratio is calculated correctly
↪ **interpretation may still be unsupported**

What the workbook may establish

Management identifies an EBITDA adjustment.

Management supplies an amount.

Management describes the item as non-recurring and provides an expected or claimed end date.

What still requires analyst judgement

Is the cost separable from ordinary operations?

Has the activity actually ceased?

Will the cost disappear from the future run-rate?

What independent evidence supports those claims?

Key distinction

An adjusted leverage ratio can be **arithmetically correct** before the adjusted EBITDA denominator is **analytically approved**.

The constraint that changes the answer

P1 constraints

Map from formulas and dependencies. For every blank, ask whether the workbook supplies the evidence required to calculate it. Do not infer or fill a missing predecessor. Record documented exceptions separately. Map only. No correctness conclusion. No edit.

After the constraint

02!D7: documented first-period exception.
02!D26: documented bridge with a different construction.
03_Adjustments evidence blanks: unresolved controls.
Adjusted EBITDA: management presentation, not an approved denominator.

What comes later

The audit method scans construction.
P2 classifies candidates with finance rules.
P3 preserves both EBITDA treatments.
P4 sees only approved objective corrections.

Task decomposition limits what AI may conclude at each step.

Try yourself (1/2): 25 minutes

PART A:

1. **Build the workbook map.** One record per sheet, in the format on the next frame.
2. **State the finance controls.** Write the identities that must hold if this model implements its own stated definitions.

PART B:

Decide, and write down, *how* you will:

3. scan formula patterns across periods and related rows;
4. choose and build the independent checks;
5. classify each candidate once it is confirmed;
6. prioritise the confirmed candidates.

You are writing the method, not implementing it.

DO NOT

Do not resolve candidate issues (no edit, no fix): record it as an unresolved candidate and move on.

You do not yet have the audit lenses: no independent check.

When each step happens

Now	map + controls + written audit plan
Next	compare the two orders of work
After the break	build and test the Excel Audit Assistant
Last 60'	P2 + P3 + P4
End	reconcile + 06_Audit_Log

A completed map record

Example: 01_Raw_Data

Sheet	01_Raw_Data
Purpose	Stores the values and their source notes.
Inputs	The declared hardcoded source cells.
Calculations	None (or minimal).
Outputs	Source values for the analysis.
Depends on	No other sheet.
Feeds	02_Historical_Analysis, 03_Adjustments...
Definitions	units; tax-rate note; Operating-NWC components; the management-adjustment descrip.
Open question	management-provided vs. analyst-derived values

Now produce the same for the other five sheets

Record definitions before interpreting

When the workbook explicitly states a definition or a convention, **record the actual wording and/or the exact cell, before interpretation.**

Spotting what a model *says* and what it *does*: visible only after claiming.

The hidden rule for the next 25 minutes: **change nothing.**

The pre-edit audit plan

	Step	Question it answers	Action and deliverable	Executed
A	Architecture	What is this workbook made of?	Map the sheets and their dependencies. <i>Deliverable:</i> the workbook map.	Now.
B	Check the finance	Are the stated definitions what the model implements?	State the control and compare workbook construction with the finance definition. <i>Deliverable:</i> the control list.	Now.
C	Scan the formulas	Where does construction differ from the expected pattern?	Choose a row that should repeat across FY2022A–FY2025A. Compare cells; record unexpected constants or relative references. <i>Deliverable:</i> cell, observed construction, expected pattern, why investigate. Do not yet call it wrong.	Later.
D	Independent reconciliation	Can important outputs be reproduced directly from source values?	Recalculate selected controls from source inputs: EBIT, operating NWC, net debt, leverage. <i>Deliverable:</i> workbook value, recomputed value, difference.	Later.
E	Classify	What type of candidate is this?	Only after the independent check: objective construction error / documented legitimate exception / open finance judgement / insufficient evidence. <i>Deliverable:</i> category + one-sentence reason.	Later.
F	Prioritise	Which candidates matter first?	Ask: does it affect a number currently used? Could it fail silently on refresh? <i>Deliverable:</i> High / Medium / Low + one-sentence reason.	Later.

A zero reconciliation difference proves only that the numerical identity reconciles. It does not rule out a structural or judgement problem.

Two routes to the same map

Human-first group

Map the workbook manually in Excel first: read the sheets, follow links and write the records.

Then run P1 to challenge and complete your map.

AI-first group

Run P1 first.

