Principles of Finance

Fundamentals of capital budgeting

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Capital budgeting

- Capital budgets
  - Lists the investments that a company plans to undertake
- Capital budgeting
  - Process used to analyze alternate investments and decide which ones to accept

DCF valuation

□ Discounted Cash Flow valuation: used to **evaluate firms/projects** by discounting their future cash flows

□ Three steps when determining firm value

- Estimation of cash flows, called **Free Cash Flows**
- Estimation of the discount rate
- Estimation of the terminal value (generally equal to the PV of future cash flow for a long lived project)

□ Compute the **NPV**

Free cash flows

□ The firm or project cash flows to be discounted, also called free cash flows, are the **incremental** cash flows of the project under the assumption that it is **all equity financed**

- The effects of financing are taken into account separately (see handout 4). The rationale is that the project should be judged on its own, not on how it will be financed.

□ **Incremental cash flows**:

- The amount by which the firm's cash flows are expected to change as a result of the investment decision

□ In finance you must use cash flows rather than earnings

- You cannot spend earnings

DCF valuation

□ **Two important points**:

□ **Sunk costs** are costs that have been or will be paid regardless of the decision whether or not the investment is undertaken

- Sunk costs should not be included in the incremental cash flow analysis. For example, money that has already been spent on R&D is sunk and therefore irrelevant. The decision to continue a project should be based only on the incremental costs and benefits of the product going forward

□ **Fixed Overhead Expenses**

- Typically overhead costs are fixed and not incremental to the project and should not be included in the calculation of incremental cash flows

Earnings vs. cash flows

□ Earnings:

GLOBAL CONGLOMERATE CORPORATION

Income Statement
Year Ended December 31 (in $ million)

	2015	2014
Total sales	186.7	176.1
Cost of sales	(153.4)	(147.3)
Gross Profit	33.3	28.8
Selling, general, and administrative expenses	(13.5)	(13.0)
Research and development	(8.2)	(7.6)
Depreciation and amortization	(1.2)	(1.1)
Operating Income	10.4	7.1
Other income	—	—
Earnings Before Interest and Taxes (EBIT)	10.4	7.1
Interest income (expense)	(7.7)	(4.6)
Pretax Income	2.7	2.5
Taxes	(0.7)	(0.6)
Net Income	2.0	1.9
Earnings per share:	$0.556	$0.528
Diluted earnings per share:	$0.526	$0.500

Earnings vs. cash flows

□ Assuming you have correctly forecasted earnings (i.e. costs and benefits, you can go from earnings to cash flows as follows:

Free cash flow =	EBIT
–	EBIT x Tax rate
–	Change in working capital
+	Depreciation and amortization
–	Capital expenditures
+	Sales of capital assets
–	Realized capital gains
+	Realized capital losses

Earnings vs. cash flows

□ Why do we make these adjustments?

□ Principles governing **accounting earnings measurement**

1. Show revenues when products and services are sold or provided, not when they are paid for (adjustment ⇔ ΔWC)

2. Show expenses associated with these revenues rather than cash expenses (adjustment ⇔ ΔWC)

3. Only expenses associated with creating revenues in the current period should be treated as operating expenses. Expenses that create benefits over several periods are written off over multiple period (adjustment ⇔ depreciation and capital expenditure)

More on capital expenditures (adjustment 3)

□ Suppose you buy a factory with a price of 80 and an expected lifetime of 4 years

More on the working capital (adjustments 1 and 2)

□ Definition

$$\begin{aligned}\text{Net Working Capital} &= \text{Current Assets} - \text{Current Liabilities} \\ &= \text{Cash} + \text{Inventory} + \text{Receivables} - \text{Payables}\end{aligned}$$

□ **Note**: The cash included in net working capital is cash that is not invested to earn a market rate of return (i.e. wasting cash) but is necessary to run the business (see below)

□ To determine the free cash flow, we need to know the change in net working capital (denoted by ΔWC), i.e. how much has been mobilized **this period** to run the business

□ If $\Delta WC > 0$, the firm is mobilizing additional resources this period, which *reduces the Free Cash Flow* (i.e. what can be paid out)

More on the working capital (adjustments 1 and 2)

□ For example if a shoe manufacturer produces shoes for $600 but increases its inventory by $200 then the cash flow is:

- *Cash flow = Output - ΔWC = 600 – 200 = 400*

□ If the same shoe manufacturer also increases its account receivables by $100 then the cash flow is:

- *Cash flow = Output - ΔWC = 600 – 200 – 100 = 300*

□ Lastly, if account payables increase by $150, the cash flow is:

- *Cash flow = Output - ΔWC = 600 – 200 – 100 + 150 = 450*

More on the working capital

□ **Example**: Suppose you start in year 0 a firm which is expected to produce the following cash flows: 100 in year 1, 150 in year 2, 200 in year 3 and 150 in year 4.

The company estimates that cash requirements will be 5% of sales, inventory will be 7% of sales, receivables will be 10% of sales, and payables will be 8% of sales

Assume you recover the working capital in year 5. Compute the change in working capital in each year.

More on the working capital

□ **Solution**:

Year	0	1	2	3	4	5
Sales	0	100	150	200	150	0
Cash	0	5	7.5	10	7.5	0
Inventory	0	7	10.5	14	10.5	0
Receivables	0	10	15	20	15	0
Payables	0	8	12	16	12	0
WC	0	14	21	28	21	0
ΔWC	**0**	**14**	**7**	**7**	**-7**	**-21**

More on asset sales

□ Asset sales example

Earnings vs. cash flows

- To translate EBIT into cash flows, note that EBIT is
  - Reduced by depreciation and amortization, which affects earnings but not cash flows ⇒ Need to **add back depreciation and amortization**
  - Not affected by new investment in working capital ⇒ Need to **substract the change in working capital**
  - Not affected by purchases of capital assets ⇒ Need to **substract the cost of investment** (CAPEX)
  - Not affected by the sale of capital assets, except when such sales generate capital gains and losses ⇒ Need to **add back the proceeds from the asset sales and realized capital losses** and to **substract realized capital gains**
  - Computed before tax ⇒ Need to **substract taxes**

Earnings vs. cash flows

- To go from earnings to free cash flows:

Free cash flow =	EBIT
–	EBIT x Tax rate
–	Change in working capital
+	Depreciation and amortization
–	Capital expenditures
+	Sales of capital assets
–	Realized capital gains
+	Realized capital losses

