
Questions

Investment, strategy, and economic rents

Question 1. Suppose that you are considering investing in an asset for which there is a reasonably good secondary market. Specifically, your company is Delta Airlines, and the asset is a Boeing 757—a widely used airplane. How does the presence of a secondary market simplify your problem in principle? Do you think these simplifications could be realized in practice? Explain.

Question 2. There is an active, competitive leasing (i.e., rental) market for most standard types of commercial jets. Many of the planes flown by the major domestic and international airlines are not owned by them but leased for periods ranging from a few months to several years.

Gamma Airlines, however, owns two long-range DC-11s just withdrawn from Latin American service. Gamma is considering using these planes to develop the potentially lucrative new route from Akron to Yellowknife. A considerable investment in terminal facilities, training, and advertising will be required. Once committed, Gamma will have to operate the route for at least three years. One further complication: The manager of Gamma's international division is opposing commitment of the planes to the Akron–Yellowknife route because of anticipated future growth in traffic through Gamma's new hub in Ulan Bator.

How would you evaluate the proposed Akron–Yellowknife project? Give a detailed list of necessary steps in your analysis. Explain how the airplane leasing market would be taken into account. If the project is attractive, how would you respond to the manager of the international division?

Question 3. Suppose the current price of gold is \$650 an ounce. Hotshot Consultants advises you that gold prices will increase at an average rate of 12% for the next two years. After that the growth rate will fall to a long-run trend of 3% per year. What is the price of 1 million ounces of gold produced in eight years? Assume that the gold prices have a beta of 0 and that the risk-free rate is 5.5%.

Question 4. We characterized the interstate rail lines owned by major U.S. railroads as “strategic assets” that generated increased profits in 2005 and 2006. In what conditions would you expect these assets to generate economic rents? Keep in mind that railroads compete with trucking companies as well as other railroads. Trucking companies have some advantages, including flexibility.

Question 5. Thanks to acquisition of a key patent, your company now has exclusive production rights for barkelgassers (BGs) in North America. Production facilities for 200,000 BGs per year will require a \$25 million immediate capital expenditure. Production costs are estimated at \$65 per BG. The BG marketing manager is confident that all 200,000 units can be sold for \$100 per unit (in real terms) until the patent runs out five years hence. After that the marketing manager hasn't a clue about what the selling price will be.

What is the NPV of the BG project? Assume the real cost of capital is 9%. To keep things simple, also make the following assumptions:

- The technology for making BGs will not change. Capital and production costs will stay the same in real terms
- Competitors know the technology and can enter as soon as the patent expires, that is, in year 6.
- If your company invests immediately, full production begins after 12 months, that is, in year 1.
- There are no taxes.
- BG production facilities last 12 years. They have no salvage value at the end of their useful life.

Question 6. How would you answer to the previous question change if:

- Technological improvements reduce the cost of new BG production facilities by 3% per year?

Thus a new plant built in year 1 would cost only $25(1-0.03) = \$24.25$ million; a plant built in year 2 would cost \$23.52 million; and so on. Assume that production costs per unit remain at \$65.

Question 7. Recall the polyzone project of the lecture notes with the following characteristics:

	Year 0	Year 1	Year 2	Year 3	Year 4	Years 5-10
Investment	100					
Production, millions of pounds per year	0	0	40	80	80	80
Spread, \$ per pound	1.20	1.20	1.20	1.20	1.10	.95
Net revenues	0	0	48	96	88	76
Production costs	0	0	30	30	30	30
Transport	0	0	4	8	8	8
Other costs	0	20	20	20	20	20
Cash flow	-100	-20	-6	38	30	18
NPV (at $r = 8\%$) = -9.8						

Reevaluate the NPV of the proposed polyzone project under each of the following assumptions. What's the right management decision in each case?

- Spread in year 4 holds at \$1.20 per pound.
- The U.S. Chemical company can start up polyzone production at 40 million pounds in year 1 rather than year 2.
- The U.S. company makes a technological advance that reduces its annual production costs to \$25 million. Competitors' production costs do not change.

Question 8. Photographic laboratories recover and recycle the silver used in photographic film. Stikine River Photo is considering purchase of improved equipment for their laboratory at Telegraph Creek. Here is the information they have:

- The equipment costs \$100,000 and will cost \$80,000 per year to run.
- It has an economic life of 10 years but can be depreciated over 5 years by the straight-line method.
- It will recover an additional 5,000 ounces of silver per year.
- Silver is selling for \$20 per ounce. Over the past 10 years, the price of silver has appreciated by 4.5% per year in real terms. Silver is traded in an active, competitive market.
- Stikine's marginal tax rate is 35%. Assume U.S. tax law.
- Stikine's company cost of capital is 8% in real terms.
- The nominal interest rate is 6%.

What is the NPV of the new equipment? Make additional assumptions as necessary.

Question 9. The Cambridge Opera Association has come up with a unique door prize for its December (2010) fund-raising ball: Twenty door prizes will be distributed, each one a ticket entitling the bearer to receive a cash award from the association on December 31, 2011. The cash award is to be determined by calculating the ratio of the level of the Standard and Poor's Composite Index of stock prices on December 31, 2011, to its level on June 30, 2011, and multiplying by \$100. Thus, if the index turns out to be 1,000 on June 30, 2011, and 1,200 on December 31, 2011, the payoff will be $100 \times (1,200/1,000) = \120 .

After the ball, a black market springs up in which the tickets are traded. What will the tickets sell for January 1, 2011? On June 30, 2011? Assume the risk-free interest rate is 10% per year. Also assume the Cambridge Opera Association will be solvent at year-end 2011 and will, in fact, pay off on the tickets. Make other assumptions as necessary.

Would ticket values be different if the tickets' payoffs depended on the Dow Jones Industrial index rather than the Standard and Poor's Composite?

