FIN2010 Financial Management
Lecture 17: Cash Flows of a Project I

Review—Project Evaluation Criteria

- Net Present Value: $\sum_{t=0}^{n} PV(CF_t)$
- Payback Period: *# years to recover the initial investment*
- Discounted Payback Period: *# years for the* $\sum_{t=1}^{n} PV(CF_t)$ *to recover the initial investment*
- Internal Rate of Return: R *that makes* $NPV = 0$
  - Multiple IRR problem
- Profitability Index: $NPV/Investment + 1$

- Mutual exclusive projects
  - Always use NPV!
- With limited capital
  - Sort by PI

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 to identify the relevant costs and benefits.
  - Reevaluate implemented investment projects continually and perform post-audits for completed projects.

Principles

- Care about cash flows, not net income
  - 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 = incremental net $income_t$ + $depreciation_t$ – $capital\ expenditure_t$ – change in net working capital
  - Where

    $incremental\ net\ income_t = (revenues_t - costs_t) * (1-\tau_c)$

- Let's then use an example to elaborate on this formula and go over the steps.

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Example

- 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, per Unit Price = $260
  - Cost Estimates:
    - Up-front R&D at year 0= $15,000,000,
    - Up-Front New Equipment at year 0= $7,500,000
      - Expected life of the new equipment is five years.
      - Housed in existing lab
    - Annual Overhead from year 1-4= $2,800,000
    - Per Unit Cost from year 1-4= $110

Example

- Our task is to fill in this table:

	Year	0	1	2	3	4	5
Increamental 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

- $Revenue_t$=100,000*260=26,000,000
- Cost of $goods\ sold_t$=100,000*110=11,000,000
- Annual Overhead = $2,800,000
- Upfront R&D: $15,000,000

	Year	0	1	2	3	4	5
Increamental 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
Increamental 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
Increamental 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)**

- Income tax = EBIT * τ_c
- 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×(1-40%)=$120,000, the after-tax benefit of renting out the warehouse space.

Opportunity Cost

	Year	0	1	2	3	4	5
Increamental 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
Increamental 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

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.
- …
- 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

	Year	0	1	2	3	4	5
Incremental Earnings Forecast ($thousands)							
	Sales		26000	26000	26000	26000	
-	Cost of goods sold		11000	11000	11000	11000	
=	**Gross profit**		15000	15000	15000	15000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	**EBIT**	(15000)	10500	10500	10500	10500	(1500)
-	Income Tax at 40%	(6000)	4200	4200	4200	4200	(600)
=	**Unlevered Net Income**	**(9000)**	**6300**	**6300**	**6300**	**6300**	**(900)**
Free Cash Flow($thousands)							
+	Depreciation		1500	1500	1500	1500	1500
-	Capital Expenditures	7500					
-	Change in NWC						
=	**Free Cash Flow**						

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 = incremental net $income_t$ + $depreciation_t$ – $capital\ expenditure_t$ – change in net working capital
  - Where

    $incremental\ earnings_t = (revenues_t - costs_t - depreciation_t) * (1-\tau_c)$

Next Lecture—Cash Flows of a Project II

- Example-HomeNet
- More examples