Example

□ Linksys has completed a $300,000 feasibility study to assess the attractiveness of a new product, HomeNet. The project has an estimated life of four years

□ Revenue estimates

- Sales = 100,000 units/year
- Per Unit Price = $260

□ Costs estimates

- Up-Front R&D = $15,000,000
- Up-Front New Equipment = $7,500,000. Expected life is 5 years. Housed in existing lab
- Annual Overhead = $3,000,000
- Per unit cost = $110

Example

□ The $7.5 million in new equipment is a cash expense, but it is not directly listed as an expense when calculating earnings. Instead, the firm deducts a fraction of the cost of these items each year as depreciation

□ Straight line depreciation

- The asset's cost is divided equally over its life
- Annual depreciation = $\frac{7{,}5\ million}{5} = \$1{,}5 million\ per\ year$

Example

- Project externalities
  - Indirect effects of the project that may affect the profits of other business activities of the firm. **Cannibalization** is when sales of a new product displaces sales of an existing product
  - In the HomeNet project, suppose 25% of sales come from customers who would have purchased an existing Linksys product if HomeNet were not available
  - Because this reduction in sales of the existing product is a consequence of the decision to develop HomeNet, we must include it when calculating HomeNet's incremental earnings. Assume that this good has a price of $100, a production cost of $60, and sales of 100'000 units per year

Example

	Year	0	1	2	3	4	5
Incremental Earnings Forecast ($000s)							
1	Sales	—	23,500	23,500	23,500	23,500	—
2	Cost of Goods Sold	—	(9,500)	(9,500)	(9,500)	(9,500)	—
3	**Gross Profit**	—	14,000	14,000	14,000	14,000	—
4	Selling, General, and Administrative	—	(3,000)	(3,000)	(3,000)	(3,000)	—
5	Research and Development	(15,000)	—	—	—	—	—
6	Depreciation	—	(1,500)	(1,500)	(1,500)	(1,500)	(1,500)
7	**EBIT**	(15,000)	9,500	9,500	9,500	9,500	(1,500)
8	Income Tax at 40%	6,000	(3,800)	(3,800)	(3,800)	(3,800)	600
9	**Unlevered Net Income**	**(9,000)**	**5,700**	**5,700**	**5,700**	**5,700**	**(900)**

Example: From earnings to Free Cash Flow

□ Capital expenditures and depreciation

- Capital Expenditures are the actual cash outflows when an asset is purchased. **These cash outflows are included in calculating free cash flow**
- Depreciation is a non-cash expense. The free cash flow estimate is adjusted for this non-cash expense

□ The $7.5 million in new equipment is a cash expense, but it is not directly listed as an expense when calculating earnings. Instead, the firm deducts a fraction of the cost of these items each year as depreciation. **We need to make adjustments when determining the free cash flows**

Example: From earnings to Free Cash Flow

□ Suppose in addition that the working capital requirements for the HomeNet are as follows

	Year	0	1	2	3	4	5
Net Working Capital Forecast ($000s)							
1	Cash Requirements	—	—	—	—	—	—
2	Inventory	—	—	—	—	—	—
3	Receivables (15% of Sales)	—	3,525	3,525	3,525	3,525	—
4	Payables (15% of COGS)	—	(1,425)	(1,425)	(1,425)	(1,425)	—
5	**Net Working Capital**	**—**	**2,100**	**2,100**	**2,100**	**2,100**	**—**

Example

□ Using these data, we can compute Home Net free cash flows

	Year	0	1	2	3	4	5
Incremental Earnings Forecast ($000s)							
1	Sales	—	23,500	23,500	23,500	23,500	—
2	Cost of Goods Sold	—	(9,500)	(9,500)	(9,500)	(9,500)	—
3	**Gross Profit**	—	14,000	14,000	14,000	14,000	—
4	Selling, General, and Administrative	—	(3,000)	(3,000)	(3,000)	(3,000)	—
5	Research and Development	(15,000)	—	—	—	—	—
6	Depreciation	—	(1,500)	(1,500)	(1,500)	(1,500)	(1,500)
7	**EBIT**	(15,000)	9,500	9,500	9,500	9,500	(1,500)
8	Income Tax at 40%	6,000	(3,800)	(3,800)	(3,800)	(3,800)	600
9	**Unlevered Net Income**	**(9,000)**	**5,700**	**5,700**	**5,700**	**5,700**	**(900)**
Free Cash Flow ($000s)							
10	Plus: Depreciation	—	1,500	1,500	1,500	1,500	1,500
11	Less: Capital Expenditures	(7,500)	—	—	—	—	—
12	Less: Increases in NWC	—	(2,100)	—	—	—	2,100
13	**Free Cash Flow**	**(16,500)**	**5,100**	**7,200**	**7,200**	**7,200**	**2,700**

Example

□ Suppose that Home Net has cost of equity of 12%

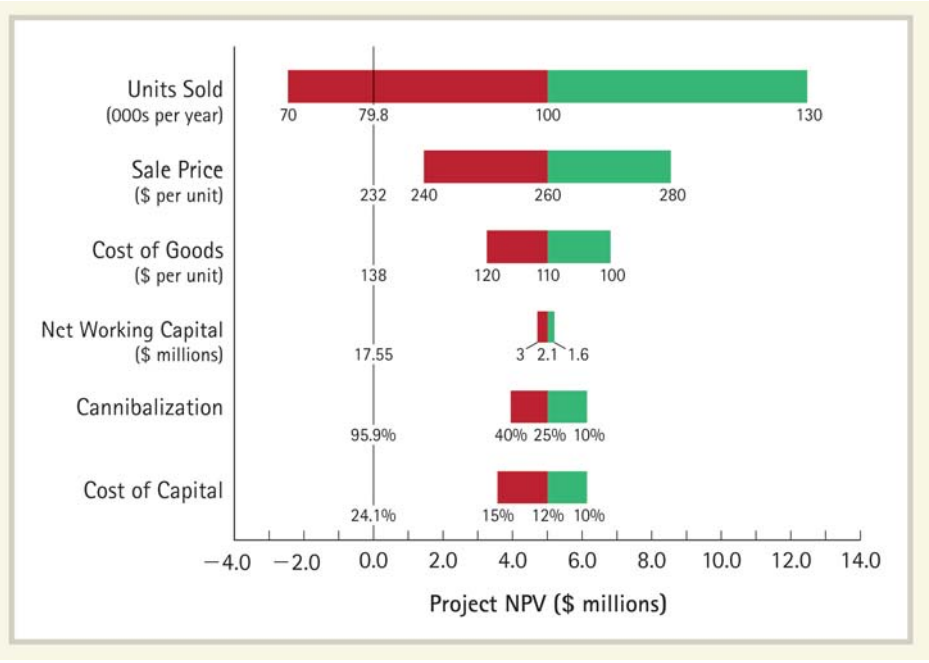
□ The NPV is

	Year	0	1	2	3	4	5
NPV ($000s) and IRR							
1	Free Cash Flow	(16,500)	5,100	7,200	7,200	7,200	2,700
2	NPV at 12%	5,027					
3	IRR	24.1%					

