LM05 · CORPORATE ISSUERS · CFA LEVEL I

Capital Investments and Capital Allocation

How firms choose which long-term investments create shareholder value

What This Reading Covers

Capital investments are investments with a life of **one year or longer**. They create long-term assets on the balance sheet and drive future cash flows. This module covers the types of projects firms undertake, the four-step capital allocation process, the core valuation tools (**NPV, IRR, ROIC**), common behavioural and cognitive pitfalls, and the real options embedded in real-world investment decisions.

Learning Outcome Statements

LOS a	Describe types of capital investments
LOS b	Describe the capital allocation process; calculate NPV, IRR and ROIC; contrast their use
LOS c	Describe principles of capital allocation and common capital-allocation pitfalls
LOS d	Describe types of real options relevant to capital investments

The Simplistic Balance Sheet View

Long-Lived Assets $(5,000) + WorkingCapital($1,500) = **Invested Capital $6,500** (financed by Long-Term Debt + Equity). Capital investment concerns the long-lived asset line — and getting these decisions right is central to value creation and a key signal of management quality.

Exam Tip: Capital investment and allocation decisions give analysts insight into the quality of management's decisions and *how* the company creates value — expect conceptual questions that reward a clear mental map of the process, plus numeric NPV and IRR calculations.

LOS A · TYPES OF CAPITAL INVESTMENTS

Four Types of Projects

Companies invest for two primary reasons — to **maintain** the existing business and to **grow** it. The four project types below map to those two motives.

PROJECT CLASSIFICATION

MAINTAIN THE BUSINESS

Going Concern
(Maintenance)
Asset replacement,
IT upgrades · Low risk

Regulatory / Compliance
Non-discretionary;
raise expenses, not revenue

Continue current operations, maintain existing size

Risk: LOW (easy to evaluate)

GROW THE BUSINESS

Expansion
(Scale or Scope)
Larger ops / adjacent
products · Higher risk

New Lines of Business / Other
Outside current
business · Highest risk

Increase scale, enter new markets or lines

Risk: HIGHER → HIGHEST

The Four Types in Detail

1. GOING CONCERN (MAINTENANCE CAPEX)

Purpose: continue the company's current operations and maintain existing size. Examples: asset replacement, IT hardware/software maintenance, improvements of existing facilities.

Risk: low — easy to evaluate (e.g., new machine with known upfront cost vs periodic savings).

Funding: match the term of new finance with the lifespan of new assets — this avoids *rollover risk* from shorter-term debt and avoids the higher cost/buyback cost of debt that matures after project life.

Analyst shortcut: estimate annual maintenance CapEx using depreciation and amortization expense (accuracy depends on whether useful life is correct and historical cost ≈ replacement cost).

2. REGULATORY / COMPLIANCE

Purpose: not discretionary — required to meet rules and standards. Typically raise expenses but *do not* raise revenue.

Upsides: avoid fines, allow business to continue, may serve as a barrier to entry that protects profitability; early adoption can create competitive advantage; working with regulators helps tailor timing.

Downsides: high regulatory costs may reduce returns below the required minimum — firm must either pass costs to customers or cease operations.

3. EXPANSION OF EXISTING BUSINESS

Scale: increase in size of operations (e.g., pharma research into new medications). **Scope:** extend to adjacent products (e.g., computer hardware maker entering video game development).

Risk: higher than maintenance or compliance — greater uncertainty, longer horizon, more capital. Scale projects face sourcing/production bottlenecks; scope projects face the complexity of managing multiple lines of business and new competitors.

Funding: firms in early stages rely on equity; more established firms have better access to debt (lower perceived risk).

4. NEW LINES OF BUSINESS (AND OTHER)

Purpose: completely outside or minimally related to current business (e.g., capital invested to explore new technology/business idea, or acquisition of a firm in a different industry — such as Kirin, a beverage company, acquiring Fancl, a cosmetics/dietary firm).

