

FIN2010 Financial Management

Estimate Cash Flows I



Agenda

- Definition and principles
- Incremental cash flows
 - Definition
 - Relevant considerations
 - Formula
- Example-HomeNet



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Definition

- What is capital budgeting?
 - The process of identifying, analyzing, and selecting investment projects
- What are the steps of capital budgeting?
 - Generate investment proposals consistent with the firm's strategic objectives.
 - Evaluate project incremental cash flows, a.k.a. free cash flows.
 - Select projects based on a value-maximizing acceptance criterion, such as NPV, IRR, payback period etc.
 - In the previous lecture, we use the rules as if we already know the costs and benefits. In this topic, we take a step back and ask how do we identify the relevant costs and benefits.
 - Reevaluate implemented investment projects continually and perform post-audits for completed projects.



Principles

- Care about cash flows, not earnings
 - Earnings are an accounting measure. A firm cannot use its earnings to buy goods, pay employees, fund new investments, or pay dividends.
 - To do these things, a firm needs cash.
- Care about incremental cash flows of a project, not the gross cash flows
 - The amount by which the firms' cash flow are expected to change as a result of the investment decision
- Do NOT care about cash flows related to financing. Will discuss why in the lecture on Capital Structure.



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Incremental cash flows (ICF)

- Incremental cash flows (ICF): the amount by which the firms' cash flow are expected to change as a result of the investment decisions.
 - Firm's cash flow with the new project – firm's cash flow w/o the new project
 - Simple analogy: if your current salary is ¥ 10,000/month. Another firm offers you ¥ 12,000/month. Incremental cash from taking the new job is ¥ 2,000/month.
- Also called as free cash flows (FCF), meaning it is the amount of cash firms expect to receive from a project and can be allocated elsewhere.



Example of ICF

- Home Builder Supply: a retailer in the home improvement industry
 - Currently operates seven retail outlets in the southern US
 - Management is contemplating building an eighth retail store
 - The company already owns the land for this store, which currently has an abandoned warehouse located on it.
 - Last month, the marketing department spent \$10,000 on market research to determine the extent of customer demand for the new store.
 - Now Home Builder must decide whether to build and open the new store.



Should these be considered as ICF?

- A. The cost of the land where the store will be located. **No, not incremental**
- B. The cost of demolishing the abandoned warehouse and clearing the lot. **Yes, extra cost**
- C. The loss of sales in the existing retail outlet, if customers who previously drove across town to shop at the existing outlet become customers of the new store instead. **Yes, project externalities**
- D. The \$10,000 in market research spent to evaluate customer demand. **No, sunk cost**
- E. Construction costs for the new store. **Yes, capital expense**
- F. The value of the land if sold. Suppose the firm is also considering selling the land. **Yes, opportunity cost**
- G. Interest expense on the debt borrowed to pay the construction costs. **No, financing related**



What are included in ICF

—Direct Effects

- Direct effects on incremental earnings
 - Revenue: yes
 - Costs (cost of goods sold, depreciation, tax): yes
 - Capital expenditure (purchase or sale of long-term assets): yes
 - Changes in net working capital: yes
 - Tax: yes
 - Interest expenses: **no. We ignore financing related costs.**



What are included in ICF

—Indirect Effects

- Opportunity costs: yes
 - The value a resource could have provided in its best alternative use
- Project externalities: yes
 - Indirect effects of the project that may increase or decrease the profits of other business activities of the firm.
- Sunk cost: no
 - Any costs that have been or will be paid regardless of the decision about whether or not to proceed with the project.
 - Fixed overhead expenses, past research and development expenditures, unavoidable competitive effects etc.



ICF Calculation

- **Regular** cash flows

Revenue

- COGS
- SGA expenses
- Depreciation
- Interest expenses
- Tax expenses

= Net income

+ Depreciation

- Changes in net working capital (current asset (excl. cash)-current liabilities)
- Capital expenditure

+ changes in financing activities

=net cash flow

- **Incremental** cash flows

Incremental Revenue

- Incremental COGS
- Incremental SGA expenses
- Incremental Depreciation

Remember, we ignore financing related cash flows

- Tax expenses

= Incremental net income (unlevered)

+ Incremental Depreciation

- Incremental changes in net working capital (current asset-current liabilities)

- Incremental capital expenditure

Remember, we ignore financing related cash flows

=net incremental cash flow



ICF Formula

- A project typically last for multiple years.
- For a particular year t :
 - $ICF_t = \text{incremental net income}_t + \text{depreciation}_t$
 - $\text{capital expenditure}_t - \text{change in net working capital}$
 - Where
$$\text{incremental net income}_t = (\text{revenues}_t - \text{costs}_t - \text{depreciation}_t) * (1 - \tau_c)$$
- Let's then use an example to elaborate on this formula and go over the steps.



