Net Present Value One potential criticism of the net present value technique is that there is an implicit assumption that the intermediate cash flows of the project are reinvested at the required return. In other words, if you calculate the future value of the intermediate cash flows to the end of the project at the required return, sum the future values, and find the net present value of the two cash flows, you will get the same net present value as the original calculation. If the reinvestment rate used to calculate the future value is lower than the required return, the net present value will decrease. How would you evaluate this criticism?

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Internal Rate of Return One potential criticism of the internal rate of return technique is that there is an implicit assumption that the intermediate cash flows of the project are reinvested at the internal rate of return. In other words, if you calculate the future value of the intermediate cash flows to the end of the project at the required return, sum the future values, and calculate the internal rate of return of the two cash flows, you will get the same internal rate of return as the original calculation. If the reinvestment rate used to calculate the future value is different than the internal rate of return, the internal rate of return calculated for the two cash flows will be different. How would you evaluate this criticism?

QUESTIONS AND PROBLEMS

connect

Basic (Questions 1–10)

1. **Calculating Payback Period and NPV** Tri Star, Inc., has the following mutually exclusive projects.

YEAR	PROJECT A	PROJECT B
0	−$15,300	−$10,700
1	8,700	5,300
2	7,400	4,300
3	3,100	4,800

   a. Suppose the company's payback period cutoff is two years. Which of these two projects should be chosen?

   b. Suppose the company uses the NPV rule to rank these two projects. Which project should be chosen if the appropriate discount rate is 15 percent?

2. **Calculating Payback** An investment project provides cash inflows of $915 per year for eight years. What is the project payback period if the initial cost is $3,400? What if the initial cost is $4,800? What if it is $7,900?

3. **Calculating Discounted Payback** An investment project has annual cash inflows of $4,300, $4,900, $5,400, and $5,600, and a discount rate of 12 percent. What is the discounted payback period for these cash flows if the initial cost is $6,000? What if the initial cost is $9,000? What if it is $13,000?

4. **Calculating Discounted Payback** An investment project costs $13,500 and has annual cash flows of $3,900 for six years. What is the discounted payback period if the discount rate is 0 percent? What if the discount rate is 7 percent? If it is 21 percent?

5. **Average Accounting Return** Your firm is considering purchasing a machine with the following annual, end-of-year, book investment accounts.

	PURCHASE DATE	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Gross investment	$57,000	$57,000	$57,000	$57,000	$57,000
Less: Accumulated depreciation	0	14,250	28,500	42,750	57,000
Net investment	$57,000	$42,750	$28,500	$14,250	$ 0

The machine generates, on average, $5,800 per year in additional net income.

a. What is the average accounting return for this machine?
b. What three flaws are inherent in this decision rule?

6. **Average Accounting Return** The Patches Group has invested $27,000 in a high-tech project lasting three years. Depreciation is $8,100, $12,400, and $6,500 in Years 1, 2, and 3, respectively. The project generates earnings before tax of $3,340 each year. If the tax rate is 25 percent, what is the project's average accounting return (AAR)? page 222

7. **Calculating IRR** Fast Machines, Inc., has a project with the following cash flows.

YEAR	CASH FLOWS ($)
0	−$16,100
1	7,800
2	9,100
3	5,300

The company evaluates all projects by applying the IRR rule. If the appropriate interest rate is 9 percent, should the company accept the project?

8. **Calculating IRR** Compute the internal rate of return for the cash flows of the following two projects.

	CASH FLOWS ($)	
YEAR	PROJECT A	PROJECT B
0	−$6,700	−$4,600
1	2,100	1,800
2	3,900	2,300
3	2,700	1,900

9. **Calculating Profitability Index** Bill plans to open a self-serve grooming center in a storefront. The grooming equipment will cost $207,000. Bill expects aftertax cash inflows of $64,000 annually for seven years, after which he plans to scrap the equipment and retire to the beaches of Nevis. The first cash inflow occurs at the end of the first year. Assume the required return is 15 percent. What is the project's PI? Should it be accepted?