Risk: highest — unforeseen challenges of an unfamiliar business, plus risk of overpayment in an acquisition.

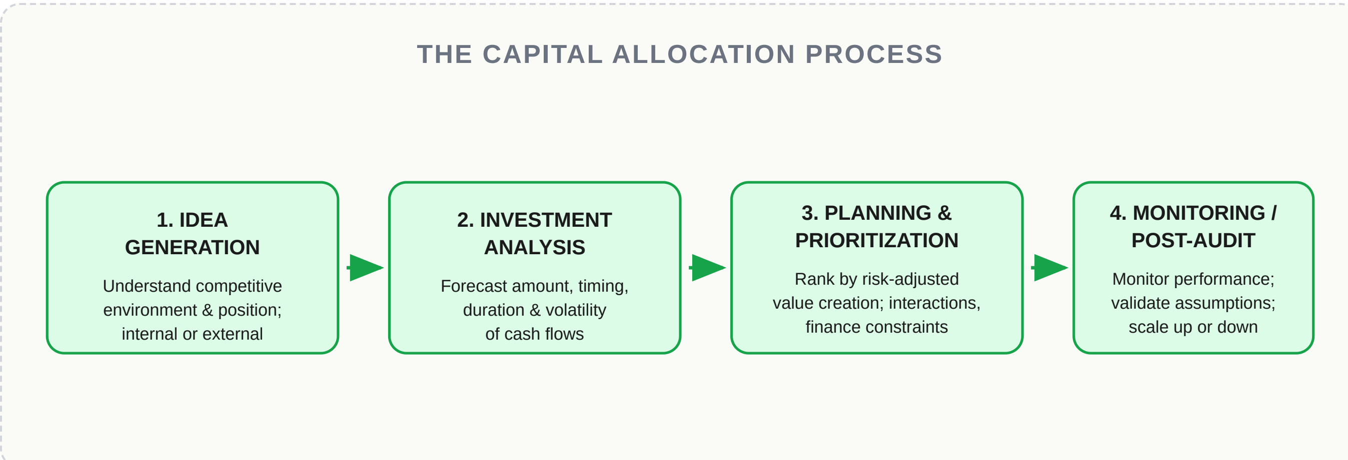
Analyst technique: review segmental disclosures where available; expansion expenditure ≈ Total CapEx − Maintenance CapEx (estimated as depreciation/amortization).

Exam Tip: Be able to **classify** a project from a brief scenario. Example mapping from the curriculum: new peripherals line for gamers → *Expansion*; tire producer invests in solar panels for subsidies → *New business*; global bank migrates data to cloud for efficiency → *Maintenance*; property manager installs ventilation for pollution regs → *Compliance*.

LOS B · THE CAPITAL ALLOCATION PROCESS

Four Steps of Capital Allocation

Capital allocation is the process used by a firm's management and board to make capital investment and return decisions. The **objective**: earn risk-adjusted returns greater than investors could earn on similarly risky investments elsewhere — i.e., beat investors' opportunity cost.



Step Details

1. **Idea Generation** — understand the competitive environment and the firm's competitive position. Ideas may be internally generated or come via consultants.
2. **Investment Analysis** — forecast the amount, timing, duration, and volatility of cash flows.
3. **Planning and Prioritization** — choose the *most value-enhancing* projects on a risk-adjusted basis. Only select projects whose returns exceed investors' opportunity cost; consider interactions with existing operations and finance constraints; *return unused capital to shareholders*.
4. **Monitoring and Post-Investment Review (Post-Audit)** — monitor performance, validate assumptions, and increase or decrease investment accordingly. This is also where *real options* get exercised.

Capital Allocation vs Portfolio Construction

The process is similar to portfolio construction but **more granular** — evaluating individual *projects* rather than entire companies — and it uses **proprietary, non-public** information about the firm's own operations.

