

Charta Learning

Cost of Capital and Capital Investments

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Cost of Capital

CI.3.a · Work out a firm's weighted average cost of capital

What does WACC represent?	The return a firm must earn to satisfy everyone who funded it, weighted by how much each provided.
Why does debt enter WACC after tax?	Interest is deductible and the tax saving is real money, making debt cheaper still.
Why should WACC weights be market values rather than book values?	The question is what capital costs to raise now, not what it cost historically.
Why is one firm-wide WACC dangerous for all projects?	It suits projects of average risk only; using it for everything subsidises risky projects with safe ones.
Weighted average cost of capital	WACC = $(D \div V) \times r_d \times (1 - t) + (P \div V) \times r_p + (E \div V) \times r_e$ where D, P, E = the market values of debt, preferred stock and common equity; V = the three of them added together; r_d, r_p, r_e = the before-tax cost of debt and the costs of preferred and common equity; t = the marginal tax rate Market weights, not book, and target weights rather than today's if the company is moving towards one. Only the debt term is taxed, because only interest is deductible.

CI.3.b · Work out what debt costs a firm after tax

What is the cost of debt for WACC purposes?	The yield the company would pay on new borrowing today, not the coupon on debt issued years ago.
How is it estimated when a bond trades, and when none trades?	Use the bond's yield to maturity; otherwise use yields of comparable issuers with similar ratings and maturities.
How is the after-tax cost of debt found?	Pre-tax cost $\times (1 - \text{tax rate})$, because interest is deductible.
What is the standard error in estimating cost of debt?	Using the historical coupon, which describes past agreements, not what capital costs now.
After-tax cost of debt	after-tax cost of debt = $r_d \times (1 - t)$ where r_d = the before-tax cost of debt - the yield the market demands now, not the coupon on old bonds; t = the marginal tax rate Interest is deductible, so the government pays part of it. The deduction is worth nothing to a company with no taxable profit, and there the cost of debt is the full rate.

CI.3.c · Work out the cost of both common and preferred equity

How is the cost of preferred equity calculated?	Fixed dividend $\div$ current price, a perpetuity calculation.
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How does CAPM estimate the cost of common equity?	Risk-free rate + beta × equity risk premium.
What is the dividend discount approach to the cost of common equity?	Rearranging the Gordon growth model: expected dividend yield + growth rate.
Why is equity more expensive than debt?	Dividends are not tax-deductible and equity ranks behind debt.
Cost of preferred stock	$rp = Dp \div Pp$ where Dp = the fixed preferred dividend per share; Pp = the current market price of the preferred share A perpetuity, because the dividend is fixed and has no end date. There is no tax adjustment: preferred dividends are paid out of after-tax profit, unlike interest.
Required return from the capital asset pricing model	$\text{required return} = rf + \beta \times (\text{market return} - rf)$ where rf = the risk-free rate, usually a long government bond; β = the asset's sensitivity to the market; market return = the expected return on the market portfolio Used as the cost of common equity in a WACC. The bracket is the equity risk premium - the extra the market pays for bearing risk that cannot be diversified away. Beta prices only that part; risk specific to one company earns nothing, because a holder can diversify it away for free.

CI.3.d · Explain break points and how the marginal cost of capital changes at them

Why is the weighted average cost of capital not constant?	Cheap sources are used first, so raising more capital eventually means raising it more expensively.
What is a break point?	The amount of new capital at which one source is exhausted and the marginal cost steps up.
Give examples of cheap sources used before dearer ones.	Retained earnings before new equity issuance, and an existing credit facility before new bonds.
Against what should a project be judged?	The marginal cost of funding it, not the average cost of capital already in place.
Break point in the marginal cost of capital	$\text{break point} = C \div w$ where C = the amount of a source of capital available before its cost rises; w = that source's weight in the target capital structure The total new capital a company can raise before the WACC steps up. It is where the marginal cost of capital schedule breaks, and a project's acceptance can turn on which side of it the project falls.

Capital Investments

CI.7.a · Explain the kinds of capital investment a firm makes and how it allocates capital

What are the main types of capital investment?	Maintenance spending, expansion projects, new-product investments (the widest range of outcomes) and regulatory or compliance spending that must happen regardless of return.
What stages does the capital allocation process run through?	Idea generation, analysis, authorisation and post-audit.
Which allocation step is most often skipped, and what is the cost of skipping it?	The post-audit. Without it, systematic optimism in forecasts is never detected.

CI.7.b · Work out a project's internal rate of return and net present value, and explain each

What does a positive NPV mean and how is NPV calculated?	Discount the project's incremental after-tax cash flows at the required rate and subtract the outlay. Positive means the project adds that much value in today's terms.
How is the internal rate of return defined?	It is the discount rate at which the project's NPV is zero.
When can NPV and IRR conflict, and which rule should be followed?	For mutually exclusive projects of different size or timing. Follow NPV, because it measures value added rather than a percentage.
What reinvestment assumption does IRR carry when read as a compound return?	That cash flows are reinvested at the IRR itself, which is rarely realistic.
Net present value of a project	$NPV = \sum [CF_t \div (1 + r)^t] - \text{outlay}$ where CF_t = the after-tax incremental cash flow in year t; r = the required return, usually the WACC for a project of the firm's usual risk; t = the year the cash flow arrives in; outlay = the money spent at the start Incremental cash flows only: sunk costs are ignored and opportunity costs are counted. A positive NPV is value added in today's money, which is why it is the rule to follow when it disagrees with IRR.
Internal rate of return	$\sum [CF_t \div (1 + IRR)^t] = \text{outlay}$ where CF_t = the cash flow in year t; IRR = the rate that makes the present value of the inflows equal the outlay; t = the year the cash flow arrives in; outlay = the initial investment The discount rate at which NPV is zero. It assumes cash is reinvested at the IRR itself, and it can give two answers or none when the cash flows change sign more than once.

CI.7.c · Set out frequent mistakes in capital allocation and explain real options

What are the recurring pitfalls in capital allocation?	Including sunk costs, ignoring the opportunity cost of assets the project will consume, overlooking cannibalisation of existing products, and politics that favour the most persuasive sponsor.
Are the usual allocation pitfalls technical or behavioural?	Behavioural rather than technical.
What are real options and why do they matter?	The ability to expand, abandon, defer or switch inputs. They have value that a single-scenario NPV omits.
Why might a project with a slightly negative NPV still be worth undertaking?	It may carry a valuable option to expand, whose value a single-scenario NPV leaves out.

Capital Investments and Capital Allocation

CI.7.d · Work out return on invested capital and explain what it reveals

How is ROIC calculated?	$ROIC = NOPAT \div \text{average invested capital}$, where $NOPAT = EBIT \times (1 - \text{tax rate})$.
Why is ROIC a better guide than ROE to operating performance across firms?	It is measured before financing costs, so leverage does not distort it.
How can ROIC be decomposed?	After-tax operating margin $\times$ capital turnover.
How is ROIC used in capital allocation?	Compared with the cost of capital: a spread above creates value, below destroys it.
What is economic profit?	The spread of ROIC over the cost of capital $\times$ invested capital, showing value created in absolute terms.

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