Fundamentals of Capital Budgeting: Cash Flows

Gestão Financeira I
Gestão Financeira
Corporate Finance I
Corporate Finance

Licenciatura
2017-2018

Outline

- Forecasting Earnings
- From Earnings to Cash Flows
- Determining Free Cash Flow and NPV
- Further Adjustments to Free Cash Flow

Introduction to Capital Budgeting

- Goal: maximize the value of the assets?
- Corporate investment project – fixed assets:
  - Tangibles (e.g., new plant and equipment)
  - Intangibles (e.g., R&D, advertising)
- Cash flows matter—not accounting earnings (but earnings are a good starting point!)
  - Sunk costs do not matter
  - *Incremental* cash flows matter
  - Opportunity costs matter
  - Side effects like cannibalism and erosion matter
  - Taxes matter: we want incremental after-tax cash flows

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Forecasting Earnings

- Capital Budget

  – Lists the investments that a company plans
  to undertake

- Capital Budgeting

  – Process used to analyze alternate investments and
  decide which ones to accept

- Incremental Earnings

  – The amount by which the firm's earnings are expected
  to change as a result of the investment decision

Revenues and Costs Estimates

- 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

Revenues and Costs Estimates

- ## Example

  - Cost Estimates

    - Up-Front R&D = $15,000,000

    - Up-Front New Equipment = $7,500,000
      - Expected life of the new equipment is 5 years
      - Housed in existing lab

    - Annual Overhead = $2,800,000

    - Per Unit Cost = $110

Incremental Earnings Forecasts

- HomeNet's Incremental Earnings Forecast

Year	0	1	2	3	4	5
Incremental Earnings Forecast ($000s)						
1 Sales	—	26,000	26,000	26,000	26,000	—
2 Cost of Goods Sold	—	(11,000)	(11,000)	(11,000)	(11,000)	—
3 **Gross Profit**	—	15,000	15,000	15,000	15,000	—
4 Selling, General, and Administrative	—	(2,800)	(2,800)	(2,800)	(2,800)	—
5 Research and Development	(15,000)	—	—	—	—	
6 Depreciation	—	(1,500)	(1,500)	(1,500)	(1,500)	(1,500)
7 **EBIT**	(15,000)	10,700	10,700	10,700	10,700	(1,500)
8 Income Tax at 40%	6,000	(4,280)	(4,280)	(4,280)	(4,280)	600
9 **Unlevered Net Income**	**(9,000)**	**6,420**	**6,420**	**6,420**	**6,420**	**(900)**

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Comments...

- Capital Expenditures and Depreciation:
  - 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 = $7.5 million ÷ 5 years = $1.5 million/year

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Comments...

- Interest Expense: In capital budgeting decisions, *interest expense is typically not included*. The rationale is that the project should be judged on its own, not on how it will be financed.

- Taxes: Marginal Corporate Tax Rate
  - The tax rate on the marginal or *incremental* dollar of pre-tax income. Note: A negative tax is equal to a tax credit.

$$\text{Income Tax} = \text{EBIT} \times \tau_c$$

- Unlevered Net Income Calculation:

$$\text{Unlevered Net Income} = \text{EBIT} \times (1 - \tau_c)$$
$$= (\text{Revenues} - \text{Costs} - \text{Depreciation}) \times (1 - \tau_c)$$

Indirect Effects on Incremental Earnings

- Opportunity Cost: The value a resource could have provided in its best alternative use.

- HomeNet example: 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.

  - 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.

  - This represents an Incremental loss per year, after tax, of: $200,000*(1-40%)=$120,000.

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Indirect Effects on Incremental Earnings

- 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.

  - Likewise, some new projects may help promoting sales of other existing products of the firm (Synergies).

- **HomeNet example:** 25% of sales come from customers who would have purchased an existing Linksys wireless router if HomeNet were not available.

  - We must include the lost sales of existing Linksys wireless routers when calculating HomeNet's incremental earnings.

  - Suppose the existing router wholesales for $100/unit. Then, the expected loss in sales is:

    25%*100,000 units*$100/unit=$2.5 million

  - The cost of producing the existing router is $60/unit. Hence, the incremental cost of goods sold for the new HomeNet project is:

    25%*100,000 units*$60/unit=$1.5 million.

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- HomeNet's Incremental Earnings Forecast Including Cannibalization and Lost Rent:

	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)**

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Indirect Effects on Incremental Earnings

- **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 earnings analysis.
  - Example: Money that has already been spent on "feasibility study" is a **sunk cost** and therefore irrelevant right now. The decision to continue or abandon 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 earnings.

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Real World Complexities

- Typically,

  – sales will change from year to year.

  – the average selling price will vary over time.

  – the average cost per unit will change over time.