LOS C · CAPITAL ALLOCATION PRINCIPLES

Core Principles

Decisions are only as good as the cash flows that go into them. The curriculum stresses these principles before any NPV or IRR arithmetic:

AFTER-TAX CASH FLOWS

Use **cash flows**, not accounting measures. Reflect the impact of tax benefits on cash flows (e.g., tax-allowable depreciation creates a tax shield).

INCREMENTAL CASH FLOWS

Measure only cash flows that *change* because of the project. **Exclude sunk costs.** *Examine broadly* — include externalities such as cost savings elsewhere or loss of sales to existing products (cannibalization).

TIME VALUE OF MONEY

Timing of cash flows is crucial. A change in when cash flows arrive affects both NPV and IRR. Always discount.

FINANCE THROUGH THE DISCOUNT RATE

Financing costs (interest, dividends) are captured in the discount rate (WACC). **Do not** subtract them again from project cash flows — that double-counts. Internally generated cash is *not* free; retained earnings could have been returned to shareholders, so apply the same risk-adjusted hurdle rate.

Treatment of Inflation — Be Consistent

Nominal cash flows include inflation; real cash flows exclude it. **Discount nominal flows at a nominal rate; discount real flows at a real rate.** Cash flows are often affected by inflation differently (revenues vs variable costs vs depreciation), and *actual inflation will rarely equal expected inflation*, so using real rates does not neutralize inflation risk.

Exam Tip: If a question says "the project is financed from retained earnings — can we use a lower discount rate?" the answer is **no**. Retained earnings carry an opportunity cost (cost of equity). Use the risk-adjusted required return regardless of funding source.

LOS B · NET PRESENT VALUE

Net Present Value (NPV)

NPV is the expected impact on shareholder wealth if the project is undertaken — the present value of future after-tax cash flows minus the initial outlay.

$$\text{NPV} = CF_0 + CF_1/(1+r)^1 + CF_2/(1+r)^2 + \ldots + CF_T/(1+r)^T$$

where CF_0 is typically the negative initial outlay and *r* is the required rate of return.

Decision Rule

Independent projects

NPV > 0 → accept

NPV < 0 → reject

Mutually exclusive

Accept the project with the *higher positive* NPV

Why the rule works: a positive NPV increases firm value — shareholders become wealthier in expectation. NPV ≥ 0 is a *necessary but not sufficient* condition for investing (managers may also consider strategic fit, real options, and risk).

WORKED EXAMPLE

NPV Example — Equally Spaced Cash Flows

A $50minvestmenttodaygenerates$16m after-tax cash flows in years 1–4 and $20m in year 5. Required rate of return is 10%.

T	0	1	2	3	4	5
CF	(50)	16	16	16	16	20
PV @ 10%	(50.00)	14.55	13.22	12.02	10.93	12.42

SOLUTION

NPV = −50 + 16/1.10 + 16/1.10^2 + 16/1.10^3 + 16/1.10^4 + 20/1.10^5 = **+$13.136m**

NPV is positive, so **invest**. The project creates ~$13.1m of shareholder value.

Excel: =NPV(0.10, 16, 16, 16, 16, 20) − 50 (NPV function assumes the first cash flow is at T1)

> **Exam Tip:** Know the Excel vs calculator convention: Excel's `NPV()` treats the *first* value as T1 — so the initial outlay is subtracted *outside* the function. A calculator's CF0 goes in explicitly as a negative.

LOS B · INTERNAL RATE OF RETURN

Internal Rate of Return (IRR)

IRR is the discount rate that makes the NPV of all cash flows from a project equal to zero — the rate at which PV(inflows) = PV(outflows).

$$0 = CF_0 + CF_1/(1+\mathrm{IRR})^1 + CF_2/(1+\mathrm{IRR})^2 + \ldots + CF_T/(1+\mathrm{IRR})^T$$

Decision Rule

Independent

IRR ≥ r → accept

IRR < r → reject

r = required return / hurdle rate

Mutually exclusive

Accept project with highest IRR (provided IRR > r) — but watch for conflict with NPV

WORKED EXAMPLE

IRR Example — Same Cash Flows as NPV

50*minvestedtoday*;16m/yr for years 1–4, $20m year 5. Required return 10%.

