

Outline of Lecture 10



- Investment Decision Guidelines

- Materials covered:

- Reader, Lecture 8
- BM Chapter 6.

Investment Decision Guidelines

- Should you invest in a project? The answer is yes if it makes you better off, i.e.
 - Invest if $NPV > 0$.
- **The Basic Rule: Only discount cash flows!**
 - Be careful not to discount accounting numbers.
 - Use *after-tax* cash flows and *after-tax* discount rates
 - » Using pre-tax cash flows and pre-tax discount rates works in simple cases, but not in general.

1. Do Not Include Sunk Costs

- A **sunk cost** is any cost the firm must incur whether or not the project is undertaken.
- Since it occurs in either case, it has no impact on the correct decision.
- E.g. (BM p. 123) Lockheed in 1971 was trying to get a government guaranteed loan to continue developing the Tristar jet. Arguments for and against included:
 - “If we abandon the project, we’ve wasted \$1 billion”.
 - “Stupid to continue, as we’ll never make a satisfactory return on the \$1 billion already spent”.
- Both arguments suffer from the “sunk cost fallacy”.

Example – Joe's Burgers

- Joe's Burgers has invested \$20,000 to obtain the necessary permits to open.
- Joe expects that another \$5,000 in equipment is needed to finish remodeling.
- Once his hamburger joint opens it will produce cash flows of \$400 per year forever.
- The discount rate is 10%.
- Should Joe remodel?

Joe's Burgers

- The \$20,000 Joe spent for the permits are sunk. Whether or not Joe's Burgers opens, the money cannot be recovered.
 - This \$20,000 should not affect his decision in any way.
- NPV of continuing = $400 / .1 - 5,000 = -\$1,000$
- So he should not remodel

2. Include all firmwide impacts

- Suppose a project in division A will raise the value of division B.
- Then the increase in division B's value should be credited to the project.
- Example: A company must decide if it should move division A to a new building, costing \$120,000.
- In the new building, operating costs will be lowered by \$10,000 per year forever.
- Moving A allows division B to expand in the old factory, increasing its profitability by \$3,000 per year forever.
- If the discount rate is 10% should division A move?

Example

- Benefits of move are \$10,000 per year for division A and \$3,000 per year for division B
- NPV = $10,000 / .1 + 3,000 / .1 - 120,000$
= \$10,000
- So the firm should move division A.

3. Include Opportunity Costs

- Suppose project A will preempt project B.
- Then the value of project B should be counted against project A.
- Example: A firm can purchase a punch press for \$10,000.
- The new press will allow the firm to enter the widget industry, and earn cash flows of \$2,000 per year forever.
- However, the punch press will displace several screw machines, currently producing cash flows of \$1,500/yr.
- If the interest rate is 10% should they buy the punch press?

Example

- The press earns \$2,000 per year, but eliminates \$1,500 per year that would otherwise have been earned.
- NPV $= 2,000 / .1 - 1,500 / .1 - 10,000$
 $= 20,000 - 15,000 - 10,000$
 $= -\$5,000$
- The firm should not buy the press.

4. Do not allocate overhead

- On the margin, overhead is a **sunk** cost.
- Example: A company rents 40,000 ft² of space and is currently using 30,000 ft².
- It could add a new division to use the remaining 10,000 ft²
 - New equipment will cost \$210,000.
 - The new operations will generate \$50,000 in profits every year.
 - Presently, the office staff costs \$160,000 per year.
 - The expansion requires a larger staff, bringing costs up to \$180,000.
- If $r = 10\%$ should the firm expand?

Example

- The only overhead that should be considered is the additional \$20,000 due to the new division.
- NPV = $50,000 / .1 - 20,000 / .1 - 210,000$
= $500,000 - 200,000 - 210,000$
= \$90,000
- So the firm should expand.

Mini Case Study: Amy's Car Supplies

- Amy's Car Supplies wholesales parts for new and antique cars.
- Presently both the new and antique parts divisions are housed in the same facility.
- Amy has a long term lease that requires her to rent the building for **\$10,000** a year for 20 years, with the first payment due 1 year from today.

Amy's Car Supplies

- The building contains the firm's administrative staff, who occupy 10% of the floor space.
- Costs: \$20,000/yr for salaries, benefits etc.
- Current base inventories for new and used car divisions are \$2,000,000 and \$1,500,000 resp.
- 20% of the new car inventory is obsolete with little hope of ever being sold.
- Amy expects that if the new parts inventory is expanded 20% will also turn obsolete.

Amy's Car Supplies

- Sales are \$2,000,000/yr for new car parts, and \$1,000,000 for antique car parts.
- Amy expects the inventory/sales ratios to remain constant no matter what she does.
- In the new parts division, the firm purchases inventory for \$80, and then resells it for \$100.
- For the antique division the cost is only \$50.
- These ratios are also expected to remain constant into the foreseeable future.

Amy's Car Supplies

- Amy is considering expanding into a new building.
- Cost of new lease = \$50,000 a year
- She will then be able to move the antique car parts division into its own facility.
 - Antique parts sales will rise by 75%.
 - New part sales will rise by 50%.
- A larger staff will be needed.
 - Administrative overhead will increase by 100%.
- New base inventory must be purchased (today) to begin operations.

