Question Book for

Investment Criteria and Decision

9–1 All techniques with NPV profile—Mutually exclusive projects Fitch Industries is in the process of choosing the better of two equal-risk, mutually exclusive capital expenditure projects—M and N. The relevant cash flows for each project are shown in the following table. The firm's cost of capital is 14%.

	Project M	Project N
Initial investment (CF_0)	$28,500	$27,000
Year (t)	Cash inflows (CF_t)	
1	$10,000	$11,000
2	10,000	10,000
3	10,000	9,000
4	10,000	8,000

a. Calculate each project's payback period.
b. Calculate the net present value (NPV) for each project.
c. Calculate the internal rate of return (IRR) for each project.
d. Summarize the preferences dictated by each measure you calculated, and indicate which project you would recommend. Explain why.
e. Draw the net present value profiles for these projects on the same set of axes, and explain the circumstances under which a conflict in rankings might exist.

9–1 Payback period Jordan Enterprises is considering a capital expenditure that requires an initial investment of $42,000 and returns after-tax cash inflows of $7,000 per year for 10 years. The firm has a maximum acceptable payback period of 8 years.
a. Determine the payback period for this project.
b. Should the company accept the project? Why or why not?

9–2 Payback comparisons Nova Products has a 5-year maximum acceptable payback period. The firm is considering the purchase of a new machine and must

choose between two alternative ones. The first machine requires an initial investment of $14,000 and generates annual after-tax cash inflows of $3,000 for each of the next 7 years. The second machine requires an initial investment of $21,000 and provides an annual cash inflow after taxes of $4,000 for 20 years.

a. Determine the payback period for each machine.
b. Comment on the acceptability of the machines, assuming that they are independent projects.
c. Which machine should the firm accept? Why?
d. Do the machines in this problem illustrate any of the weaknesses of using payback? Discuss.

9–3 Choosing between two projects with acceptable payback periods Shell Camping Gear, Inc., is considering two mutually exclusive projects. Each requires an initial investment of $100,000. John Shell, president of the company, has set a maximum payback period of 4 years. The after-tax cash inflows associated with each project are as follows:

	Cash inflows (CF_t)	
Year	Project A	Project B
1	$10,000	$40,000
2	20,000	30,000
3	30,000	20,000
4	40,000	10,000
5	20,000	20,000

a. Determine the payback period of each project.
b. Because they are mutually exclusive, Shell must choose one. Which should the company invest in?
c. Explain why one of the projects is a better choice than the other.

9–4 NPV Calculate the net present value (NPV) for the following 20-year projects. Comment on the acceptability of each. Assume that the firm has an opportunity cost of 14%.

a. Initial investment is $10,000; cash inflows are $2,000 per year.
b. Initial investment is $25,000; cash inflows are $3,000 per year.
c. Initial investment is $30,000; cash inflows are $5,000 per year.

9–5 NPV for varying costs of capital Dane Cosmetics is evaluating a new fragrance-mixing machine. The machine requires an initial investment of $24,000 and will generate after-tax cash inflows of $5,000 per year for 8 years. For each of the costs of capital listed, (1) calculate the net present value (NPV), (2) indicate whether to accept or reject the machine, and (3) explain your decision.

a. The cost of capital is 10%.
b. The cost of capital is 12%.
c. The cost of capital is 14%.

9–6 Net present value—Independent projects Using a 14% cost of capital, calculate the net present value for each of the independent projects shown in the following table, and indicate whether each is acceptable.

	Project A	Project B	Project C	Project D	Project E
Initial investment (CF_0)	$26,000	$500,000	$170,000	$950,000	$80,000
Year (t)	Cash inflows (CF_t)				
1	$4,000	$100,000	$20,000	$230,000	$ 0
2	4,000	120,000	19,000	230,000	0
3	4,000	140,000	18,000	230,000	0
4	4,000	160,000	17,000	230,000	20,000
5	4,000	180,000	16,000	230,000	30,000
6	4,000	200,000	15,000	230,000	0
7	4,000		14,000	230,000	50,000
8	4,000		13,000	230,000	60,000
9	4,000		12,000		70,000
10	4,000		11,000		

9–7 NPV Simes Innovations, Inc., is negotiating to purchase exclusive rights to manufacture and market a solar-powered toy car. The car's inventor has offered Simes the choice of either a one-time payment of $1,500,000 today or a series of 5 year-end payments of $385,000.

a. If Simes has a cost of capital of 9%, which form of payment should the company choose?

b. What yearly payment would make the two offers identical in value at a cost of capital of 9%?

c. Would your answer to part **a** of this problem be different if the yearly payments were made at the beginning of each year? Show what difference, if any, that change in timing would make to the present value calculation.

d. The after-tax cash inflows associated with this purchase are projected to amount to $250,000 per year for 15 years. Will this factor change the firm's decision about how to fund the initial investment?