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- **Example-HomeNet**



Example

Example: Linksys just completed a \$300,000 feasibility study to assess the attractiveness of the product **HomeNet**. The project has an estimated life of four years.

– Revenue Estimates:

- sales = 100,000 units/year, unit price = \$260

– Cost Estimates:

- Up-front R&D = \$15,000,000,
- Up-Front New Equipment = \$7,500,000
- Expected life of the new equipment is five years.
- Housed in existing lab
- Annual Overhead = \$2,800,000
- Per Unit Cost = \$110



Example

- Our task is to fill in this table:

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales						
-	Cost of goods sold						
=	Gross profit						
-	Selling, general, and administrative						
-	Research and development						
-	Depreciation						
=	EBIT						
-	Income Tax at 40%						
=	Unlevered Net Income						
Free Cash Flow(\$thousands)							
+	Depreciation						
-	Capital Expenditures						
-	Change in NWC						
=	Free Cash Flow						

- Unlevered net income: a firm's net income when we ignore financing related costs such as interest expenses.



Revenue and costs

- $\text{Revenue}_t = 100,000 \times 260 = 26,000,000$
- $\text{Cost of goods sold}_t = 100,000 \times 110 = 11,000,000$
- Annual Overhead = \$2,800,000
- Upfront R&D: \$15,000,000

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales		26000	26000	26000	26000	
-	Cost of goods sold		11000	11000	11000	11000	
=	Gross profit		15000	15000	15000	15000	
-	Selling, general, and administrative		2800	2800	2800	2800	
-	Research and development	15000					
-	Depreciation						
=	EBIT						
-	Income Tax at 40%						
=	Unlevered Net Income						



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, 1) the firm list it as capital expenditure. 2) each year, the firm deducts a fraction of the cost of these items as depreciation.
- Many depreciation methods to choose from. Assume we use straight line depreciation
 - Annual Depreciation = \$7.5 million ÷ 5 years = \$1.5 million/year



Capital Expenditures and Depreciation

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales		26000	26000	26000	26000	
-	Cost of goods sold		11000	11000	11000	11000	
=	Gross profit		15000	15000	15000	15000	
-	Selling, general, and administrative		2800	2800	2800	2800	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	10700	10700	10700	10700	(1500)
-	Income Tax at 40%						
=	Unlevered Net Income						



Taxes

Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)						
Sales		26000	26000	26000	26000	
- Cost of goods sold		11000	11000	11000	11000	
= Gross profit		15000	15000	15000	15000	
- Selling, general, and administrative		2800	2800	2800	2800	
- Research and development	15000					
- Depreciation		1500	1500	1500	1500	1500
= EBIT	(15000)	10700	10700	10700	10700	(1500)
- Income Tax at 40%	(6000)	4280	4280	4280	4280	(600)
= Unlevered Net Income	(9000)	6420	6420	6420	6420	(900)

- Tax saving brought by the new project
 - Suppose w/o the project, the firm have EBIT of x ($x > 15000$)
 - With the project, $EBIT = x - 15000$
 - Change in tax $= 40\%(x - 15000) - 40\% * x = -40\% * 15,000 = -6000$
- What if $0 < x < 15000$?
 - After adding the new project, the firm has a loss. Tax = 0
 - Change in tax $= 0 - 40\% * x = -40\% * x$
- What if $x < 0$?
 - The firm pays 0 tax w/ or w/o the new project. Change in tax = 0



Opportunity Cost

- 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.
- 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?
- 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 $\$200,000 \times (1 - 40\%) = \$120,000$, the after-tax benefit of renting out the warehouse space.