The Decision

- Assume the firm lasts for 20 years, and $r = 10\%$.
- Should Amy sign a lease for the new building?
 - For ease of calculation, assume Amy never files a tax return....
- We can solve this two ways:
- **No Thought Analysis:**
 - Calculate the PV of the firm with and without the move. Then take whichever action yields the higher PV
- **Marginal Analysis:**
 - Drop the sunk costs, and consider the cash flows on an *incremental* basis

Cash Flows without move: Years 1-19



New Parts:

Sales	=	2,000,000	
Costs	=	1,600,000	(.8 x 2,000,000)
<u>Net</u>	=	<u>400,000</u>	

Antique Parts:

Sales	=	1,000,000	
Costs	=	500,000	(.5 x 1,000,000)
<u>Net</u>	=	<u>500,000</u>	

Lease	=	10,000	
Payroll	=	20,000	

Total CF	=	400,000 + 500,000 - 10,000 - 20,000	
	=	870,000	

PV of firm without move

- Year 20 is the same as years 1 – 19 with the following additions:
 - Sales of new parts inventory = $.8 \times 2,000,000 = 1,600,000$
 - Sale of antique parts inventory = $1,500,000$.
- So the PV without the move is:

$$\begin{aligned} \text{PV} &= 870,000/1.1 + 870,000/(1.1)^2 + \dots + 870,000/(1.1)^{19} \\ &\quad + [870,000 + 1,600,000 + 1,500,000]/(1.1)^{20} \\ &= \$7,867,596. \end{aligned}$$

Cash Flows with Move

- If Amy moves, she has to purchase new inventory:
 - New parts: 1,000,000 (1x increase in sales)
 - Antique parts 1,125,000 (1.5x increase in sales.)
- So $CF_0 = -2,125,000$

Cash Flows with Move, Years 1-19



New Parts:

Sales	=	3,000,000	
Costs	=	<u>2,400,000</u>	(.8 x 3,000,000)
Net	=	600,000	

Antique Parts:

Sales	=	1,750,000	
Costs	=	<u>875,000</u>	(.5 x 1,750,000)
Net	=	875,000	

Lease	=	10,000 + 50,000	=	60,000
Payroll	=	20,000 + 20,000	=	40,000

Total CF	=	600,000 + 875,000 - 60,000 - 40,000		
	=	1,375,000		

PV of firm with move

- Year 20 is the same as years 1 - 19 with the following additions.
 - Sale of new parts inventory = $.8 \times 3,000,000 = 2,400,000$
 - Sale of antique parts inventory = $2,625,000$.
- So PV with the move equals:
$$\begin{aligned} \text{PV} &= -2,125,000 + 1,375,000/1.1 + \dots + 1,375,000/(1.1)^{19} + \\ &\quad [1,375,000 + 2,400,000 + 2,625,000]/(1.1)^{20} \\ &= \$10,328,084. \end{aligned}$$
- So it pays to move.

Marginal Analysis

- Consider the cash flows on an incremental basis
 - I.e. only consider changes in the firm's cash flows.
- For example, current lease (10,000) and staff (20,000) are sunk costs.
 - Whether or not the move occurs these costs will occur.
 - They will not affect the decision
- First incremental cash flow is payment of \$2,125,000 for new inventory, (CF_0)

Incremental Cash Flows, Years 1-19



Additional New Part Cash flows:

Sales	=	1,000,000	
Costs	=	800,000	(.8 x 1,000,000)
<u>Net</u>	=	<u>200,000</u>	

Antique Parts:

Sales	=	750,000	
Costs	=	375,000	(.5 x 750,000)
<u>Net</u>	=	<u>375,000</u>	

New Lease	=	50,000	
Add. Payroll	=	20,000	

Total CF	=	200,000 + 375,000 – 50,000 – 20,000	
	=	505,000	

NPV calculation

- Year 20 is the same as years 1 - 19 with the following additions.
 - Sales of additional parts inventory = $.8 \times 1,000,000 = 800,000$
 - Sale of additional antique parts inventory = 1,125,000.

- So the NPV of moving is:

$$\begin{aligned} \text{NPV} &= -2,125,000 + 505,000/1.1 + \dots + 505,000/(1.1)^{19} \\ &\quad + [505,000 + 800,000 + 1,125,000]/(1.1)^{20} \\ &= 2,460,488. \end{aligned}$$

- Notice that:

$$\begin{aligned} \text{PV (move)} - \text{PV (do not move)} &= 10,328,084 - 7,867,596 \\ &= 2,460,488 \\ &= \text{NPV (incremental analysis)}. \end{aligned}$$

Investment Decision Guidelines: Summary

- Invest if $NPV > 0$.
- Only discount cash flows
- Sunk costs: ignore them
- Include all firmwide impacts
- Include Opportunity Costs
- Do not allocate overhead
- Consider incremental analysis; however examining the possible options one at a time produces the same answer