Sensitivity analysis

Parameter	Break-Even Level
Units sold	79,759 units per year
Wholesale price	$232 per unit
Cost of goods	$138 per unit
Cost of capital	24.1%

Sensitivity analysis



Salvage value

Adding Salvage Value to Free Cash Flow

Problem

Suppose that in addition to the $7.5 million in new equipment required for HomeNet, some equipment will be transferred to the lab from another Linksys facility. This equipment has a resale value of $2 million and a book value of $1 million. If the equipment is kept rather than sold, its remaining book value can be depreciated next year. When the lab is shut down in year 5, the equipment will have a salvage value of $800,000. What adjustments must we make to HomeNet's free cash flow in this case?

Solution

The existing equipment could have been sold for $2 million. The after-tax proceeds from this sale are an opportunity cost of using the equipment in the HomeNet lab. Thus, we must reduce HomeNet's free cash flow in year 0 by the sale price less any taxes that would have been owed had the sale occurred: $2 million − 40% × ($2 million − $1 million) = $1.6 million.

In year 1, the remaining $1 million book value of the equipment can be depreciated, creating a depreciation tax shield of 40% × $1 million = $400,000. In year 5, the firm will sell the equipment for a salvage value of $800,000. Because the equipment will be fully depreciated at that time, the entire amount will be taxable as a capital gain, so the after-tax cash flow from the sale is $800,000 × (1 − 40%) = $480,000.

The spreadsheet below shows these adjustments to the free cash flow from the spreadsheet in Table 8.3 and recalculates HomeNet's free cash flow and NPV in this case.

	Year	0	1	2	3	4	5
Free Cash Flow and NPV ($000s)							
1	Free Cash Flow w/o equipment	(16,500)	5,100	7,200	7,200	7,200	2,700
	Adjustments for use of existing equipment						
2	After-Tax Salvage Value	(1,600)	—	—	—	—	480
3	Depreciation Tax Shield	—	400	—	—	—	—
4	**Free Cash Flow with equipment**	**(18,100)**	**5,500**	**7,200**	**7,200**	**7,200**	**3,180**
5	**NPV at 12%**	**4,055**					

Opportunity cost

- Opportunity cost
  - The value a resource could have provided in its best alternative use
  - In the HomeNet project example, space will be required for the investment. Even though the equipment will be housed in an existing lab, the opportunity cost of not using the space in an alternative way (e.g., renting it out) must be considered

Opportunity cost

The Opportunity Cost of HomeNet's Lab Space

Problem

Suppose HomeNet's new lab will be housed in warehouse space that the company would have otherwise rented out for $200,000 per year during years 1–4. How does this opportunity cost affect HomeNet's incremental earnings?

Solution

In this case, the opportunity cost of the warehouse space is the forgone rent. This cost would reduce HomeNet's incremental earnings during years 1–4 by $200,000 × (1 − 40%) = $120,000, the after-tax benefit of renting out the warehouse space.

Tax loss carryforwards and carrybacks

□ Tax loss carryforwards and carrybacks allow corporations to take losses during its current year and offset them against gains in nearby years

Tax loss carryforwards and carrybacks

Tax Loss Carryforwards

Problem

Verian Industries has outstanding tax loss carryforwards of $100 million from losses over the past six years. If Verian earns $30 million per year in pretax income from now on, when will it first pay taxes? If Verian earns an extra $5 million this coming year, in which year will its taxes increase?

Solution

With pretax income of $30 million per year, Verian will be able to use its tax loss carryforwards to avoid paying taxes until year 4 (in millions of dollars):

Year	1	2	3	4	5
Pretax Income	30	30	30	30	30
Tax Loss Carryforward	−30	−30	−30	−10	
Taxable Income	0	0	0	20	30

If Verian earns an additional $5 million the first year, it will owe taxes on an extra $5 million in year 4:

Year	1	2	3	4	5
Pretax Income	35	30	30	30	30
Tax Loss Carryforward	−35	−30	−30	−5	
Taxable Income	0	0	0	25	30

Thus, when a firm has tax loss carryforwards, the tax impact of current earnings will be delayed until the carryforwards are exhausted. This delay reduces the present value of the tax impact, and firms sometimes approximate the effect of tax loss carryforwards by using a lower marginal tax rate.

Growth and terminal value

- When evaluating a firm or a project, we typically fix a terminal date and a terminal value for the project
  - Short lived projects have a natural terminal date, which is the last date at which the project produces a cash flow
  - For firms and long-lived projects, this terminal date is set arbitrarily (e.g. year 10)
- In a project with a finite and short life, you need to compute a salvage (terminal) value
  - It is usually set equal to the sum of the book value of fixed assets and working capital

Growth and terminal value

□ In a project with an infinite or very long life, we compute a terminal value which is the present value of all cash flows that occur after the estimation period ends

□ When a firm's cash flows grow at a constant rate $g<r$ forever, the present value of those cash flows can be written as

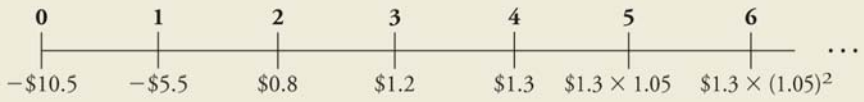
$$Value_t = \frac{E[FCF_{t+1}]}{r-g}$$

□ The constant growth rate g cannot be higher that the growth rate of the economy in which the firm operates

Growth and terminal value

Problem

Base Hardware is considering opening a set of new retail stores. The free cash flow projections for the new stores are shown below (in millions of dollars):



After year 4, Base Hardware expects free cash flow from the stores to increase at a rate of 5% per year. If the appropriate cost of capital for this investment is 10%, what continuation value in year 3 captures the value of future free cash flows in year 4 and beyond? What is the NPV of the new stores?

