# Chapter 11

# • Project Analysis and Evaluation

# Key Concepts and Skills

- Understand forecasting risk and sources of value
- Understand and be able to do scenario and sensitivity analysis
- Understand the various forms of break-even analysis

# Evaluating NPV Estimates

- An investment has a positive NPV if its MV exceeds its cost. Such an investment is desirable because it creates value for its owner.
- What is it about this investment that leads to a positive NPV? What are some potential sources of value in a new product?
  - Is it better than our competitor? Can we manufacture at lower cost? Can we distribute more effectively? Can we gain control of the market?
- Forecasting risk the risk that a poor decision is made because of errors in projected cash flows.
  - How sensitive is our NPV to changes in the CF estimates? The more sensitive, the greater the forecasting risk

# Scenario and Sensitivity Analyses

- Scenario Analysis
  - The determination of what happens to NPV estimates under different CF scenarios. (we let all different variables change only a small number of values)
- Sensitivity Analysis
- Investigation of what happens to NPV when only one variable is changed.
- <u>AIM:</u>

# Scenario Analysis

- What happens to the NPV under different cash flows scenarios?
- At the very least look at:
  - Base case initial set of projections
  - Best case high revenues, low costs
  - Worst case low revenues, high costs
  - Measure of the range of possible outcomes
- Best case and worst case are not necessarily probable, but they can still be possible

## BEST CASE

- Sales and prices increase, while costs decrease.
- WORST CASE
  - Sales and prices decrease, and costs increase.

# Example 11.1: Senario Analysis

 Consider a project. The initial cost is \$200,000 and the project has a 5-year life. There is no salvage. Depreciation is straight-line, the required return is 12% and the tax rate is 34%. What is the base case NPV? What are the best and worst case senario NPVs?

	Base Case	Lower Bound	Upper Bound
Unit Sales	6,000	5,500	6,500
Price/unit	\$ 80	\$75	\$ 85
Var. cost/unit	\$ 60	\$ 58	\$ 62
Fixed cost/year	\$ 50,000	\$ 45,000	\$55,000
			X

Base case 1	0.000			
	9,800	59,800	15,567	15.1%
Vorst case -2	23,500	16,500	-140,521	-14.4%
Best case 5	9,730	99,730	159,507	40.9%

# Sensitivity Analysis

What happens to NPV when we vary one variable at a time? i.e. we are looking at the effect of specific variables on NPV.

 The greater the volatility in NPV in relation to a specific variable, the larger the forecasting risk associated with that variable and the more attention we want to pay to its estimation.



### Summary of Sensitivity Analysis for New Project (Unit Sales) Scenario Unit Sales Cash Flow NPV IRR Base case 6000 59.800 15 567 15.1% Worst case 5500 53,200 -8.226 10.3% 6500 66,400 39,357 19.7% Best case



# Making a Decision

- At some point you have to make a decision
- If the majority of your scenarios have positive NPVs, then you can feel reasonably comfortable about accepting the project.
- If you have a crucial variable that leads to a negative NPV with a small change in the estimates, then you may want to give up the project.





# Average vs. Marginal Cost <u>Average Cost</u>: TC / # of units Will decrease as # of units increases Marginal Cost The cost to produce one more unit Same as variable cost per unit

# Example 11.3

- Your firm pays \$3000 per month in fixed costs. You also pay \$15 per unit to produce your product. First assume that you produce 1000 units and than assume that you produce 5000 units?
  - A) What is your total cost?
  - B) What is your average cost?
  - C) That is your marginal cost





# **Break-Even Analysis**

- B-E Analysis is a tool for analyzing the relationship between sales volume and profitability.
- "How bad do sales have to get before we actually begin to lose money?"









# Example11.5: Break-Even Analysis

Consider the previous example. Assume a required return of 18%. What is the financial B-E point? i.e. What OCF (or payment) makes NPV = 0?



# Example 11.6

A project under consideration costs \$ 750,000, has a five-year life, and has no salvage value. Depreciation is straight line to zero. The required return is 17%, and the tax rate is 34%. Sales are projected at 500 units per year. Price per unit is \$2,500, variable cost per unit is \$1,500, and fixed costs are \$200,000 per year.



B) Given the base case projections in the previous problem, what are the cash, accounting and financial break even sales level for this project? Ignore taxes in answering.

# Sugested Problems

• 1-3, 7, 9, 10, 19.