- ## Example:

in $000s	Year 1	Year 2	Year 3	Year 4	
Sales	100000	125000	125000	50000	
Price	0,26	0,234	0,2106	0,1895	down 10%
Up-Front R&D	15000				
Up-Front New Equipment	7500				
Life	5				
Annual Overhead	2800	2912	3028,5	3149,6	up 4%
Cost	0,11	0,099	0,0891	0,0802	down 10%
Tax Rate	40%				
Lost Sales %	0,25	0,25	0,25	0,25	
Unit Price	0,10	0,09	0,081	0,0729	down 10%
Incremental reduction COGS%	0,25	0,25	0,25	0,25	
Unit Cost	0,06	0,054	0,049	0,044	down 10%
Lost Rent	200	208	216,32	224,97	up 4%

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Incremental Earnings with Changing Prices

Year	0	1	2	3	4	5
Incremental Earnings Forecast ($000s)						
1 Sales	0	23500	26438	23794	8566	0
2 Cost of Goods Sold	0	9500	10688	9619	3463	0
3 **Gross Profit**	0	14000	15750	14175	5103	0
4 Selling, General and Administrative	0	3000	3120	3245	3375	0
5 Research and Development	15000	0	0	0	0	0
6 Depreciation	0	1500	1500	1500	1500	1500
7 **EBIT**	-15000	9500	11130	9430	228	-1500
8 Income Tax at 40%	-6000	3800	4452	3772	91,36	-600
9 **Unlevered Net Income**	-9000	5700	6678	5658	137	-900

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Calculating the Free Cash Flow

- The incremental effect of a project on a firm's available cash is its **free cash flow**. Timing is crucial! Which corrections need to be made?

  - Capital Expenditures and Depreciation:

    - Include Capital Expenditures: they are the actual cash outflows when an asset is purchased.

    - Exclude Depreciation: it is a non-cash expense.

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Calculating the Free Cash Flow

- Include Net Working Capital (NWC):

Net Working Capital = Current Assets – Current Liabilities

= Cash + Inventory + Receivables – Payables

  – Most projects will require an investment in net working capital.

  – The **increase in net working capital** is defined as:

$$\Delta NWC_t \; = \; NWC_t \; - \; NWC_{t-1}$$

- **Free Cash Flow:**

$$\text{Free Cash Flow} = \overbrace{(\text{Revenues} - \text{Costs} - \text{Depreciation}) \times (1 - \tau_c)}^{\text{Unlevered Net Income}}$$
$$+ \text{Depreciation} - \text{CapEx} - \Delta NWC$$

OR:

$$\text{Free Cash Flow} = (\text{Revenues} - \text{Costs}) \times (1 - \tau_c) - \text{CapEx} - \Delta NWC$$
$$+ \tau_c \times \text{Depreciation}$$

- The term $\tau_c \times Depreciation$ is called the depreciation tax shield.

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Calculating the Free Cash Flow

- ## HomeNet Example:
  - ### Capital Expenditures:
    - Subtract CapEx= $7,500,000 in Year 0;
  - ### Depreciation:
    - Add back annual depreciation Years 1-5;
  - ### Change in Net Working Capital:
    - Compute Working Capital each Year, and then compute its changes.
    - Subtract the annual change in NWC.
    - Assume: (i) HomeNet Project has no Cash Requirements and no Inventory, (ii) Receivables are 15% of Sales; (iii) Payables are 15% of COGS.

Calculating the Free Cash Flow

- Example:

in $000s	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	
1. Cash Requirements	0	0	0	0	0	0	
2. Inventory	0	0	0	0	0	0	
3. Receivables	0	3525	3966	3569	1285	0	15%Sales
4. Payables	0	1425	1603	1443	519,4	0	15%COGS
5. Net Working Capital	**0**	**2100**	**2363**	**2126**	**765,5**	**0**	5=1+2+3-4

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Calculating the Free Cash Flow

		Year	0	1	2	3	4	5
Incremental Earnings Forecast ($000s)								
1	Sales		0	23500	26438	23794	8566	0
2	Cost of Goods Sold		0	9500	10688	9619	3463	0
3=1-2	**Gross Profit**		0	14000	15750	14175	5103	0
4	Selling, General and Administrative		0	3000	3120	3245	3375	0
5	Research and Development		15000	0	0	0	0	0
6	Depreciation		0	1500	1500	1500	1500	1500
7=3-4-5-6	**EBIT**		-15000	9500	11130	9430	228	-1500
8	Income Tax at 40%		-6000	3800	4452	3772	91,36	-600
9=7-8	**Unlevered Net Income**		-9000	5700	6678	5658	137	-900
Free Cash Flow ($000s)								
10	Depreciation		0	1500	1500	1500	1500	1500
11	Capital Expenditures		7500	0	0	0	0	0
12	Increases in NWC		0	2100	262,5	-236	-1361	-765
13=9+10-11-12	**Free Cash Flow**		**-16500**	**5100**	**7916**	**7394**	**2998**	**1365**