Growth and terminal value

Solution

The expected free cash flow from the store in year 4 is $1.30 million, with future free cash flow beyond year 4 expected to grow at 5% per year. The continuation value in year 3 of the free cash flow in year 4 and beyond can therefore be calculated as a constant growth perpetuity:

$$\text{Continuation Value in Year 3} = \text{PV(FCF in Year 4 and Beyond)}$$

$$= \frac{FCF_4}{r-g} = \frac{\$1.30 \text{ million}}{0.10 - 0.05} = \$26 \text{ million}$$

We can restate the free cash flows of the investment as follows (in thousands of dollars):

Year	0	1	2	3
Free Cash Flow (Years 0–3)	(10,500)	(5,500)	800	1,200
Continuation Value				26,000
Free Cash Flow	(10,500)	(5,500)	800	27,200

The NPV of the investment in the new stores is

$$NPV = -10{,}500 - \frac{5500}{1.10} + \frac{800}{1.10^2} + \frac{27{,}200}{1.10^3} = \$5597$$

or $5.597 million.

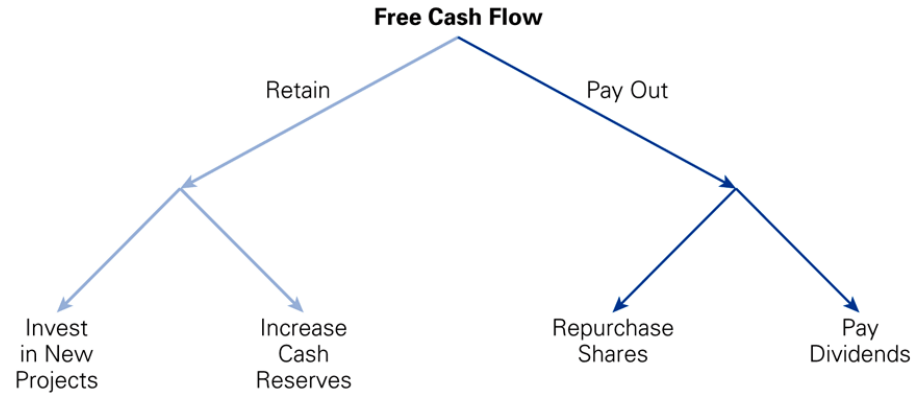
Expected growth in EBIT

□ When determining a terminal value for a long-lived project or a firm, we need to make a number of assumptions regarding future cash flows and their growth rate

□ How can we estimate this growth rate?

⇔ All growth in earnings can be traced back to two fundamentals – how much the firm is investing and what returns these projects are making for the firm

Expected growth in EBIT



Expected growth in EBIT

□ For growth in operating income, the definitions are

Reinvestment rate = (Net CAPEX + Δ WC) / Ebit (1-t)

Return on invested capital = ROIC = EBIT (1-t) / BV Assets

□ We also have

$$g_{EBIT} = \text{Reinvestment rate} \times \text{ROIC}$$

□ Suppose that the EBIT of Disney is 6020, its tax rate is 36% and the book value of its assets is 19331.

ROIC at Disney = EBIT (1-t) / BV Assets

= 6020 (1-0.36) / 19331 = 19.93%

Expected growth in EBIT

- Example: Suppose Hansol Paper has the following data
  - Net CAPEX = 105'000'000
  - Change in WC = 1'000'000
  - EBIT = 109'569'000
  - Tax rate = 30%
  - BV Assets = 1'134'580'000
- What is the expected growth in EBIT?
  - Reinvestment rate = (105000 + 1000) /(109569 × 0.7) = 1.382
  - ROIC = 109569 × 0.7 / 1134580 = 6.76%
  - g_{EBIT} = 6.76% × 1.382 = 9.35%

Dividends vs reinvestment

- Crane Sporting Goods expects to have earnings per share of $6 in the coming year
- Rather than reinvest these earnings and grow, the firm plans to pay out all of its earnings as a dividend. With these expectations of no growth, Crane's current share price is $60.
- Suppose Crane could cut its dividend payout rate to 75% for the foreseable future and use the retained earnings to open new stores. The return on investment (ROIC) in these stores is 12%
- Assuming its equity cost of capital is unchanged, what effect would this policy have on Crane's stock price?

Solution

First, let's estimate Crane's equity cost of capital. Currently, Crane plans to pay a dividend equal to its earnings of $6 per share. Given a share price of $60, Crane's dividend yield is $6 / $60 = 10%. With no expected growth ($g = 0$), we can use Eq. 9.7 to estimate r_E:

$$r_E = \frac{Div_1}{P_0} + g = 10\% + 0\% = 10\%$$

In other words, to justify Crane's stock price under its current policy, the expected return of other stocks in the market with equivalent risk must be 10%.

Next, we consider the consequences of the new policy. If Crane reduces its dividend payout rate to 75%, then from Eq. 9.8 its dividend this coming year will fall to $Div_1 = EPS_1 \times 75\% = \$6 \times 75\% = \$4.50$. At the same time, because the firm will now retain 25% of its earnings to invest in new stores, from Eq. 9.12 its growth rate will increase to

$$g = \text{Retention Rate} \times \text{Return on New Investment} = 25\% \times 12\% = 3\%$$

Assuming Crane can continue to grow at this rate, we can compute its share price under the new policy using the constant dividend growth model of Eq. 9.6:

$$P_0 = \frac{Div_1}{r_E - g} = \frac{\$4.50}{0.10 - 0.03} = \$64.29$$

Thus Crane's share price should rise from $60 to $64.29 if it cuts its dividend to increase investment and growth, implying the investment has positive NPV.

Dividends vs reinvestment

□ Suppose Crane could cut its dividend payout rate to 75% for the foreseable future and use the retained earnings to open new stores. The return on investment in these stores is **8%**

□ Assuming its equity cost of capital is unchanged, what effect would this policy have on Crane's stock price?