9–8 NPV and maximum return A firm can purchase a fixed asset for a $13,000 initial investment. The asset generates an annual after-tax cash inflow of $4,000 for 4 years.

a. Determine the net present value (NPV) of the asset, assuming that the firm has a 10% cost of capital. Is the project acceptable?

b. Determine the maximum required rate of return (closest whole-percentage rate) that the firm can have and still accept the asset. Discuss this finding in light of your response in part **a.**

9–9 NPV—Mutually exclusive projects Hook Industries is considering the replacement of one of its old drill presses. Three alternative replacement presses are

under consideration. The relevant cash flows associated with each are shown in the following table. The firm's cost of capital is 15%.

	Press A	Press B	Press C
Initial investment (CF_0)	$85,000	$60,000	$130,000
Year (t)	Cash inflows (CF_t)		
1	$18,000	$12,000	$50,000
2	18,000	14,000	30,000
3	18,000	16,000	20,000
4	18,000	18,000	20,000
5	18,000	20,000	20,000
6	18,000	25,000	30,000
7	18,000	—	40,000
8	18,000	—	50,000

a. Calculate the net present value (NPV) of each press.
b. Using NPV, evaluate the acceptability of each press.
c. Rank the presses from best to worst using NPV.

9–10 Payback and NPV Neil Corporation has three projects under consideration. The cash flows for each of them are shown in the following table. The firm has a 16% cost of capital.

	Project A	Project B	Project C
Initial investment (CF_0)	$40,000	$40,000	$40,000
Year (t)	Cash inflows (CF_t)		
1	$13,000	$ 7,000	$19,000
2	13,000	10,000	16,000
3	13,000	13,000	13,000
4	13,000	16,000	10,000
5	13,000	19,000	7,000

a. Calculate each project's payback period. Which project is preferred according to this method?
b. Calculate each project's net present value (NPV). Which project is preferred according to this method?
c. Comment on your findings in parts **a** and **b**, and recommend the best project. Explain your recommendation.

9–11 Internal rate of return For each of the projects shown in the following table, calculate the internal rate of return (IRR). Then indicate, for each project, the maximum cost of capital that the firm could have and still find the IRR acceptable.

	Project A	Project B	Project C	Project D
Initial investment (CF_0)	$90,000	$490,000	$20,000	$240,000
Year (t)	Cash inflows (CF_t)			
1	$20,000	$150,000	$7,500	$120,000
2	25,000	150,000	7,500	100,000
3	30,000	150,000	7,500	80,000
4	35,000	150,000	7,500	60,000
5	40,000	—	7,500	—

9–12 IRR—Mutually exclusive projects Bell Manufacturing is attempting to choose the better of two mutually exclusive projects for expanding the firm's warehouse capacity. The relevant cash flows for the projects are shown in the following table. The firm's cost of capital is 15%.

	Project X	Project Y
Initial investment (CF_0)	$500,000	$325,000
Year (t)	Cash inflows (CF_t)	
1	$100,000	$140,000
2	120,000	120,000
3	150,000	95,000
4	190,000	70,000
5	250,000	50,000

a. Calculate the IRR to the nearest whole percent for each of the projects.
b. Assess the acceptability of each project on the basis of the IRRs found in part **a.**
c. Which project, on this basis, is preferred?

9–13 IRR, investment life, and cash inflows Oak Enterprises accepts projects earning more than the firm's 15% cost of capital. Oak is currently considering a 10-year project that provides annual cash inflows of $10,000 and requires an initial investment of $61,450. (*Note:* All amounts are after taxes.)
a. Determine the IRR of this project. Is it acceptable?
b. Assuming that the cash inflows continue to be $10,000 per year, how many *additional years* would the flows have to continue to make the project acceptable (that is, to make it have an IRR of 15%)?
c. With the given life, initial investment, and cost of capital, what is the minimum annual cash inflow that the firm should accept?

9–14 NPV and IRR Benson Designs has prepared the following estimates for a long-term project it is considering. The initial investment is $18,250, and the project is expected to yield after-tax cash inflows of $4,000 per year for 7 years. The firm has a 10% cost of capital.
a. Determine the net present value (NPV) for the project.
b. Determine the internal rate of return (IRR) for the project.

c. Would you recommend that the firm accept or reject the project? Explain your answer.