Then verify every part of the returned map against Excel, cell area by cell area.

The question: which order leaves the analyst better able to defend the map?

Same deliverable

Both groups use Excel and AI. Neither uses Python. The comparison concerns the order of work.

After the 25'

What did the human-first group notice before AI?

What did the AI-first group obtain faster?

What did AI omit or classify wrongly?

Which order made verification easier?

Try yourself (2/2): 25 minutes

Map + controls + audit plan

Human-first: Excel, then P1

AI-first: P1, then verify in Excel

Same deliverable. Change nothing in TargetCo.

Welcome-back: compare your maps

Compare the order of work

1. What did human-first reviewers see before P1?
2. What did AI-first reviewers map faster?
3. Which AI statement required the most verification in Excel?
4. Which omission changed your view of the workbook?

Compare the maps

1. Where does the workbook state its definitions?
2. Which sheet has the largest downstream consequence?
3. Which pattern differences are documented?
4. Which blanks are evidence controls rather than missing data?

What we settle now

We compare representation and order of work. Candidate resolution comes after the Excel Audit Assistant report and P2.

Break — 15'

15 minutes

Keep TargetCo open. We return by building a read-only Excel auditing prototype with AI.

Build the Excel Audit Assistant

BUILD WINDOW: 30 minutes

1. Translate the functional requirements into an AI coding request.
2. Ask ChatGPT/Claude for VBA attaching:
 - TargetCo_historical_model.xlsx;
 - SESSION2_EXCEL_AUDIT_ASSISTANT_SPEC.md.
3. Inspect the returned code using the safety checklist.
4. Try to install and run it.

At about 10 minutes:

If your prototype runs, continue with it. If it does not, ask for TargetCo_AuditAssistant_solution.bas and continue the analytical exercise.

Objective: specify → generate → inspect → test → understand failure modes.

Do not spend twenty minutes debugging VBA: the instructor .bas still requires safety review, interpretation and testing.

What the prototype must do

Read the open TargetCo workbook.

Separate declared inputs from calculations.

Compare formula presence and FormulaR1C1 patterns.

Flag constants, formula errors and suspicious deviations.

Write candidates to a new report.

Leave analyst disposition blank.

Desktop Excel setup

COMMON START

1. Open TargetCo_historical_model.xlsx and keep it open.
2. In Excel choose File → New Workbook.
3. Save the new blank workbook as Session2_AuditAssistant_Controller.xlsm. .xlsm
4. Open the VBA editor. Mac: Tools → Macro → Visual Basic Editor, or Developer → Visual Basic. Windows: Developer → VB. (If Developer is hidden, enable it in Preferences/Options → Ribbon settings. Do not weaken macro settings).

PATH A — AI-GENERATED VBA TEXT

5. In the VBA editor choose Insert → Module.
6. A blank code window appears.
7. Paste the VBA produced by ChatGPT/Claude (the AI-generated VBA).
8. Save the controller workbook.

PATH B — WITH THE .bas SOLUTION

5. File → Import File...
6. Select TargetCo_AuditAssistant_solution.bas.
7. A module named TargetCo_AuditAssistant should appear.

RUN — BOTH PATHS: Confirm TargetCo is still open. Locate Public Sub AuditOpenTargetCo(), click inside it, then Run → Run Sub/UserForm. Alternatively in Excel: Tools/Developer → Macro(s) → AuditOpenTargetCo → Run.

Expected result

A new workbook appears with a worksheet named approximately Audit Report. Candidate findings are written there. TargetCo remains unchanged and unsaved. If Excel asks whether macros may run, follow your institution's approved security policy; do not disable protections simply to run the exercise.

Source basis: Full click-by-click guide and contingency.

Reference

Code safety review

Allowed	Read cells and formulas from the named TargetCo workbook. Create a new report workbook. Write findings only there.
Reject	Any write to a TargetCo Value or Formula. Any target-workbook save, save-as, close, rename or sheet deletion.
Reject	Shell or system calls. File deletion. Network or API calls. External-file modification.
Reject	Code that selects reported or adjusted EBITDA, applies a correction or fills analyst disposition.

Apply the same review to your AI-generated VBA and the instructor .bas. Ask the AI to explain every procedure that writes output.

Trace each write back to the new report object before running the macro.