More on the valuation of stocks

□ In the **total payout model** (see handout 1), we valued the firm's equity, rather than just a single share

□ The **discounted free cash flow model** goes one step further and begins by determining the total value of the firm to all investors – both *equity* and *debt* holders

□ In this model, the entreprise value of the firm is given by

$$V_0 = PV(\text{Future Free Cash Flow of Firm})$$

and the share price satisfies

$$P_0 = \frac{V_0 + \text{Cash}_0 - \text{Debt}_0}{\text{Shares Outstanding}_0}$$

More on the valuation of stocks

□ A key difference between the discounted free cash flow model and the earlier models is the **discount rate**

□ In the previous calculations, we used the firm's equity cost of capital r_E, because we were discounting the cash flows to equity holders

□ In this new model, we should use the firm's **weighted average cost of capital** (**WACC**), denoted by r_{wacc}

- It is the cost of capital that reflects the risk of the overall business, which is the **combined risk of the firm's equity and debt**

More on the valuation of stocks

□ Given the firm's weighted average cost of capital, we have

$$V_0 = \frac{FCF_1}{1 + r_{wacc}} + \frac{FCF_2}{(1 + r_{wacc})^2} + \cdots + \frac{FCF_N}{(1 + r_{wacc})^N} + \frac{V_N}{(1 + r_{wacc})^N}$$

□ Often the terminal value is estimated by assuming a constant long-run growth rate for the free cash flows beyond year N, so that

$$V_N = \frac{FCF_{N+1}}{r_{wacc} - g_{FCF}} = \left(\frac{1 + g_{FCF}}{r_{wacc} - g_{FCF}}\right) \times FCF_N$$

More on the valuation of stocks

Problem

Kenneth Cole's (KCP) had sales of $518 million in 2005. Suppose you expect its sales to grow at a 9% rate in 2006, but that this growth rate will slow by 1% per year to a long-run growth rate for the apparel industry of 4% by 2011. Based on KCP's past profitability and investment needs, you expect EBIT to be 9% of sales, increases in net working capital requirements to be 10% of any increase in sales, and capital expenditures to equal depreciation expenses. If KCP has $100 million in cash, $3 million in debt, 21 million shares outstanding, a tax rate of 37%, and a weighted average cost of capital of 11%, what is your estimate of the value of KCP's stock in early 2006?

Solution

We can estimate KCP's future free cash flow based on the estimates above as follows:

	Year	2005	2006	2007	2008	2009	2010	2011
FCF Forecast ($ million)								
1	Sales	518.0	564.6	609.8	652.5	691.6	726.2	755.3
2	*Growth versus Prior Year*		*9.0%*	*8.0%*	*7.0%*	*6.0%*	*5.0%*	*4.0%*
3	EBIT (9% of sales)		50.8	54.9	58.7	62.2	65.4	68.0
4	Less: Income Tax (37%)		(18.8)	(20.3)	(21.7)	(23.0)	(24.2)	(25.1)
5	Plus: Depreciation		–	–	–	–	–	–
6	Less: Capital Expenditures		–	–	–	–	–	–
7	Less: Inc. in NWC (10% ΔSales)		(4.7)	(4.5)	(4.3)	(3.9)	(3.5)	(2.9)
8	Free Cash Flow		27.4	30.1	32.7	35.3	37.7	39.9

Note that because captial expenditures are expected to equal depreciation, lines 5 and 6 in the spreadsheet cancel out, and so we can set them both to zero rather than explicitly forecast them. Because we expect KCP's free cash flow to grow at a constant rate after 2011, we can use Eq. 9.22 to compute a terminal enterprise value:

$$V_{2011} = \left(\frac{1 + g_{FCF}}{r_{wacc} - g_{FCF}}\right) \times FCF_{2011} = \left(\frac{1.04}{0.11 - 0.04}\right) \times 39.9 = \$592.8 \text{ million}$$

From Eq. 9.21, KCP's current enterprise value is the present value of its free cash flows plus terminal value:

$$V_0 = \frac{27.4}{1.11} + \frac{30.1}{1.11^2} + \frac{32.7}{1.11^3} + \frac{35.3}{1.11^4} + \frac{37.7}{1.11^5} + \frac{39.9}{1.11^6} + \frac{592.8}{1.11^6} = \$456.9 \text{ million}$$

We can now estimate the value of a share of KCP's stock using Eq. 9.20:

$$P_0 = \frac{456.9 + 100 - 3}{21} = \$26.38$$

The value of cash

□ Kenneth Cole's, like many firms, has investments in cash and near cash investments (riskfree bonds, …)

□ Firms hold cash for many reasons:

- **Operations**: Some cash may be needed for operations; a retail firm will have cash in its cash registers.
- **Precautionary motive**: Firms hold cash just in case they may need to draw on it in the event of a crisis
- **Speculation**: Just in case a great investment opportunity comes along

□ Since cash is so different from other operating assets in terms of risk and returns, valuing it becomes a challenge

The value of cash

□ There are two general ways of dealing with cash:

- Value it separately from the other assets (what we just did)
- Incorporate it into cash flows and value it with other assets

□ The simplest way of dealing with cash and marketable securities is to keep it out of the valuation

- The cash flows should be before interest income from cash and securities and the discount rate should not be contaminated by the inclusion of cash

□ Once the entreprise value of the firm has been determined, we add back the value of cash and marketable securities and subtract out gross debt. (This is equivalent to subtracting out net debt.)

The value of cash

□ Some practitioners draw a distinction between what they call operating cash and excess cash

□ Operating cash is usually defined as a percent of revenues (based either on industry averages or rules of thumb) and is considered to be required for operations. Thus, it is included in the working capital and acts as a drain on the cash flows

□ It is only the excess cash that is added on to the DCF value of operating assets

□ **The discussion** of whether cash is operating or non-operating **misses the point**. The real distinction should be between wasting and non-wasting cash.

The value of cash

□ As long as cash is invested to earn a fair market rate (given the risk of the investment), it is not wasting cash. It is irrelevant whether it is needed for operations or not

□ It is difficult, from the outside, to estimate how much cash in a firm is wasting and how much is non-wasting

□ Two solutions

- Assume that any reasonably competent treasury department would not let large cash balances go uninvested. This leads us to conclude that no cash will be wasting cash
- **Or** divide the interest income earned by the average cash balance during the year and to compare this rate to the rate on a short-term government security

The value of cash

□ Example

- Interest income for year: $3 million
- Average cash balance: $150 million
- Interest rate earned: 3/150 =2%
- Riskfree rate during the year: 3%
- Wasting cash for year: $150 - \frac{2\%}{3\%} \times 150 = \$50\ million$

□ Only the non-wasting cash should be added back to the value of the operating assets to arrive at firm value

□ The wasting cash should become part of working capital. As revenues increase, the wasting cash balance will increase proportionately and reduce value

Summarizing the inputs

- In summary, at this stage, we should have an estimate of:
  - The current cash flows on the investment, either to the firm (free cash flows to the firm) or to equity investors (free cash flows to equity; see handout 4)
  - The current cost of equity and/or capital on the investment
  - The expected growth rate in earnings, based upon historical growth, analysts forecasts and/or fundamentals
- The next step in the process is deciding (next handout)
  - Which cash flow to discount
  - Which discount rate needs to be estimated
  - What pattern we will assume growth to follow