SOLUTION

Solve −50 + 16/(1+IRR) + 16/(1+IRR)^2 + 16/(1+IRR)^3 + 16/(1+IRR)^4 + 20/(1+IRR)^5 = 0

IRR = 19.52%

Since IRR 19.52% > required 10%, **invest** — consistent with the positive NPV decision.

Excel: =IRR(−50, 16, 16, 16, 16, 20)   (IRR function treats the first value as T0)

Important Caveat — The Reinvestment Assumption

An investor will only realize the IRR as a (geometric) rate of return **if interim cash flows are reinvested at the IRR**. In practice, reinvestment typically occurs at the *required* rate, which is why NPV (which discounts at the required rate) is generally preferred theoretically.

Multiple IRR Problem

When cash flows change sign *more than once* (non-conventional cash flows), multiple IRRs may solve the equation.

$$Example: T0(1,000) \quad T1 + 5,000 \quad T2(6,000) \quad \Rightarrow \quad \text{IRR} = 100$$

Neither IRR is economically meaningful — use NPV instead.

QUIZ 1 · CHECKPOINT

Test Your Understanding: Types, Process & Principles

Q1. A property management company installs new ventilation systems to meet pollution regulations. This is *best* classified as a:

Q2. Which is *not* one of the four steps in the capital allocation process?

Q3. A project is funded using internally generated cash flows. Should it be evaluated at a *lower* required rate of return than an externally financed project of equivalent risk?

Q4. Which principle is *most consistent* with correct capital budgeting?

Q5. An analyst uses real cash flows and a real discount rate. A project's NPV will be unaffected by future inflation. This statement is:

LOS B · COMPARING NPV AND IRR

NPV vs IRR — When They Conflict

For independent projects, NPV and IRR give the **same** accept/reject decision. For *mutually exclusive* projects the two methods can conflict due to differences in project **size** or **timing** of cash flows. When they conflict, **NPV wins**.

WORKED EXAMPLE

Scale Conflict

PROJECT	T0	T1	REQUIRED RETURN	NPV	IRR
Small	(500)	700	10%	$136.36	40%
Large	(10,000)	12,000	10%	$909.09	20%

SOLUTION

IRR ranks the Small project higher (40% > 20%), but NPV ranks the Large project higher ($909 > 136$). **Choose the Large project** — it creates more shareholder wealth in dollar terms. IRR does not account for project size or length.

Advantages and Disadvantages

	NPV	IRR
Advantages	Direct measure of expected increase in firm value; theoretically the best method	Shows return per dollar invested; lets you compare to required rate
Disadvantages	Does not consider project size on its own (but the level of NPV does reflect scale)	Assumes reinvestment at IRR (correct: required rate); may conflict with NPV; multiple IRRs possible

Reinvestment Assumption — Intuition

NPV implicitly assumes interim cash flows are reinvested at the *required rate* (WACC). **IRR** implicitly assumes reinvestment at the IRR itself. Because firms can realistically redeploy cash at the cost of capital, NPV's assumption is more defensible.

Exam Tip: For **mutually exclusive** projects with conflicting NPV and IRR rankings, **always select by NPV**. For **independent** projects, NPV and IRR agree and either works.