Run and read the report

Run and inspect: 15 minutes

1. Obtain the report from your own VBA, the instructor .bas, or the Python contingency.
2. Check that a separate report appears.
3. Trace each candidate back to Excel.
4. Leave the disposition blank until P2.
5. Re-run after one prompt or code improvement, where applicable.

Each report row needs

worksheet and cell
detected role
rule
formula or value
reason for flag
blank analyst disposition

The next analytical task is identical whichever route produced the report. The report is a screen, not the diagnosis.

Detection outcomes

Convention

POSITIVE = the audit method flags the item as requiring analyst attention. **NEGATIVE** = the audit method does not flag the item.

	ACTUAL	
	Issue	Legitimate
FLAGGED	TP	FP
NOT FLAGGED	FN	TN

TP Flagged and independently confirmed as an in-scope issue.

FP Flagged, but independent review shows the construction is legitimate.

FN Genuine in-scope issue the method missed.

TN Legitimate construction correctly left alone.

The VBA report produces candidate flags. TP/FP/FN/TN can only be assigned after independent review.

Test the auditor, not only the workbook

Test case	Expected auditor behaviour	Why
Declared hardcodes in 01_Raw_Data	Do not classify as formula errors merely because they are constants.	Intended source inputs.
02_Historical_Analysis!D7: first-period growth; FY2021A unavailable	Do not invent/fill a value; recognize documented exception.	Required predecessor is absent.
Constant in an otherwise formula-driven calculated row	Flag for analyst attention.	Possible lost dependency.
Operating NWC inconsistent with AR + Inventory – AP	Flag.	Declared finance definition fails.
Net-debt sign inconsistent with Debt – eligible Cash	Flag.	Declared finance definition fails.
Documented first-period bridge whose formula legitimately differs from later periods	May be structurally unusual; do not confirm an error without review.	Pattern difference can be legitimate.

Record: one TP; one FP, if generated; one FN, if observed; one prompt/code improvement; evidence TargetCo remained unchanged.

The question is whether the tool behaves correctly on known cases, not a precision/recall score.

Perturbation tests dependency

Controlled copy

Change FY2024A reported EBITDA from 58.2 to 59.2 in a sandbox copy. Recalculate. Then restore the input. Do not retain the test edit.

Cell	Before	After	Observed
Reported EBITDA	58.2	59.2	changes
EBIT	34.9	34.9	does not respond
EBIT margin	7.69%	7.69%	does not respond
Historical FCF	13.3	13.3	does not respond

The hardcoded EBIT equals the correct value today. A static reconciliation misses the lost dependency. The perturbation exposes it.

From screening to decision

AUDIT ASSISTANT REPORT



P2 — CLASSIFY

P2 inputs

Audit report; workbook; finance rules; documented exceptions.

P2 statuses

OBJECTIVE

EXCEPTION

OPEN JUDGEMENT

INSUFFICIENT EVIDENCE

OBJECTIVE

EXCEPTION

INSUFFICIENT
EVIDENCE

OPEN JUDGEMENT

EVI-

independent verification → human
approval → P4 — EDIT

leave unchanged

identify missing information; no
forced correction

P3-naive demonstration → P3 —
COMPARE A/B → carry unresolved
treatment forward

P2 tells us what type of candidate we have. P3 is only for the unresolved EBITDA judgement. P4 receives only verified + approved objective corrections. P3-naive shows what happens when AI is asked to choose too early; it is not the disciplined workflow.

P2: classify the candidates

Canonical P2, abbreviated

Inputs: Excel Audit Assistant report, workbook, explicit finance rules and documented exceptions. For each candidate return Classification, Reason, Independent check, Downstream effect and Status: objective / exception / open judgement / insufficient evidence. No edit.

Finance rules at the centre

EBIT dependency.
Operating NWC and downstream cash flow.
Net debt and named leverage denominator.
Historical FCF reconciliation.

What P2 cannot do

Treat a candidate as a diagnosis without a check.
Approve management's adjustment.
Invent missing evidence.
Edit the workbook.

Source basis: Full canonical prompt on the prompt card.

Reference

P3-naive: a premature decision

Canonical P3-naive

Based on the workbook and management's adjustment schedule, which EBITDA measure best represents TargetCo's sustainable operating performance? Choose the basis you would use and update the relevant metrics.

The prompt is plausible. It asks for a finance conclusion an analyst may genuinely need.

It also grants the AI the right to choose the basis and update the model before the evidence threshold has been agreed.

Source basis: Exact prompt and benchmark.