More on the valuation of stocks

- Alternative to FCF Analysis: **Method of comparables**
  - Estimate the value of the firm based on the value of other, comparable firms or investments that we expect will generate very similar cash flows in the future
- **Valuation Multiple**:
  - A ratio of firm's value to some measure of the firm's scale or cash flow
- The *Price-Earnings (PE) Ratio*
  - Share price divided by earnings per share

More on the valuation of stocks

□ Footwear industry, January 2006

Ticker	Name	Stock Price ($)	Market Capitalization ($ millions)	Enterprise Value ($ millions)	P/E	Price/ Book	Enterprise Value/ Sales	Enterprise Value/ EBITDA
KCP	Kenneth Cole Productions	26.75	562	465	16.21	2.22	0.90	8.36
NKE	NIKE, Inc.	84.20	21,830	20,518	16.64	3.59	1.43	8.75
PMMAY	Puma AG	312.05	5,088	4,593	14.99	5.02	2.19	9.02
RBK	Reebok International	58.72	3,514	3,451	14.91	2.41	0.90	8.58
WWW	Wolverine World Wide	22.10	1,257	1,253	17.42	2.71	1.20	9.53
BWS	Brown Shoe Company	43.36	800	1,019	22.62	1.91	0.47	9.09
SKX	Skechers U.S.A.	17.09	683	614	17.63	2.02	0.62	6.88
SRR	Stride Rite Corp.	13.70	497	524	20.72	1.87	0.89	9.28
DECK	Deckers Outdoor Corp.	30.05	373	367	13.32	2.29	1.48	7.44
WEYS	Weyco Group	19.90	230	226	11.97	1.75	1.06	6.66
RCKY	Rocky Shoes & Boots	19.96	106	232	8.66	1.12	0.92	7.55
DFZ	R.G. Barry Corp.	6.83	68	92	9.20	8.11	0.87	10.75
BOOT	LaCrosse Footwear	10.40	62	75	12.09	1.28	0.76	8.30
			Average (excl. KCP)		**15.01**	**2.84**	**1.06**	**8.49**
			Max (relative to Ave.)		+51%	+186%	+106%	+27%
			Min (relative to Ave.)		−42%	−61%	−56%	−22%

More on the valuation of stocks

Valuation Using an Enterprise Value Multiple

Problem

Suppose Rocky Shoes and Boots (RCKY) has earnings per share of $2.30 and EBITDA of $30.7 million. RCKY also has 5.4 million shares outstanding and debt of $125 million (net of cash). You believe Deckers Outdoor Corporation is comparable to RCKY in terms of its underlying business, but Deckers has no debt. If Deckers has a P/E of 13.3 and an enterprise value to EBITDA multiple of 7.4, estimate the value of RCKY's shares using both multiples. Which estimate is likely to be more accurate?

More on the valuation of stocks

Solution

Using Decker's P/E, we would estimate a share price for RCKY of $P_0 = \$2.30 \times 13.3 = \$30.59$. Using the enterprise value to EBITDA multiple, we would estimate RCKY's enterprise value to be $V_0 = \$30.7$ million $\times 7.4 = \$227.2$ million. We then subtract debt and divide by the number of shares to estimate RCKY's share price: $P_0 = (227.2 - 125)/5.4 = \$18.93$. Because of the large difference in leverage between the firms, we would expect the second estimate, which is based on enterprise value, to be more reliable.

More on the valuation of stocks

□ When valuing a firm using multiples, there is no clear guidance about how to adjust for differences in expected future growth rates, risk, or differences in accounting policies

□ Comparables only provide information regarding the value of a firm relative to other firms in the comparison set:

- Using multiples will not help us determine if an entire industry is overvalued

□ Discounted cash flows methods have the advantage that they can incorporate specific information about the firm's cost of capital or future growth

Other investment rules

□ The NPV of any individual project represents its contribution to firm value

- To maximize firm value, firms should take all positive NPV projects

□ Managers often use criteria other than NPV when evaluating investment projects

- Although these alternative criteria have intuitive appeal, they are generally **ad hoc and can lead to poor investment decisions**

Other investment rules

□ Researchers at Fredrick Feed and Farm (FFF) have found how to produce a better fertilizer

□ The fertilizer will require a new plant that can be built immediately at a cost of $250 million. The benefits of the new fertilizer will be $35 million per year starting at the end of the first year and lasting forever

□ The NPV of this project, given a discount rate *r*, is then

$$NPV = -250 + \frac{35}{r}$$

The internal rate of return

□ The **internal rate of return** (**IRR**) investment rule is based on an intuitive notion:

- If the return of the investment you are considering is greater than the cost of capital, you should undertake this investment opportunity

□ Investment rules with the IRR

- With mutually exclusive projects, take the project with the highest IRR
- With non-mutually exclusive projects, take projects with an IRR greater than the opportunity cost of capital

The internal rate of return

□ The IRR of a project is **the discount rate that makes the *NPV = 0***

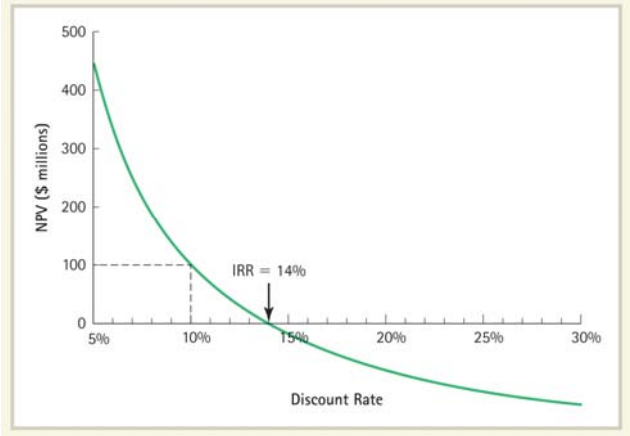
□ In our example, it is thus defined by

$$0 = -250 + \frac{35}{IRR}$$

□ The IRR investment rule will give the correct answer (i.e. the same answer as the NPV rule) in many - but not all – situations

□ In general, the IRR rule works for a stand alone project if the project's negative cash flows precede its positive cash flows.

The internal rate of return



The graph shows the NPV as a function of the discount rate. The NPV is positive only for discount rates that are less than 14%, the internal rate of return (IRR). Given the cost of capital of 10%, the project has a positive NPV of $100 million.