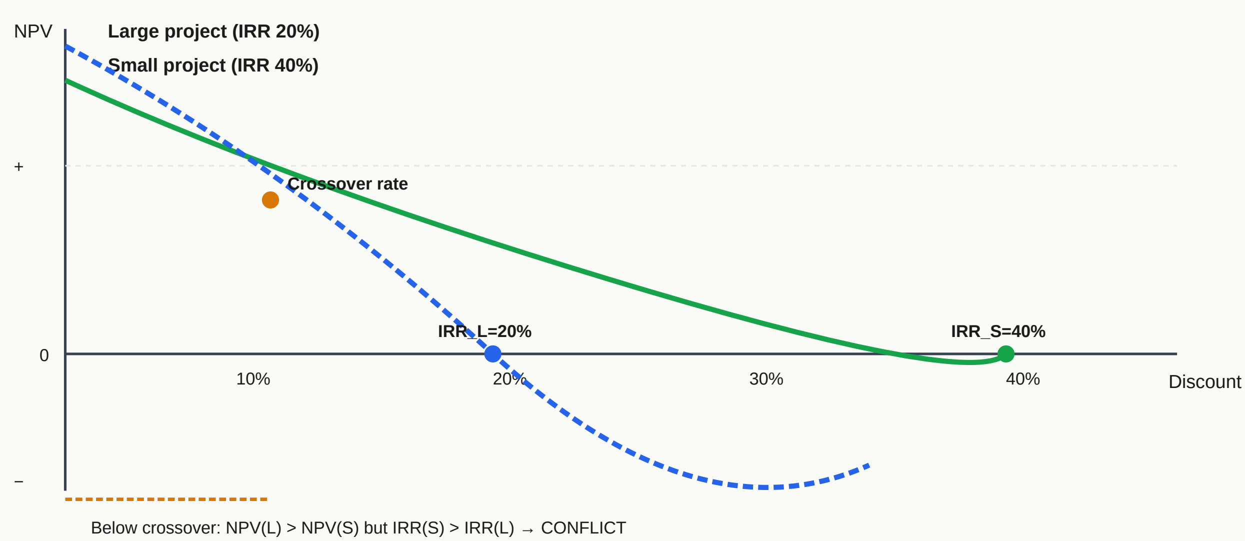
VISUAL INTUITION

NPV Profile & Crossover Rate

An **NPV profile** plots NPV on the y-axis against the discount rate on the x-axis. Two key points emerge:

1. The rate at which NPV = 0 **is the IRR** (the x-intercept).
2. For mutually exclusive projects, the point where two profiles cross is the **crossover rate** — below that rate NPV and IRR can disagree; above it they usually agree.

NPV PROFILES — TWO PROJECTS



How to read it: at r = 10% the *Large* project has the higher NPV (choose Large by NPV). The *Small* project has the higher IRR (40% > 20%). The methods disagree because the scales differ. NPV is the correct tiebreaker — it measures dollars of wealth created.

LOS B · RETURN ON INVESTED CAPITAL

Return on Invested Capital (ROIC)

ROIC (also called ROCE in some curriculum references) is an **aggregate**, backward-looking profitability measure. Unlike NPV and IRR — which are used inside the firm on individual projects — ROIC uses publicly available financial statement data, so external analysts rely on it heavily.

$$\text{ROIC} = After - TaxOperatingProfit / AverageInvestedCapital$$

After-Tax Operating Profit = (1 − Tax Rate) × Operating Profit · Invested Capital ≈ Average total long-term liabilities + equity

Decomposition

$$\begin{aligned} \text{ROIC} &= (After - TaxOperatingProfit / Sales) \times (Sales / AverageInvestedCapital) \\ &= After - TaxOperatingMargin \times CapitalTurnover \end{aligned}$$

Value Creation Threshold

ROIC can be compared to the required return for both debt and equity investors — i.e., to **WACC**. The rule of thumb for value creation:

ROIC > WACC
Creating value

ROIC = WACC
Neither creating nor destroying

ROIC < WACC
Destroying value

Benefits and Drawbacks

Benefits

- Data available to independent analysts (unlike NPV or IRR)
- Accounts for capital invested — unlike operating profit or operating margin alone
- Aggregate measure spanning the whole firm
- Comparable to required return for both debt and equity

Drawbacks

- Accounting-based — backward-looking
- Aggregation can hide a multitude of sins (mix of good and bad projects)
- Operating profit and invested capital are open to interpretation — intangibles, excess cash, deferred tax liabilities, non-recurring items, NCI may or may not be included

Exam Tip: Remember the trade-off: NPV/IRR are *forward-looking project-level* tools used internally; ROIC is a *backward-looking firm-level* tool used externally. External analysts use ROIC because they lack the project-level data management has.