Question 10. You are asked to value a large building in northern New Jersey. The valuation is needed for a bankruptcy settlement. Here are the facts:

- The settlement requires that the building's value equal the PV of the net cash proceeds the railroad would receive if it cleared the building and sold it for its highest and best nonrailroad use, which is as a warehouse.
- The building has been appraised at \$1 million. This figure is based on actual recent selling prices of a sample of similar New Jersey buildings used as, or available for use as, warehouse.
- If rented today as a warehouse, the building could generate \$80,000 per year. This cash flow is calculated after out-of-pocket operating expenses and after real estate takes of \$50,000 per year:

Gross rents	\$180,000
Operating expenses	50,000
Real estate taxes	50,000
Net	\$80,000

Gross rents, operating expenses, and real estate taxes are uncertain but are expected to grow with inflation.

- However, it would take one year and \$200,000 to clear out the railroad equipment and prepare the building for use as a warehouse. This expenditure would be spread evenly over the next year.
- The property will be put on the market when ready for use as a warehouse. Your real estate adviser says that properties of this type take, on average, one year to sell after they are put on the market. However, the railroad could rent the building as a warehouse while waiting for it to sell.
- The opportunity cost of capital for investment in real estate is 8% in real terms.
- Your real estate adviser notes that selling prices of comparable buildings in northern New Jersey have declined, in real terms, at an average rate of 2% per year over the last 10 years.
- A 5% sales commission would be paid by the railroad at the time of the sale.
- The railroad pays no income taxes. It would have to pay property taxes.

Question 11. The manufacture of polysyllabic acid is a competitive industry. Most plants have an annual output of 100,000 tons. Operating costs are \$0.90 a ton, and the sales price is \$1 a ton. A 100,000-ton plant costs \$100,000 and has an indefinite life. Its current scrap value of \$60,000 is expected to decline to \$57,900 over the next two years.

Phlogiston, Inc., proposes to invest \$100,000 in a plant that employs a new low-cost process to manufacture polysyllabic acid. The plant has the same capacity as existing units, but operating costs are \$0.85 a ton. Phlogiston estimates that it has two years' lead over each of its rivals in use of the process but is unable to build any more plants itself before year 2. Also it believes that demand over the next two years is likely to be sluggish and that its new plant will therefore cause temporary overcapacity.

You can assume that there are no taxes and that the cost of capital is %10.

- (a) By the end of year 2, the prospective increase in acid demand will require the construction of several new plants using the Phlogiston process. What is the likely NPV of such plants?
- (b) What does that imply for the price of polysyllabic acid in year 3 and beyond?
- (c) Would you expect existing plant to be scrapped in year 2? How would your answer differ if scrap value were \$40,000 or \$80,000?
- (d) The acid plants of United Alchemists, Inc., have been fully depreciated. Can it operate them profitably after year 2?
- (e) Acidosis, Inc., purchased a new plant last year for \$100,000 and is writing it down by \$10,000 a year. Should it scrap this plant in year 2?
- (f) What would be the NPV of Phlogiston's venture?

Question 12. The world airline system is composed of the routes X and Y, each of which requires 10 aircraft. These routes can be serviced by three types of aircraft—A, B, and C. There are 5 type A aircraft available, 10 type B, and 10 type C. These aircraft are identical except for their operating costs, which are as follows:

Aircraft Type	Annual Operating Cost (\$ millions)	
	Route X	Route Y
A	1.5	1.5
B	2.5	2.0
C	4.5	3.5

The aircraft have a useful life of five years and a salvage value of \$1 million. The aircraft owners do not operate the aircraft themselves but rent them to the operators. Owners act competitively to maximize their rental income, and operators attempt to minimize their operating costs. Airfares are also competitively determined. Assume the cost of capital is 10%.

- Which aircraft would be used on which route, and how much would each aircraft be worth?
- What would happen to usage and prices of each aircraft if the number of type A aircraft increased to 10?
- What would happen if the number of type A aircraft increased to 15?
- What would happen if the number of type A aircraft increased to 20?

State any additional assumptions you need to make.

Question 13. Taxes are a cost, and, therefore, changes in tax rates can affect consumer prices, project lives, and the value of existing firms. The following problem illustrates this. It also illustrates that the tax changes that appear to be “good for business” do not always increase the value of existing firms. Indeed, unless new investment incentives increase consumer demand, they can work only by rendering existing equipment obsolete.

The manufacture of bucolic acid is a competitive business. Demand is steadily expanding, and new plants are constantly being opened. Expected cash flows from an investment in a new plant are as follows:

	0	1	2	3
1. Initial investment	100			
2. Revenues		100	100	100
3. Cash operating costs		50	50	50
4. Tax depreciation		33.33	33.33	33.33
5. Income pretax		16.67	16.67	16.67
6. Tax at 40%		6.67	6.67	6.67
7. Net income		10	10	10
8. After-tax salvage				15
9. Cash flow (7 + 8 + 4 - 1)	-100	+43.33	+43.33	+58.33
NPV at 20% = 0				

Assumptions:

1. *Tax depreciation is straight-line over three years.*
2. *Pretax salvage value is 25 in year 3 and 50 if the asset is scrapped in year 2.*
3. *Tax on salvage value is 40% of the difference between salvage value and depreciated investment.*
4. *The cost of capital is 20%.*

- (a) What is the value of a one-year-old plant? Of a two-year-plant?
- (b) Suppose that the government new changes tax depreciation to allow a 100% writeoff in year 1. How does this affect the value of existing one- and two-year-old plants? Existing plants must continue using the original tax depreciation schedule.
- (c) Would it now make sense to scrap existing plants when they are two rather than three years old?
- (d) How would your answers change if the corporate income tax were abolished entirely?