

CHAPTER 5

Problems and Questions

1. You have been given the following information on a project:
- It has a five-year lifetime
 - The initial investment in the project will be \$25 million, and the investment will be depreciated straight line, down to a salvage value of \$10 million at the end of the fifth year.
 - The revenues are expected to be \$20 million next year and to grow 10% a year after that for the remaining four years.
 - The cost of goods sold, excluding depreciation, is expected to be 50% of revenues.
 - The tax rate is 40%.
- a. Estimate the pretax return on capital, by year and on average, for the project.
 - b. Estimate the after-tax return on capital, by year and on average, for the project.
 - c. If the firm faced a cost of capital of 12%, should it take this project?
2. Now assume that the facts in Problem 1 remain unchanged except for the depreciation method, which is switched to an accelerated method with the following depreciation schedule:

Year	% of Depreciable Asset
1	40%
2	20%
3	14.4%
4	13.3%
5	13.3%

Depreciable Asset = Initial Investment – Salvage Value

- a. Estimate the pretax return on capital, by year and on average, for the project.
 - b. Estimate the after-tax return on capital, by year and on average, for the project.
 - c. If the firm faced a cost of capital of 12%, should it take this project?
3. Consider again the project described in Problem 1 (assume that the depreciation reverts to a straight line). Assume that 40% of the initial investment for the project will be

financed with debt, with an annual interest rate of 10% and a balloon payment of the principal at the end of the fifth year.

a. Estimate the return on equity, by year and on average, for this project.

b. If the cost of equity is 15%, should the firm take this project?

4. Answer true or false to the following statements:

a. The return on equity for a project will always be higher than the return on capital on the same project.

b. If the return on capital is less than the cost of equity, the project should be rejected.

c. Projects with high financial leverage will have higher interest expenses and lower net income than projects with low financial leverage and thus end up with a lower return on equity.

d. Increasing the depreciation on an asset will increase the estimated return on capital and equity on the project.

e. The average return on equity on a project over its lifetime will increase if we switch from straight line to double declining balance depreciation.

5. Under what conditions will the return on equity on a project be equal to the IRR, estimated from cash flows to equity investors, on the same project?

6. You are provided with the projected income statements for a project:

Year	1	2	3	4
Revenues (\$)	\$10,000	\$11,000	\$12,000	\$13,000
– Cost of goods sold (\$)	\$4,000	\$4,400	\$4,800	\$5,200
– Depreciation	\$4,000	\$3,000	\$2,000	\$1,000
= EBIT	\$2,000	\$3,600	\$5,200	\$6,800

- The tax rate is 40%.
- The project required an initial investment of \$15,000 and an additional investment of \$2,000 at the end of year two.
- The working capital is anticipated to be 10% of revenues, and the working capital investment has to be made at the beginning of each period.

a. Estimate the free cash flow to the firm for each of the four years.

b. Estimate the payback period for investors in the firm.

c. Estimate the NPV to investors in the firm, if the cost of capital is 12%. Would you accept the project?

d. Estimate the IRR to investors in the firm. Would you accept the project?

7. Consider the project described in Problem 6. Assume that the firm plans to finance 40% of its net capital expenditure and working capital needs with debt.

a. Estimate the free cash flow to equity for each of the four years.

b. Estimate the payback period for equity investors in the firm.

c. Estimate the NPV to equity investors if the cost of equity is 16%. Would you accept the project?

d. Estimate the IRR to equity investors in the firm. Would you accept the project?

8. You are provided with the following cash flows on a project:

<i>Year</i>	<i>Cash Flow to Firm (\$)</i>
0	-10,000,000
1	\$ 4,000,000
2	\$ 5,000,000
3	\$ 6,000,000

Plot the net present value NPV profile for this project. What is the IRR? If this firm had a cost of capital of 10% and a cost of equity of 15%, would you accept this project?

9. You have estimated the following cash flows on a project:

<i>Year</i>	<i>Cash Flow to Equity (\$)</i>
0	-\$ 5,000,000
1	\$4,000,000
2	\$ 4,000,000
3	-\$3,000,000

Plot the NPV profile for this project. What is the IRR? If the cost of equity is 16%, would you accept this project?