LOS C · CAPITAL ALLOCATION PITFALLS

Common Pitfalls — Cognitive & Behavioural

Even with correct principles, managers make predictable mistakes. The curriculum groups them into cognitive errors (informational/analytical) and behavioural biases (psychological/organizational).

Cognitive Errors

1. **Internal forecasting errors** — biased or optimistic forecasts of costs, required returns, or competitor responses. Revenues are overstated; costs, delays, and rivals' reactions are understated.
2. **Ignoring the cost of internal financing** — treating retained earnings as "free." They are not — shareholders could have received the cash. Always apply the risk-adjusted required return.
3. **Inconsistent treatment of (or ignoring) inflation** — mixing nominal flows with real rates or vice versa. Discount nominal at nominal, real at real. Remember: actual inflation ≠ expected inflation, and different cash flow components are affected differently.

Behavioural Biases

1. **Inertia** — managers tend to keep capital budgets roughly equal to the prior period. McKinsey (2012) found the correlation between capital investment in year t and year $t-1$ was 0.92. Inertia also manifests as *retaining losing projects* instead of abandoning them.
2. **Basing decisions on accounting measures (EPS, ROE, net income)** — managers may be compensated on EPS, and high-NPV projects sometimes depress near-term EPS due to depreciation or start-up costs. Good long-term projects get rejected.
3. **Pet projects** — projects favoured by senior management, selected without rigorous analysis. Forecasts used to justify them tend to be optimistic.
4. **Failure to consider alternatives** — breakeven, scenario, and simulation analyses ignored. May reflect lack of experience or the apparent lack of failures — but a long history without failure may itself indicate insufficient risk-taking.

Sunk Cost Fallacy

Money already spent is **irrelevant** to a forward-looking decision. Projects should be evaluated on the basis of incremental *future* cash flows only. The emotional pull to "recover" sunk costs leads to throwing good money after bad.

> **Exam Tip:** If a question describes a manager continuing a project because "we've already invested *5m”—that'sthesunkcostfallacy.Thecorrectanalysisignoresthe*5m entirely and asks whether *future* cash flows still justify *future* outlays.

WORKED EXAMPLE · APPLYING THE PRINCIPLES

From Gross Flows to After-Tax NPV

WORKED EXAMPLE **Converting Gross Cash Flows to After-Tax NPV**

GIVEN

TIME	0	1	2	3
Forecasted gross cash flows	(7.5)	4.5	4.5	6.0
Forecasted depreciation	0.0	(1.0)	(1.0)	(1.0)

Required rate of return: 6% · **Tax rate:** 18% · **Note:** Depreciation is *not* deductible for taxes in this jurisdiction.

FIND

The after-tax cash flows and the project NPV.

SOLUTION

SOLUTION

1. **Because depreciation is not tax-deductible here**, taxable income = gross cash flow, and after-tax CF = gross CF × (1 − t).

```
After-tax CF_t = Gross CF_t × (1 − 0.18)
```

2. **Compute after-tax cash flows**:

T	0	1	2	3
After-tax CF	(7.5)	3.69	3.69	4.92

(Initial outlay at t=0 is already after-tax — a cash outflow, not an income item.)

3. **Discount at 6%**:

$$NPV = -7.5 + 3.69/1.06 + 3.69/1.06^2 + 4.92/1.06^3$$

$$NPV = -7.5 + 3.481 + 3.284 + 4.131 = +3.396$$

ANSWER

NPV ≈ +$3.40m → Accept the project

Positive NPV increases shareholder wealth. Notice that depreciation never entered the cash flow calculation — it is a non-cash item, and here it was explicitly non-deductible for tax too.