Reference

What P3-naive may decide

Plausible AI answer

Use Scenario B. Management labels the costs non-recurring. The amount falls from 2.4 to 1.4. Management says the activities ended late in FY2025A.

Update EBITDA margin, EBIT, leverage and normalized unlevered FCF proxy.

Questions the answer cannot close

Are the costs separable from normal operations?

Did the activities actually end?

Are the costs absent from the future cost base?

What independent evidence supports the claim?

What did we allow AI to conclude? More than the supplied evidence established.

Reported vs management-adjusted EBITDA

Finance rule

Reported financials are the starting point. A genuine non-recurring item may be adjusted to obtain a more representative normalized view of ongoing earnings, but only after the banker has sufficient support for the treatment.

Scenario A — REPORTED BASIS

EBITDA remains as reported. Commissioning / duplicate-QA costs remain operating expenses in the periods incurred. This is the default historical basis while normalization remains unsupported.

Scenario B — MANAGEMENT-PROPOSED ADJUSTED BASIS

Add back the full amount management identifies: FY2024A 2.4; FY2025A 1.4. Management says the costs arise from the ramp and ended late FY2025A. This is a proposed normalization, not yet an analyst-approved basis.

Question: have we gained sufficient comfort that the costs are genuinely non-recurring?

Source basis: Rosenbaum & Pearl Ch. 1: adjustments for non-recurring items.

Reference

Evidence available today

Evidence	What it supports	What it does not establish
Management schedule: 2.4 in FY2024A; 1.4 in FY2025A	Claimed amount and category	Separability from ordinary run-rate operations
Management: duplicate-QA ended Nov-25; commissioning support ended Dec-25	Link to a specific activity and claimed finite end date	Actual cessation; absence from the future cost base
No invoices / supporting schedules	—	Independent support for the amounts and separability
No FY2026 staffing/cost plan or FY2026 budget	—	Whether the cost is expected to remain in operations

Evidence needed for normalization: separately identifiable; linked to a specific event/activity; not ordinary run-rate operations; finite / ceased or credibly expected to cease; not expected in the forecast cost base.

Management's description is relevant evidence. It is not, by itself, sufficient analyst support for the normalization. The banker needs sufficient comfort that the item is genuinely non-recurring.

How the treatment propagates

$EBITDA_A = \text{reported EBITDA}$

$EBITDA_B = \text{reported EBITDA} + \text{management adjustment}$

$EBIT_{A,B} = EBITDA_{A,B} - D\&A$

$\text{Net debt} = \text{gross debt} - \text{cash}$

$$\text{Leverage}_{A,B} = \frac{\text{Net debt}}{EBITDA_{A,B}}$$

$$\text{Normalized FCF proxy}_{A,B} = EBIT_{A,B}(1 - t) + D\&A - \text{CapEx} - \Delta\text{NWC}$$

Leverage changes only because the EBITDA denominator changes. Scenario B asks what the operating cash-flow measure would look like on the same normalized earnings basis. It is an analytical normalization; it does *not* mean TargetCo actually received more cash historically.

Revenue, debt, cash, D&A, CapEx and operating NWC do not change merely because the EBITDA treatment changes.

FY2025A leverage: worked bridge

STEP 1 — NET DEBT

Gross debt = 198.0

less cash = (28.0)

Net debt = 170.0

STEP 2 — SCENARIO A

Reported EBITDA = 68.8

$170.0/68.8 = 2.47x$

STEP 3 — SCENARIO B

Reported EBITDA = 68.8

+ management adjustment = 1.4

Management-adjusted EBITDA = 70.2

$170.0/70.2 = 2.42x$

STEP 4 — DIFFERENCE

$2.42x - 2.47x \approx -0.05x$

Debt and cash did not change. Only the earnings denominator changed. Both calculations can be arithmetically correct. The unresolved question is whether the 1.4 add-back is sufficiently supported to use adjusted EBITDA as the normalized denominator.

P3: preserve and compare

Canonical P3, abbreviated

Preserve A and B. Build and propagate both through EBITDA margin, EBIT, net debt / EBITDA and normalized unlevered FCF proxy for FY2024A and FY2025A. Return A, B, Difference, Why it changes, Resolvable today? and Evidence needed. Do not select a treatment or invent an unsupported amount.

Consistency test

Trace each formula. A row is inconsistent if one component uses Scenario A while another uses Scenario B without explicit justification.