Opportunity Cost

Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)						
Sales		26000	26000	26000	26000	
- Cost of goods sold		11000	11000	11000	11000	
= Gross profit		15000	15000	15000	15000	
- Selling, general, and administrative		2800	2800	2800	2800	
- Research and development	15000					
- Depreciation		1500	1500	1500	1500	1500
= EBIT	(15000)	10700	10700	10700	10700	(1500)
- Income Tax at 40%	(6000)	4280	4280	4280	4280	(600)
= Unlevered Net Income	(9000)	6420	6420	6420	6420	(900)

- After adjusting for opportunity cost:

Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)						
Sales		26000	26000	26000	26000	
- Cost of goods sold		11000	11000	11000	11000	
= Gross profit		15000	15000	15000	15000	
- Selling, general, and administrative		3000	3000	3000	3000	
- Research and development	15000					
- Depreciation		1500	1500	1500	1500	1500
= EBIT	(15000)	10500	10500	10500	10500	(1500)
- Income Tax at 40%	(6000)	4200	4200	4200	4200	(600)
= Unlevered Net Income	(9000)	6300	6300	6300	6300	(900)

2,800,000 + 200,000
= 3,000,000



Project externalities

- In the HomeNet project example, assume that 25% of sales will come from customers who would have purchased an existing Linksys wireless router if HomeNet were not available. Suppose existing router wholesales for \$100/unit and the cost of goods sold is \$60/unit.
- Because this reduction in sales of the existing wireless router is a consequence of the decision to develop HomeNet, we must include it when calculating HomeNet's incremental earnings.
 - Sales from the old existing router: $25\% \times 100,000 \text{ units} \times \$100/\text{unit} = \$2.5 \text{ million}$
 - Cost for the existing router: $25\% \times 100,000 \text{ units} \times \$60/\text{unit} = \$1.5 \text{ million}$
 - Therefore, the incremental earnings declines by \$1million



Project externalities

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales		26000	26000	26000	26000	
-	Cost of goods sold		11000	11000	11000	11000	
=	Gross profit		15000	15000	15000	15000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	10500	10500	10500	10500	(1500)
-	Income Tax at 40%	(6000)	4200	4200	4200	4200	(600)
=	Unlevered Net Income	(9000)	6300	6300	6300	6300	(900)

• After adjusting for project externalities

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales		23500	23500	23500	23500	
-	Cost of goods sold		9500	9500	9500	9500	
=	Gross profit		14000	14000	14000	14000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	9500	9500	9500	9500	(1500)
-	Income Tax at 40%	(6000)	3800	3800	3800	3800	(600)
=	Unlevered Net Income	(9000)	5700	5700	5700	5700	(900)

26,000,000-
2,500,000=23,500,000

11,000,000-
1,500,000=9,500,000



Sunk Costs

- 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.
- Past Research and Development Expenditures
 - Money that has already been spent on R&D is a sunk cost and therefore irrelevant. The decision to continue or abandon a project should be based only on the incremental costs and benefits of the product going forward. \$300,000 feasibility study is a sunk cost.
- Unavoidable Competitive Effects
 - When developing a new product, firms may be concerned about the cannibalization of existing products.
 - However, if sales are likely to decline in any case as a result of new products introduced by competitors, then these lost sales should be considered a sunk cost.
- Sunk costs **should NOT be included** in the incremental earnings analysis.



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. To calculate the free cash flow, we need to add back depreciation.



Capital expenditures and depreciation

- Up-Front New Equipment = \$7,500,000
- Expected life of the new equipment is five years.

Thus, with straight-line depreciation: depreciation amount=\$1,500,000/year

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales		23500	23500	23500	23500	
-	Cost of goods sold		9500	9500	9500	9500	
=	Gross profit		14000	14000	14000	14000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	9500	9500	9500	9500	(1500)
-	Income Tax at 40%	(6000)	3800	3800	3800	3800	(600)
=	Unlevered Net Income	(9000)	5700	5700	5700	5700	(900)
Free Cash Flow(\$thousands)							
+	Depreciation		1500	1500	1500	1500	1500
-	Capital Expenditures	7500					
-	Change in NWC						
=	Free Cash Flow						



Disposal of capitalized assets

- When firms sell their capital assets, they may realize a capital gain (loss) and have tax liabilities (savings) accordingly.
 - $\text{Capital gain/loss} = \text{sale price} - \text{book value}$
 - $\text{Book value} = \text{purchase price} - \text{accumulated depreciation}$
- When there is capital gain, firms pay taxes.
 - The after-tax cash flow from the asset sale
 $= \text{sale price} - \text{tax liabilities} = \text{sale price} - (\text{tax rate} * \text{capital gain})$
- When there is capital losses:
 - The after-tax cash flow from the asset sale
 $= \text{sale price} + \text{tax savings} = \text{sale price} + (\text{tax rate} * \text{capital losses})$
- Capital losses are deductible only against capital gains
- Sale price also called liquidation or salvage value



Example

Assume we estimate that the equipment can be sold for \$20,000 by the end of year 5. What adjustment should we make for the cash flows?