LOS D · REAL OPTIONS

Real Options

Standard DCF assumes all decisions are taken at inception and one course of action is maintained throughout the project's life. In practice, managers can **take decisions in the future based on how events unfold**. The right (but not the obligation) to take such future actions is a *real option*.

> **Real options can only add value** — they are exercised only when value-enhancing. Their value depends on future events.

Four Types of Real Options

1. TIMING OPTIONS

Delay the investment to wait for improved information; sequence projects so that later phases depend on earlier outcomes.

2. SIZING OPTIONS

Abandonment: exit when CF from abandoning > PV of future flows (like a put option).
Growth: make additional investment when performance is strong (like a call option).

3. FLEXIBILITY OPTIONS

Price-setting: raise price to capture strong demand.
Production-flexibility: alter production levels in line with demand.

4. FUNDAMENTAL OPTIONS

The entire investment *is* an option — value depends on an underlying such as a commodity price (e.g., an oil well, a mine, R&D projects).

Evaluation Approaches

1. **If NPV > 0 *without* options:** accept the project; the option can only add value.
2. **If NPV < 0 without options:** compute NPV with the option:

```
NPV(project with option) = NPV(without option) − Option cost + Option value
```

3. **For complex options:** use decision trees or option pricing models.

WORKED EXAMPLE

Real Option — Timing Example

A company is considering expansion. New environmental regulation may provide tax incentives that would increase cash flows:

- Waiting for the new legislation before expanding will incur a cost of **$1.8m**
- NPV if the company waits is estimated at **$9.7m**; NPV if work starts immediately is **$8.9m**

SOLUTION

Option value = NPV(with waiting) − NPV(without waiting) = 9.7 − 8.9 = **$0.8m**

Since the option *value* ($0.8m) is less than the *cost* of waiting ($1.8m), the firm should **not** wait — invest immediately. (Formally: NPV with the waiting option = 8.9 − 1.8 + 0.8 < 8.9.)

REAL OPTIONS · DECISION TREE EXAMPLE

Valuing an Abandonment / Growth Option

WORKED EXAMPLE

Decision Tree Setup

Initial outlay \$500m to produce a new product; 10% required return.

- 60% probability of success → \$750m at T1
- 40% probability of failure, and in that case:
  - 30% probability of alternative launch returning \$600m at T2
  - 30% probability assets sold realising \$400m at T2
  - 40% probability assets abandoned realising \$0

SOLUTION

NPV without options (assume failure path yields 0):

$$[(0.6 \times 750) + (0.4 \times 0)] / 1.10 - 500 = 450/1.10 - 500 = 409.09 - 500 = \mathbf{(90.91)}$$

Value of the options on the failure branch:

$$[(0.4 \times 0.3 \times 600) + (0.4 \times 0.3 \times 400) + (0.4 \times 0.4 \times 0)] / 1.10^2 = (72 + 48 + 0) / 1.21 = 120/1.21 \approx \mathbf{99.17}$$

NPV with options = −90.91 + 99.17 ≈ **+\$8.27m → Accept**

Without recognizing the abandonment/alternative-use options, the project looks value-destroying. Embedding the options flips the decision.

Key Takeaway

Real options convert "one-shot" DCF into a sequence of decisions. They become more valuable when there is more **uncertainty**, more **time**, and more managerial **flexibility**. A project with a negative static NPV may still be attractive once embedded options are properly valued.

QUIZ 2 · CHECKPOINT

Test Your Understanding: NPV & IRR Mechanics

Q6. A project costs $50matT0,produces$16m in years 1–4 and $20m in year 5. The required return is 10%. The NPV is *closest* to:

Q7. For the same project, the IRR is *closest* to:

Q8. Project A: (−500, +700) at 10% gives NPV $136.36,IRR40$909.09, IRR 20%. The two are *mutually exclusive*. Which should the firm choose?