The student 05_Scenarios sheet contains the row structure and blank work areas. P3 helps build the table. It does not arrive solved.

Source basis: Full canonical prompt on the prompt card.

Reference

Complete the A/B table

Work in pairs: 8 minutes.

1. Use P3 to draft formulas in the blank 05_Scenarios work areas.
2. Trace each source and calculate the difference.
3. Apply the consistency test to every row.
4. Complete *Resolvable today?* and *Evidence needed*.
5. State the uncertainty carried into Session 3.

Submission standard

One table. Both bases visible. Every formula traced. No recommendation without evidence.

Decision logic

P2 status	Treatment now	Record
Objective construction error	Close after independent verification and approval	Exact correction and post-edit control
Documented exception	Leave unchanged	Evidence supporting the exception
Open judgement	Preserve A/B and carry forward	Missing evidence, owner and next decision point
Insufficient evidence	Do not force a diagnosis	Specific information required

Keeping A and B visible is controlled uncertainty. It prevents a historical assumption from becoming an undisclosed valuation fact.

What reaches P4

1. P2 returns classifications.
2. The analyst independently verifies each candidate.
3. The analyst marks **Approved objective correction** = YES/NO.
4. Only YES rows are copied into P4.
5. P4 drafts exact changes and verification tests.
6. The analyst approves each edit, edits, then re-runs controls.

Exclude from P4

Scenario B as a decision. Open judgement rows. Documented exceptions. Any candidate without independent verification.

P4: approved objective corrections

Canonical P4, abbreviated

Use only P2 rows marked Approved objective correction = YES. For each return exact cell, current content, proposed formula, direct effect, downstream checks, independent verification and rollback. Do not edit until each row is approved. Then make only those edits, rerun controls and draft the Audit Log entry.

AI may do

Draft exact formulas and tests for the approved rows.

AI may not do

Approve its diagnosis, choose Scenario B, fill an exception or change an evidence field.

Source basis: Full canonical prompt on the prompt card.

Reference

From approval to Audit Log

Before edit → approval → change → independent test → 06_Audit_Log

Cell	02!F11
Before	Constant 34.9; current value reconciles but dependency fails
Approval	Objective correction = YES
Change	=F8-F10
Independent test	Increase FY2024A EBITDA by 1.0 in a copy; EBIT must also move by 1.0
Audit Log	Original content, approved formula, expected effect, result and reviewer

Repair the construction that violates the rule. Do not change an input merely to make a check pass.

From prototype to reusable add-in

VBA prototype → known-workbook test → validated findings → .xlam package → next workbook

Next time: open the workbook, run the add-in, review the report, then use finance-informed P2.

An institutional version also needs code review, versioning, signing and security approval, regression workbooks and controlled deployment.

The reusable asset is the reviewed rule set and code. Packaging does not remove the analyst's approval responsibility.

Source basis: Packaging checklist.

Reference

The Session-4 bridge

Today in Excel/VBA

State a finance identity
Compare a formula family
Run one perturbation
Keep Scenario A and B
Reconcile after edits

Later in Python

Encode it as an assertion
Parse formulas and test patterns
Loop over inputs and expected dependents
Automate scenario runs without overwriting the base
Repeat controls on every refresh

Session 4 implements the same idea transparently in Python: rules, assertions, loops, scenario automation and reconciliation.

Carry the uncertainty forward

Before Session 3

Save the repaired historical workbook.
Complete 06_Audit_Log.
Keep Scenario A and B.
Record the unresolved evidence question.

Session 3

Use the audited historical basis for valuation.
Compare the valuation implication of the unresolved EBITDA treatment.
Keep the denominator choice visible.

Final question

What evidence would you require before allowing management-adjusted EBITDA into a valuation output?

Source basis: Session boundary.

Reference

Appendix: finance quantities

Quantity	Construction	Use in Session 2
EBIT	EBITDA less D&A	Dependency control and perturbation
Operating NWC	AR plus inventory less AP	Balance and cash-flow control
Historical FCF	EBIT(1 - t) plus D&A less CapEx less Δ NWC	Downstream reconciliation
Net debt	Gross debt less eligible cash	Credit numerator
Leverage	Net debt divided by a named EBITDA basis	Definition and scenario control

Source basis: RP-IB Ch. 1; KGW Chs. 11–13.