10. **Calculating Profitability Index** Suppose the following two independent investment opportunities are available to Greene, Inc. The appropriate discount rate is 10 percent.

YEAR	PROJECT ALPHA	PROJECT BETA
0	−$2,100	−$3,400
1	900	1,700
2	1,200	2,900
3	1,100	1,400

a. Compute the profitability indexes for each of the two projects.
b. Which project(s) should the company accept based on the profitability index rule?

Intermediate (Questions 11–22)

11. Cash Flow Intuition A project has an initial cost of I, has a required return of R, and pays C annually for N years.

a. Find C in terms of I and N such that the project has a payback period just equal to its life.

b. Find C in terms of I, N, and R such that this is a profitable project according to the NPV decision rule.

c. Find C in terms of I, N, and R such that the project has a benefit–cost ratio of 2.

QUESTIONS AND PROBLEMS

connect

Basic (Questions 1–10)

1. **Calculating Project NPV** Creole Restaurant is considering the purchase of a $33,000 soufflé maker. The soufflé maker has an economic life of six years and will be fully depreciated by the straight-line method. The machine will produce 2,400 soufflés per year, with each costing $2 to make and priced at $7. Assume that the discount rate is 14 percent and the tax rate is 34 percent. Should the company make the purchase?

2. **Calculating Project NPV** The Freeman Manufacturing Company is considering a new investment. Financial projections for the investment are tabulated below. The corporate tax rate is 34 percent. Assume all sales revenue is received in cash, all operating costs and income taxes are paid in cash, and all cash flows occur at the end of the year. All net working capital is recovered at the end of the project.

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Investment	$31,000	–	–	–	–
Sales revenue	–	$14,200	$15,900	$15,700	$12,900
Operating costs	–	2,100	2,100	2,100	2,100
Depreciation	–	7,750	7,750	7,750	7,750
Net working capital spending	450	175	250	275	?

   a. Compute the incremental net income of the investment for each year.
   b. Compute the incremental cash flows of the investment for each year.
   c. Suppose the appropriate discount rate is 12 percent. What is the NPV of the project?

3. **Calculating Project NPV** Down Under Boomerang, Inc., is considering a new three-year expansion project that requires an initial fixed asset investment of $3,950,000. The fixed asset will be depreciated straight-line to zero over its three-year tax life, after which time it will be worthless. The project is estimated to generate $3,175,000 in annual sales, with costs of $1,455,000. The tax rate is 35 percent and the required return is 10 percent. What is the project's NPV?

4. **Calculating Project Cash Flow from Assets** In the previous problem, suppose the project requires an initial investment in net working capital of $450,000 and the fixed asset will have a market value of $575,000 at the end of the project. What is the project's Year 0 net cash flow? Year 1? Year 2? Year 3? What is the new NPV?

5. **NPV and Modified ACRS** In the previous problem, suppose the fixed asset actually falls into the three-year MACRS class. All the other facts are the same. What is the project's Year 1 net cash flow now? Year 2? Year 3? What is the new NPV?

6. **Project Evaluation** Your firm is contemplating the purchase of a new $625,000 computer-based order entry system. The system will be depreciated straight-line to zero over its five-year life. It will be worth $60,000 at the end of that time. You will save $235,000 before taxes per year in order processing costs, and you will be able to reduce working capital by $55,000 (this is a one-time reduction). If the tax rate is 35 percent, what is the IRR for this project?

7. **Project Evaluation** Symon Meats is looking at a new sausage system with an installed cost of $267,000. This cost will be depreciated straight-line to zero over the project's five-year life, at the end of which the sausage system can be scrapped for $30,000. The sausage system will save the firm $87,000 per year in pretax operating costs, and the system requires an initial investment in net working capital of $11,000. If the tax rate is 34 percent and the discount rate is 10 percent, what is the NPV of this project?

8. **Calculating Salvage Value** An asset used in a four-year project falls in the five-year MACRS class for tax purposes. The asset has an acquisition cost of $7,300,000 and will be sold for $1,640,000 at the end of the project. If the tax rate is 35 percent, what is the aftertax salvage value of the asset?