- Solution:
 - Sale price=\$20,000
 - Book value by the end of year 5= $7,500,000 - 1,500,000 \times 5 = \0
 - Capital gain/loss= $20,000 - 0 = \$20,000$
 - After-tax cash flow from the sale= $20,000 - 20,000 \times 40\% = 12,000$



Example

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales		23500	23500	23500	23500	
-	Cost of goods sold		9500	9500	9500	9500	
=	Gross profit		14000	14000	14000	14000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	9500	9500	9500	9500	(1500)
-	Income Tax at 40%	(6000)	3800	3800	3800	3800	(600)
=	Unlevered Net Income	(9000)	5700	5700	5700	5700	(900)
Free Cash Flow(\$thousands)							
+	Depreciation		1500	1500	1500	1500	1500
-	Capital Expenditures	7500					
+	Adjustment for salvage value						12
-	Change in NWC						
=	Free Cash Flow						



Net working capital (NWC)

- Most projects will require net working capital.
 - $NWC = \text{Current Asset} - \text{Current Liability}$
 - Current asset: assets that can be easily converted to cash in the next year
 - Cash
 - Inventory
 - Account receivable
 - Current liability: cash that needs to be paid out within a year
 - Account payable
- The change of NWC affects incremental cash flow
 - $\Delta NWC_t = NWC_t - NWC_{t-1}$



Incremental NWC due to HomeNet

Suppose HomeNet will not have incremental cash or inventory requirements. However, receivables related to HomeNet are expected to account for 15% of annual sales, and payables are expected to be 15% of cost of goods sold starting from year 1.

- Accounts receivables: $15\% * 23,500,000 = 3,525,000$
- Accounts payables: $15\% * 9,500,000 = 1,425,000$
- Assumptions:
 - During the project life, we reuse the net working capital
 - At the end of project life, we pay off all the accounts payables and collect back all the receivables



Net working capital (NWC)

	Year	0	1	2	3	4	5
	Cash requirement	--	--	--	--	--	--
+	Inventory	--	--	--	--	--	--
+	Receivables		3525	3525	3525	3525	--
-	Payables		1425	1425	1425	1425	--
=	Net working capital requirement	--	2100	2100	2100	2100	--
	ΔNWC		2100	0	0	0	(2100)

- After adjusting for new working capital

	Year	0	1	2	3	4	5
Incremental Earnings Forecast							
	Sales		23500	23500	23500	23500	
-	Cost of goods sold		9500	9500	9500	9500	
=	Gross profit		14000	14000	14000	14000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	9500	9500	9500	9500	(1500)
-	Income Tax at 40%	(6000)	3800	3800	3800	3800	(600)
=	Unlevered Net Income	(9000)	5700	5700	5700	5700	(900)
Free Cash Flow(\$thousands)							
+	Depreciation		1500	1500	1500	1500	1500
-	Capital Expenditures	7500					
+	Adjustment for salvage value						12
-	Change in NWC		2100	0	0	0	(2100)
=	Free Cash Flow	(16500)	5100	7200	7200	7200	2712

Calculating the NPV

- Assuming HomeNet's cost of capital is 12%

Year	0	1	2	3	4	5
Free cash flow	(16500)	5100	7200	7200	7200	2712
PV of free cash flow @12%	(\$16,500)	\$4,554	\$5,740	\$5,125	\$4,576	\$1,539
NPV	\$5,033					



Summary

- Evaluate project's incremental cash flows, a.k.a. free cash flows.
 - Incremental cash flows (ICF): the amount by which the firms' cash flow are expected to change as a result of the investment decisions.
 - Should consider both direct and indirect effects of a project.
 - Should ignore sunk costs
- For a particular year t :
 - $ICF_t = \text{incremental net income}_t + \text{depreciation}_t$
 - $\text{capital expenditure}_t - \text{change in net working capital}$
 - Where
$$\text{incremental earnings}_t = (\text{revenues}_t - \text{costs}_t - \text{depreciation}_t) * (1 - \tau_c)$$