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Appendix: model controls

$$\text{EBIT}_t = \text{EBITDA}_t - \text{D\&A}_t$$

$$\Delta \text{NWC}_t = \text{NWC}_t - \text{NWC}_{t-1}$$

$$\text{FCF}_t = \text{EBIT}_t(1 - t) + \text{D\&A}_t - \text{CapEx}_t - \Delta \text{NWC}_t$$

$$\text{NWC}_t = \text{AR}_t + \text{Inv}_t - \text{AP}_t$$

$$\text{Net debt}_t = \text{Debt}_t - \text{eligible cash}_t$$

Growth and same-period margin are calibration checks. Reported versus adjusted EBITDA remains an analytical treatment.

Source basis: Instructor finance recap.

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Appendix: six-sheet workbook

01_Raw_Data	Supplied facts and definition notes
02_Historical_Analysis	Historical analysis and cash-flow control
03_Adjustments	Management bridge and open evidence controls
04_Summary	KPIs, leverage and independent checks
05_Scenarios	Blank student work areas for the A/B comparison
06_Audit_Log	Changes, exceptions and unresolved decisions

Source basis: Generated workbook architecture.

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Appendix: audit plan A–F

A Architecture	Map sheets, roles and dependencies. Deliver the workbook map.
B Finance controls	State each accounting/finance definition before judging implementation. Deliver the control list.
C Formula scan	Pick a row expected to repeat across FY2022A–FY2025A. Compare formulas cell by cell. Look for a constant among formulas or an unexpected relative-reference change. Record: <i>Cell / observed construction / expected pattern / why investigate</i> . Do not yet call it wrong.
D Independent reconciliation	Recompute directly from source values, not another downstream calculated cell. Examples: $EBIT = EBITDA - D\&A$; $operating\ NWC = AR + Inventory - AP$; $net\ debt = gross\ debt - eligible\ cash$; $leverage = net\ debt / explicitly\ named\ EBITDA\ basis$. Record: <i>workbook value / independently recomputed value / difference</i> . A zero difference settles only that numerical identity.
E Classification	Only after an independent check: (1) objective construction error; (2) documented legitimate exception; (3) open finance judgement; (4) insufficient evidence. Record one category + one-sentence reason.
F Prioritisation	Ask: does this affect a number currently used? Could it fail silently on refresh? Assign High / Medium / Low + one-sentence reason.

Source basis: Student audit plan.

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Appendix: assistant requirements

Input boundary	Declared source inputs separated from calculations
Formula families	Presence and FormulaR1C1 pattern across comparable years
Construction	Constants inside formula-driven rows and formula/reference errors
Finance rules	EBIT, NWC, net debt, leverage denominator and historical FCF
Metadata	Optional formula-role against colour-role check
Output	New report, reason for flag, blank analyst disposition

The assistant reads TargetCo. It writes only to a new report and makes no finance decision.

Source basis: Student functional specification.

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Appendix: Excel execution

A. Files open. Keep `TargetCo_historical_model.xlsx` open. Create a separate controller workbook; `TargetCo` is the workbook being read, not edited.

B. Controller workbook. A separate Excel file that holds/runs the audit macro. Save a new blank workbook as `Session2_AuditAssistant_Controller.xlsm`. `.xlsm` = an Excel workbook allowed to contain macros. A *macro* = a small program run inside Excel.

C. VBA editor. The window where Excel VBA code is stored and run. Mac: Tools → Macro → Visual Basic Editor, or Developer → Visual Basic. Windows: Developer → Visual Basic. If Developer is hidden, enable it in Excel Preferences/Options → Ribbon settings. Do not weaken macro-security settings.

D. Path A — AI-generated text. In the VBA editor choose Insert → Module. A *module* = a container for VBA code. Paste the reviewed code into the blank module and save the controller.

E. Path B — instructor file. A `.bas` file = an exported VBA module. Do not insert a blank module. Choose File → Import File..., select `TargetCo_AuditAssistant_solution.bas`; a module named approximately `TargetCo_AuditAssistant` should appear.

F. Run. Confirm `TargetCo` is still open. Locate `Public Sub AuditOpenTargetCo()`, click inside the procedure, then Run → Run Sub/UserForm. Or in Excel: Tools/Developer → Macro(s) → `AuditOpenTargetCo` → Run.

G. Success. A new workbook appears with a worksheet named approximately `Audit Report`; candidate findings are written there. `TargetCo` must not be changed, saved or closed. Follow institutional macro-security policy.