The internal rate of return

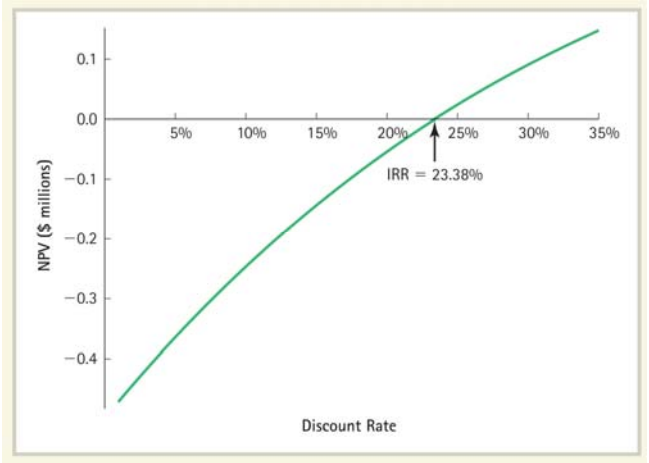
□ Let's examine situations in which the IRR rule fails

□ John Star has just retired as a CEO. A major publisher has offered him a $1 million «How I dit it» book deal

□ John Star will receive $1 million upfront. However, he estimates that the time he will spend writing will cause him to forgo alternative sources of income amounting to $500,000 per year for three years

□ Considering the risk of his alternative sources of income, Star estimates the opportunity cost of capital to be 10%

The internal rate of return



When the benefits of an investment occur before the costs, the NPV is an *increasing* function of the discount rate.

According to the IRR rule Star should write the book. The NPV rule and the IRR rule give opposite recommendations

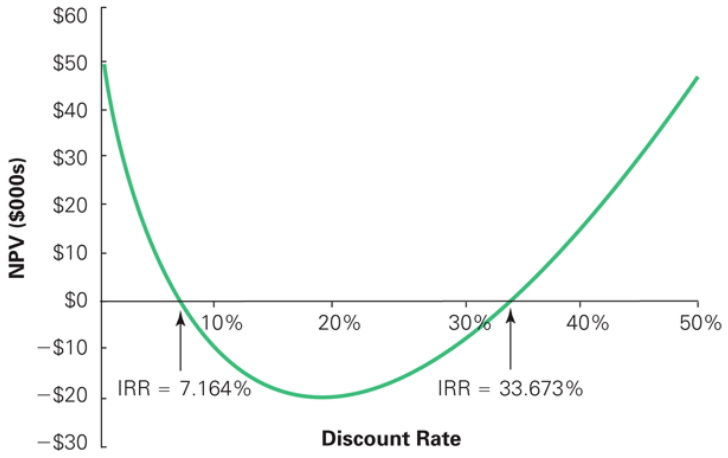
The internal rate of return

□ Suppose Star informs the publisher that it needs to sweeten the deal before he will accept it

□ In response, the publisher offers $550,000 advance and $1,000,000 in four years when the book is published

$$NPV = 550 - \frac{500}{0{,}1}\left(1 - \frac{1}{1{,}1^3}\right) + \frac{1000}{1{,}1^4}$$

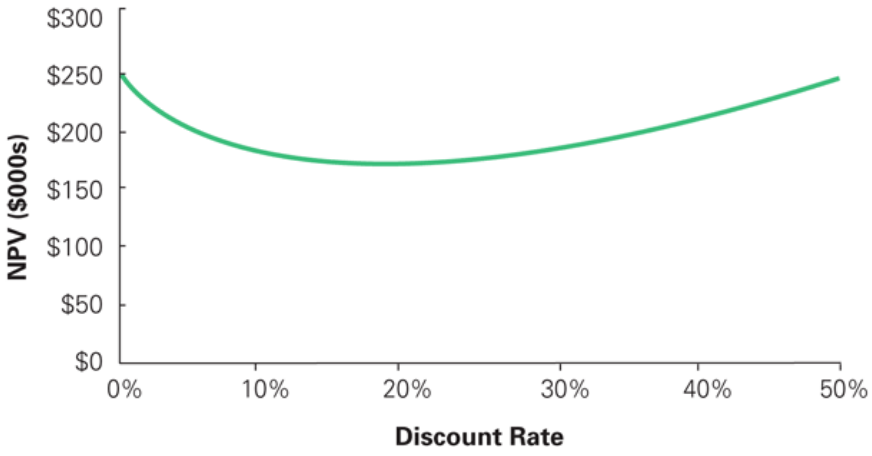
The internal rate of return



By setting the NPV equal to zero and solving for *r*, we find the IRR. In this case, there are two IRRs: 7.164% and 33.673%. Because there is more than one IRR, the IRR rule cannot be applied

The internal rate of return

□ Finally, Star is able to get the publisher to increase his advance to $750,000, in addition to the $1 million when the book is published in four years. With these cash flows, no IRR exists; there is no discount rate that makes NPV equal to zero



The internal rate of return

□ Takeaway: the IRR rule may disagree with the NPV rule and thus be incorrect

□ While the IRR rule has shortcomings for making investment decisions, the IRR itself remains useful

- IRR measures the average return of the investment

The internal rate of return

□ Sometimes, a firm must choose one project among several possible projects. For example, a manager may be evaluating alternative marketing campaigns for a new product

□ When projects are **mutually exclusive**, it is not enough to determine which project has positive NPV. One has to find the project that has the highest NPV

□ By contrast, picking the project with the highest IRR can lead to mistakes

- Problems arise when the mutually exclusive investments have differences in scale and when they have different cash flow patterns

The internal rate of return

□ If a project has a positive NPV, then if we can double its size, its NPV will double (law of one price)

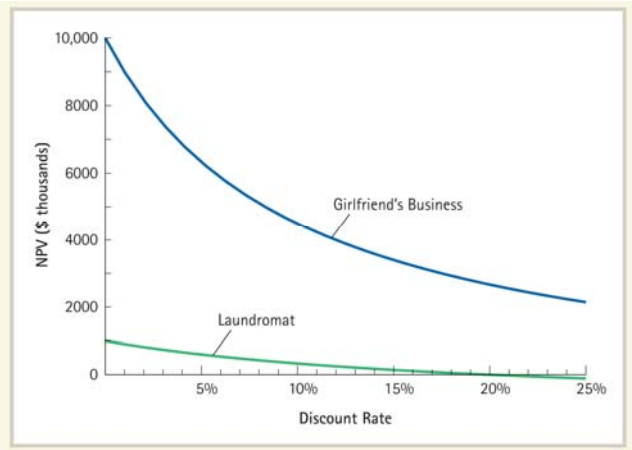
- The IRR does not have this property

□ Consider two mutually exclusive projects with the same scale and cost of capital of 12%.