9–15 NPV, with rankings Botany Bay, Inc., a maker of casual clothing, is considering four projects. Because of past financial difficulties, the company has a high cost of capital at 15%. Which of these projects would be acceptable under those cost circumstances?

	Project A	Project B	Project C	Project D
Initial investment (CF_0)	$50,000	$100,000	$80,000	$180,000
Year (t)	Cash inflows (CF_t)			
1	$20,000	$35,000	$20,000	$100,000
2	20,000	50,000	40,000	80,000
3	20,000	50,000	60,000	60,000

a. Calculate the NPV of each project, using a cost of capital of 15%.
b. Rank acceptable projects by NPV.
c. At what approximate cost of capital would all of the projects be acceptable?

9–16 All techniques, conflicting rankings Nicholson Roofing Materials, Inc., is considering two mutually exclusive projects, each with an initial investment of $150,000. The company's board of directors has set a 4-year payback requirement and has set its cost of capital at 9%. The cash inflows associated with the two projects are as follows:

	Cash inflows (CF_t)	
Year	Project A	Project B
1	$45,000	$75,000
2	45,000	60,000
3	45,000	30,000
4	45,000	30,000
5	45,000	30,000
6	45,000	30,000

a. Calculate the payback period for each project.
b. Calculate the NPV of each project at 0%.
c. Calculate the NPV of each project at 9%.
d. Derive the IRR of each project.
e. Rank the projects by each of the techniques used. Make and justify a recommendation.

9–17 Payback, NPV, and IRR Rieger International is attempting to evaluate the feasibility of investing $95,000 in a piece of equipment that has a 5-year life. The firm has estimated the *cash inflows* associated with the proposal as shown in the following table. The firm has a 12% cost of capital.

Year (t)	Cash inflows (CF_t)
1	$20,000
2	25,000
3	30,000
4	35,000
5	40,000

a. Calculate the payback period for the proposed investment.
b. Calculate the net present value (NPV) for the proposed investment.
c. Calculate the internal rate of return (IRR), rounded to the nearest whole percent, for the proposed investment.
d. Evaluate the acceptability of the proposed investment using NPV and IRR. What recommendation would you make relative to implementation of the project? Why?

9–18 NPV, IRR, and NPV profiles Thomas Company is considering two mutually exclusive projects. The firm, which has a 12% cost of capital, has estimated its cash flows as shown in the following table.

	Project A	Project B
Initial investment (CF_0)	$130,000	$85,000
Year (t)	Cash inflows (CF_t)	
1	$25,000	$40,000
2	35,000	35,000
3	45,000	30,000
4	50,000	10,000
5	55,000	5,000

a. Calculate the NPV of each project, and assess its acceptability.
b. Calculate the IRR for each project, and assess its acceptability.
c. Draw the NPV profiles for both projects on the same set of axes.
d. Evaluate and discuss the rankings of the two projects on the basis of your findings in parts **a**, **b**, and **c**.
e. Explain your findings in part **d** in light of the pattern of cash inflows associated with each project.

9–19 All techniques—Decision among mutually exclusive investments Pound Industries is attempting to select the best of three mutually exclusive projects. The initial investment and after-tax cash inflows associated with these projects are shown in the following table.

Cash flows	Project A	Project B	Project C
Initial investment (CF_0)	$60,000	$100,000	$110,000
Cash inflows (CF_t), $t = 1$ to 5	$20,000	$ 31,500	$ 32,500

a. Calculate the payback period for each project.

b. Calculate the net present value (NPV) of each project, assuming that the firm has a cost of capital equal to 13%.
c. Calculate the internal rate of return (IRR) for each project.
d. Draw the net present value profiles for both projects on the same set of axes, and discuss any conflict in ranking that may exist between NPV and IRR.
e. Summarize the preferences dictated by each measure, and indicate which project you would recommend. Explain why.

9–20 All techniques with NPV profile—Mutually exclusive projects Projects A and B, of equal risk, are alternatives for expanding the Rosa Company's capacity. The firm's cost of capital is 13%. The cash flows for each project are shown in the following table.

	Project A	Project B
Initial investment (CF_0)	$80,000	$50,000
Year (t)	Cash inflows (CF_t)	
1	$15,000	$15,000
2	20,000	15,000
3	25,000	15,000
4	30,000	15,000
5	35,000	15,000

a. Calculate each project's payback period.
b. Calculate the net present value (NPV) for each project.
c. Calculate the internal rate of return (IRR) for each project.
d. Draw the net present value profiles for both projects on the same set of axes, and discuss any conflict in ranking that may exist between NPV and IRR.
e. Summarize the preferences dictated by each measure, and indicate which project you would recommend. Explain why.