10. Estimate the MIRR for the project described in Problem 8. Does it change your decision on accepting this project?

11. You are analyzing two mutually exclusive projects with the following cash flows:

Year	A	B
0	-\$4,000,000	-\$4,000,000
1	\$2,000,000	\$1,000,000
2	\$1,500,000	\$1,500,000
3	\$ 1,250,000	\$1,700,000
4	\$1,000,000	\$2,400,000

- Estimate the NPV of each project, assuming a cost of capital of 10%. Which is the better project?
- Estimate the IRR for each project. Which is the better project?
- What reinvestment rate assumptions are made by each of these rules? Can you show the effect on future cash flows of these assumptions?
- What is the MIRR on each of these projects?

12. You have a project that does not require an initial investment but has its expenses spread over the life of the project. Can the IRR be estimated for this project? Why or why not?

13. Businesses with severe capital rationing constraints should use IRR more than NPV. Do you agree? Explain.

14. You have to pick between three mutually exclusive projects with the following cash flows to the firm:

<i>Year</i>	<i>Project A</i>	<i>Project B</i>	<i>Project C</i>
0	-\$10,000	\$5,000	-\$15,000
1	\$ 8,000	\$ 5,000	\$ 10,000
2	\$ 7,000	-\$8,000	\$10,000

The cost of capital is 12%.

- Which project would you pick using the NPV rule?
- Which project would you pick using the IRR rule?
- How would you explain the differences between the two rules? Which one would you rely on to make your choice?

15. You are analyzing an investment decision, in which you will have to make an initial investment of \$10 million and you will be generating annual cash flows to the firm of \$2 million every year, growing at 5% a year, forever.

- a. Estimate the NPV of this project, if the cost of capital is 10%.
- b. Estimate the IRR of this project.

16. You are analyzing a project with a thirty-year lifetime, with the following characteristics:

- The project will require an initial investment of \$20 million and additional investments of \$5 million in year ten and \$5 million in year twenty.
- The project will generate earnings before interest and taxes of \$3 million each year. (The tax rate is 40%.)
- The depreciation will amount to \$500,000 each year, and the salvage value of the equipment will be equal to the remaining book value at the end of year thirty.
- The cost of capital is 12.5%.

- a. Estimate the NPV of this project.
- b. Estimate the IRR on this project. What might be some of the problems in estimating the IRR for this project?

17. You are trying to estimate the NPV of a three-year project, where the discount rate is expected to change over time.

Year	Cash Flow to Firm (\$)	Discount Rate (%)
0	\$15,000	9.5%
1	\$5,000	10.5%
2	\$ 5,000	11.5%
3	\$ 10,000	12.5%

- a. Estimate the NPV of this project. Would you take this project?
- b. Estimate the IRR of this project. How would you use the IRR to decide whether to take this project?

18. Barring the case of multiple IRRs, is it possible for the NPV of a project to be positive while the IRR is less than the discount rate? Explain.

19. You are helping a manufacturing firm decide whether it should invest in a new plant. The initial investment is expected to be \$50 million, and the plant is expected to generate after-tax cash flows of \$5 million a year for the next twenty years. There will be an additional investment of \$20 million needed to upgrade the plant in ten years. If the discount rate is 10%,

- a. Estimate the NPV of the project.
- b. Prepare an NPV Profile for this project.
- c. Estimate the IRR for this project. Is there any aspect of the cash flows that may prove to be a problem for calculating IRR?

20. You have been asked to analyze a project where the analyst has estimated the return on capital to be 37% over the ten-year lifetime of the project. The cost of capital is only 12%, but you have concerns about using the return on capital as an investment decision rule. Would it make a difference if you knew that the project was employing an accelerated depreciation method to compute depreciation? Why?

21. Accounting rates of return are based on accounting income and book value of investment, whereas internal rates of return are based on cash flows and take into account the time value of money. Under what conditions will the two approaches give you similar estimates?