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Determining the FCF and the NPV

- To compute the NPV of any project you need to know its FCFs and the cost of capital r:

$$NPV = \sum_{t=0}^{N} \frac{FCF_t}{(1+r)^t} = FCF_0 + \frac{FCF_1}{1+r} + \frac{FCF_2}{(1+r)^2} + \cdots + \frac{FCF_N}{(1+r)^N}$$

- Example: Assuming a discount rate r=12%

	Year	0	1	2	3	4	5
9	**Unlevered Net Income**	-9000	5700	6678	5658	137	-900
Free Cash Flow ($000s)							
10	Depreciation	0	1500	1500	1500	1500	1500
11	Capital Expenditures	7500	0	0	0	0	0
12	Increases in NWC	0	2100	263	-236	-1361	-765
13	**Free Cash Flow**	**-16500**	**5100**	**7916**	**7394**	**2998**	**1365**
14	Discounted FCF	-16500	4553,57	6310	5263	1905	775
	NPV	**2307**					

Discount Rate 12%

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Further Adjustments to FCF

- Other Non-cash Items

    – Amortization

- Timing of Cash Flows

    – Cash flows are often spread throughout the year.

- Accelerated Depreciation

Further Adjustments to FCF

- ## Liquidation or Salvage Value

    Capital Gain = Sale Price – Book Value

    Book Value = Purchase Price – Accumulated Depreciation

    After-Tax Cash Flow from Asset Sale = Sale Price – $(\tau_c \times$ Capital Gain$)$

- ## Terminal or Continuation Value: This amount represents the market value of the free cash flow from the project at all future dates.

    - Many times assume that after a certain period, the future FCFs follow a perpetuity structure with a constant growth rate g.
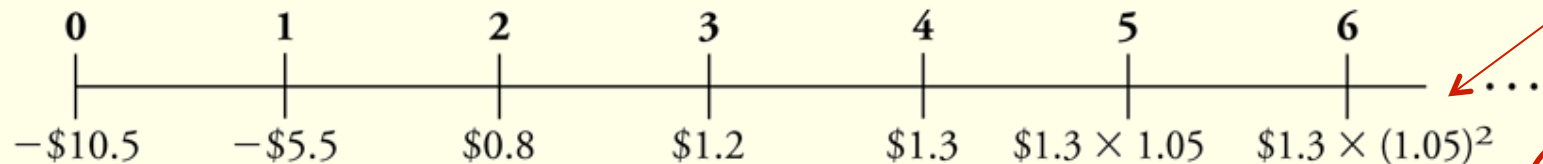
- Example:

Continuation Value with Perpetual Growth

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):

0	1	2	3	4	5	6	
−$10.5	−$5.5	$0.8	$1.2	$1.3	$1.3 × 1.05	$1.3 × (1.05)^2	...

FCFs

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 4 captures the value of future free cash flows in year 5 and beyond? What is the NPV of the new stores?

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Terminal or Continuation Value

- To compute the NPV we consider the initial 4 years plus a Continuation Value:

$$NPV = -10.5 - \frac{5.5}{1.1} + \frac{0.8}{1.1^2} + \frac{1.2}{1.1^3} + \frac{1.3}{1.1^4} + \frac{CV_4}{1.1^4}$$

- For the Continuation Value we consider a Growing Perpetuity:

$$CV_4 = \frac{FCF_5}{r-g} = \frac{FCF_4 \times (1+g)}{r-g} = \frac{1.3(1+0.05)}{0.1-0.05} = 27.3$$

- Finally, the NPV:

$$NPV = -10.5 - \frac{5.5}{1.1} + \frac{0.8}{1.1^2} + \frac{1.2}{1.1^3} + \frac{1.3}{1.1^4} + \frac{27.3}{1.1^4} =$$

$$= \$5.597 \text{million}$$

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Further Adjustments to FCF

- **Tax Carryforwards**: Tax loss carryforwards and carrybacks allow corporations to take losses during the current year and offset them against gains in nearby years.

- **Example**: Verian Industries has outstanding tax loss carryforwards of $100 million from losses over the past 6 years. If Verian earns $30 million per year in pre-tax income from now on, when will it first pay taxes?

Year	1	2	3	4	5
Past Losses	*100*	*70*	*40*	*10*	*0*
Pre-Tax Income	30	30	30	30	30
Tax Loss Carryforward	30	30	30	10	0
Taxable Income	0	0	0	20	30