Source basis: Back to desktop setup.

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Appendix: if VBA cannot run

Contingency only

Python is not taught or assessed in Session 2. Use this pre-built fallback only if managed Excel/security settings make VBA impossible.

1. On a Mac, open Terminal.
2. Change directory:
`cd "/Users/aandriollo/Library/CloudStorage/Dropbox/ai_corporate_finance/sessions/02_excel_ai_model"`
3. Run:
`python3 tools/targetco_model_audit.py student/TargetCo_historical_model.xlsx`
4. The script creates `student/TargetCo_structural_audit_report.csv` and `student/TargetCo_perturbation_report.csv`.
5. Open the structural audit CSV in Excel.
6. Continue from the same point as the VBA report: trace candidates back to the workbook and use P2.

This is a pre-built fallback. You are not expected to understand the Python implementation today. The workbook is not edited. Python becomes a teaching object in Session 4.

Source basis: Back to desktop setup.

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Appendix: canonical prompt ladder

P0	Broad audit and fix	Grants diagnosis, treatment choice and edit
P1	Decode	Map only; no correctness conclusion or edit
Build	Excel assistant	Generate reviewed VBA from functional requirements
P2	Classify	Finance rules applied to report candidates
P3-naive	Premature decision	Intentionally grants the EBITDA choice
P3	Compare	Preserve A/B and state missing evidence
P4	Edit	Approved objective rows only

Exact full text: SESSION2_PROMPT_CARD.pdf. Canonical source: session2_prompt_registry.json.

Source basis: Canonical registry.

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Appendix: VBA safety checklist

Target workbook writes	Prohibited: values, formulas, sheets, names or metadata
Target save or close	Prohibited
System, deletion and network calls	Prohibited
External-file modification	Prohibited
New report workbook writes	Allowed
Target workbook reads	Allowed
Finance treatment or correction	Prohibited

Source basis: Instructor benchmark solution.

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Appendix: detection convention

Positive	Item classified as requiring analyst attention under the declared rule
True positive	Flagged and genuinely in-scope
False positive	Flagged but legitimate under the rule
False negative	Genuine in-scope issue not detected
True negative	Legitimate item correctly left unflagged

Evaluate at issue level. Keep candidate screening separate from confirmed diagnosis. Record the observed test cases and results.

Source basis: Evaluation rule.

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Appendix: perturbation test

Change	FY2024A reported EBITDA + EUR 1.0m in a sandbox copy
Expected	EBIT and its downstream calculations move by the implied amount
Observed in student workbook	EBIT, EBIT margin and historical FCF remain fixed
Diagnosis	Current value reconciles; dependency has been lost
Restore	Return the source input and close the sandbox without retaining the test edit

Source basis: Instructor benchmark.

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Appendix: scenario formulas

EBITDA margin	Scenario EBITDA divided by same-period revenue
EBIT	Scenario EBITDA less unchanged D&A
Net debt	Gross debt less unrestricted cash in both cases
Leverage	Same net debt divided by the named scenario EBITDA
Normalized unlevered FCF proxy	Scenario EBIT $(1 - t)$ plus D&A less CapEx less Δ NWC

Scenario B is a normalized operating comparison, not a restatement of historical cash.

Source basis: Instructor clean workbook.

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Appendix: correction and log standard

Objective correction	Current content, approved formula, expected effect and post-edit test
Documented exception	Observation, supporting evidence and no-change disposition
Open judgement	Scenario A/B, missing evidence, owner and decision status
False positive	Rule that fired and why the construction is legitimate
Refresh failure	Input changed, expected dependent, observed result and repair

Source basis: Instructor solution key.

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Appendix: add-in packaging

Prototype in a controller workbook. Test on a known workbook. Reconcile findings. Review and version the code. Package a validated copy as .xlam. Enable it in Excel Add-ins. Test again before deployment.

Institutional deployment also requires signing and security approval, regression workbooks and controlled distribution. No compiled add-in is supplied.

Source basis: Instructor packaging guide.

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Appendix: session boundary

Session 2 releases an audited historical base and two unresolved EBITDA treatments. It contains no forecast, discount rate, valuation multiple, terminal value, enterprise value or equity value.

Session 3 tests valuation implications. Session 4 implements the same audit idea in Python through rules, assertions, loops, scenario automation and reconciliation.

Source basis: Session-2 boundary.

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