Don is evaluating two investment opportunities. If he went into business with his girlfriend, he would need to invest $1000 and the project would generate incremental cash flows of $1100 per year, declining at 10% forever

Alternatively, he could start a single-machine laundromat. This would cost $1000 and would generate incremental cash flows of $400 per year, declining at 20% forever

The internal rate of return



The NPV of his girlfriend's business is always larger than the NPV of the single-machine laundromat. The same is true for the IRR; the IRR of his girlfriend's business is 100%, while the IRR for the laundromat is 20%.

The internal rate of return

□ What happens if we change the scale of the project?

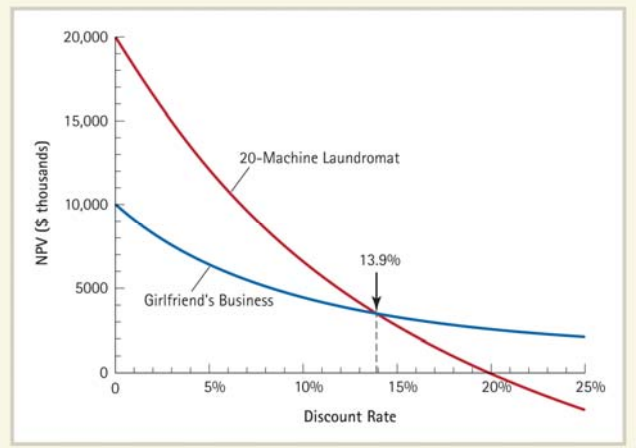
□ Suppose for example that given the space available in the facility, Don could install 20 machines in the landromat

□ Note that the IRR is unaffected by the scale (it is still 20% and lower than that of the girlfriend's project). However the NPV of the project does grow by the scale: It is 20 times larger

$$NPV = 20\left(-1000 + \frac{4000}{0{,}12 + 0{,}20}\right) = 5000$$

□ Now Don should invest in the 20-machine laundromat, which is not what the IRR rule would predict. **What matters is not your return but how much value you create.**

The internal rate of return



As in the previous figure, the IRR of his girlfriend's business is 100%, while the IRR for the laundromat is 20%. But in this case, the NPV of his girlfriend's business is larger than the NPV of the 20-machine laundromat **only** for discount rates in excess of 13.9%.

Incremental IRR

□ When choosing between two projects, an alternative to computing their IRRs is to compute the **incremental IRR**, which is the IRR of the incremental cash flows that would result form replacing one project with the other

□ Apply the IRR rule to the difference between the cash flows of the two mutually exclusive alternatives (the increment to the cash flows of one investment over the other)

Incremental IRR

Using the Incremental IRR to Compare Alternatives

Problem

Your firm is considering overhauling its production plant. The engineering team has come up with two proposals, one for a minor overhaul and one for a major overhaul. The two options have the following cash flows (in millions of dollars):

Proposal	0	1	2	3
Minor Overhaul	−10	6	6	6
Major Overhaul	−50	25	25	25

What is the IRR of each proposal? What is the incremental IRR? If the cost of capital for both of these projects is 12%, what should your firm do?

Incremental IRR

□ The IRR for the minor overhaul is 36,3% and solves

$$-10 + \frac{6}{1 + IRR} + \frac{6}{(1 + IRR)^2} + \frac{6}{(1 + IRR)^3} = 0$$

□ The IRR for the major overhaul is 23,4% and solves

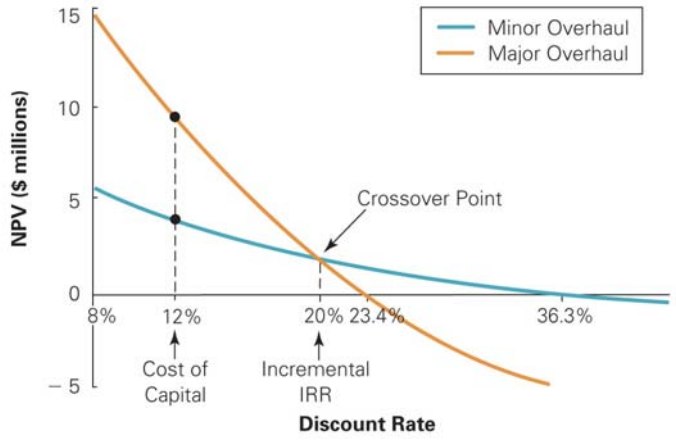
$$-50 + \frac{25}{1 + IRR} + \frac{25}{(1 + IRR)^2} + \frac{25}{(1 + IRR)^3} = 0$$

□ The incremental IRR is 20% and solves

$$-(50 - 10) + \frac{25 - 6}{1 + IRR} + \frac{25 - 6}{(1 + IRR)^2} + \frac{25 - 6}{(1 + IRR)^3} = 0$$

□ Because the incremental IRR exceeds the 12% cost of capital, switching to the major overhaul looks attractive

Incremental IRR



Despite its lower IRR, the major overhaul has a higher NPV at the cost of capital of 12%. The incremental IRR of 20% determines the crossover point or discount rate at which the optimal decision changes

Incremental IRR

- Shortcomings of the Incremental IRR Rule
  - The incremental IRR may not exist
  - Multiple incremental IRRs could exist
  - The fact that the IRR exceeds the cost of capital for both projects does not imply that either project has a positive NPV
  - When individual projects have different costs of capital, it is not obvious which cost of capital the incremental IRR should be compared to

Payback rule

- The **payback rule** is based on the notion that an opportunity that pays back its initial investment quickly is a good idea
- To apply the payback rule, you first calculate the amount of time it takes to pay back the initial investment cost, called the **payback period**
- If the payback period is less than a prespecified length of time – usually a few years – you accept the project. Otherwise you turn it down
- The payback rule is not reliable because it ignores the time value of money and does not depend on the cost of capital

Payback rule

Problem

Assume FFF requires all projects to have a payback period of five years or less. Would the firm undertake the fertilizer project under this rule?

Solution

The sum of the cash flows from year 1 to year 5 is $\$35 \times 5 = \$175$ million, which will not cover the initial investment of \$250 million. Because the payback period for this project exceeds 5 years, FFF will reject the project.