Q9. A project has cash flows T0 (−1,000), T1 +5,000, T2 (−6,000). Applying IRR, a researcher finds two solutions: 100% and 200%. The *best* interpretation is:

Q10. Which statement about the reinvestment assumption is *most accurate*?

Q11. A $7.5mprojectgeneratesgrossCFof$4.5, $4.5,$6.0m in years 1–3. Tax rate 18% (depreciation not deductible), required return 6%. The NPV is *closest* to:

QUIZ 3 · CHECKPOINT

Test Your Understanding: ROIC, Pitfalls & Real Options

Q12. A company reports after-tax operating profit of $24.4mandaverageinvestedcapitalof$ 271.8m. Its ROIC is *closest* to:

Q13. A firm's ROIC is 9%, its WACC is 11%, and its ROE is 13%. Based *only* on these figures:

Q14. A manager continues investing in a struggling project because "we've already sunk $10m." This is *best* described as:

Q15. A mining company can *delay* opening a copper mine until copper prices recover. This embedded flexibility is an example of a:

Q16. An analyst correlates a firm's capital expenditure in year *t* with its capital expenditure in year *t−1* and finds the correlation is very high (~0.9). This evidence is *most consistent* with:

MODULE COMPLETE

Your Scorecard

0 / 16

LM05 Key Takeaways — Exam-Ready Cheat Sheet

Project Types & Process

1. **Four project types:** going concern (maintenance), regulatory/compliance, expansion, new line of business — risk rises roughly in that order.
2. **Capital allocation steps:** (1) Idea generation, (2) Investment analysis, (3) Planning & prioritization, (4) Monitoring / post-audit.
3. **Objective:** earn risk-adjusted returns > investors' opportunity cost on similarly risky investments.

Principles

4. Use **after-tax**, **incremental** cash flows. **Ignore sunk costs**; include externalities (cost savings, cannibalization).
5. Time value of money matters. Discount **nominal at nominal**, **real at real**.
6. Finance costs go in the **discount rate (WACC)** — never in the cash flows. Retained earnings are *not* free.

NPV, IRR, ROIC

7. **NPV** = $\Sigma\, CF_t/(1+r)^t$ − Outlay · accept if NPV > 0. Direct measure of shareholder wealth creation.
8. **IRR** = rate that makes NPV = 0 · accept if IRR ≥ r. Assumes reinvestment at IRR (unrealistic). Watch for multiple IRRs with non-conventional cash flows.

9 **NPV vs IRR:** independent → agree; mutually exclusive → can conflict on scale/timing → **choose by NPV**.

10 **ROIC** = After-Tax Operating Profit / Average Invested Capital · value created when **ROIC > WACC**.

Pitfalls

11 **Cognitive:** internal forecasting errors · ignoring cost of internal financing · inconsistent inflation treatment.

12 **Behavioural:** inertia (McKinsey 0.92 CapEx correlation) · EPS/ROE-based decisions · pet projects · failure to consider alternatives · **sunk-cost fallacy**.

Real Options

13 **Four types:** timing · sizing (abandonment & growth) · flexibility (price-setting & production) · fundamental.

14 If NPV > 0 *without* option → invest. Otherwise: $NPV_{\text{with option}} = NPV_{\text{without}}$ − Option cost + Option value. Options can only add value.

Last-Minute Exam Checklist

NPV formula: $\Sigma\ CF_t/(1+r)^t$ − Outlay · accept if > 0

IRR: sets NPV = 0 · accept if IRR ≥ hurdle rate

Conflict rule: mutually exclusive → always NPV

Reinvestment: NPV @ required rate · IRR @ IRR

ROIC > WACC = value creation · ROIC is *backward-looking, firm-level*

Sunk costs: never incremental — exclude

Internal funds: not free — use risk-adjusted required return

Real option value: $NPV_{\text{with}} = NPV_{\text{without}} - Cost_{\text{option}} + Value_{\text{option}}$

Step 1 of 17