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- b. Calculate the NPV of the project using the single future value calculated in the previous step and the initial outlay. It is easy to verify that you will get the same NPV as in your original calculation only if you use the required return as the reinvestment rate in the previous step.
15. **Internal Rate of Return [LO5]** It is sometimes stated that "the internal rate of return approach assumes reinvestment of the intermediate cash flows at the internal rate of return." Is this claim correct? To answer, suppose you calculate the IRR of a project in the usual way. Next, suppose you do the following:
- Calculate the future value (as of the end of the project) of all the cash flows other than the initial outlay assuming they are reinvested at the IRR, producing a single future value figure for the project.
 - Calculate the IRR of the project using the single future value calculated in the previous step and the initial outlay. It is easy to verify that you will get the same IRR as in your original calculation only if you use the IRR as the reinvestment rate in the previous step.



QUESTIONS AND PROBLEMS

1. **Calculating Payback [LO2]** What is the payback period for the following set of cash flows?

BASIC
(Questions 1–19)

Year	Cash Flow
0	–\$5,500
1	1,300
2	1,500
3	1,900
4	1,400

2. **Calculating Payback [LO2]** An investment project provides cash inflows of \$585 per year for eight years. What is the project payback period if the initial cost is \$1,700? What if the initial cost is \$3,300? What if it is \$4,900?
3. **Calculating Payback [LO2]** Buy Coastal, Inc., imposes a payback cutoff of three years for its international investment projects. If the company has the following two projects available, should it accept either of them?

Year	Cash Flow (A)	Cash Flow (B)
0	–\$60,000	–\$ 70,000
1	23,000	15,000
2	28,000	18,000
3	21,000	26,000
4	8,000	230,000

4. **Calculating Discounted Payback [LO3]** An investment project has annual cash inflows of \$3,200, \$4,100, \$5,300, and \$4,500, and a discount rate of 14 percent. What is the discounted payback period for these cash flows if the initial cost is \$5,900? What if the initial cost is \$8,000? What if it is \$11,000?
5. **Calculating Discounted Payback [LO3]** An investment project costs \$10,000 and has annual cash flows of \$2,900 for six years. What is the discounted payback period if the discount rate is zero percent? What if the discount rate is 5 percent? If it is 19 percent?

6. **Calculating AAR [LO4]** You're trying to determine whether to expand your business by building a new manufacturing plant. The plant has an installation cost of \$12 million, which will be depreciated straight-line to zero over its four-year life. If the plant has projected net income of \$1,854,300, \$1,907,600, \$1,876,000, and \$1,329,500 over these four years, what is the project's average accounting return (AAR)?
7. **Calculating IRR [LO5]** A firm evaluates all of its projects by applying the IRR rule. If the required return is 14 percent, should the firm accept the following project?

Year	Cash Flow
0	-\$28,000
1	12,000
2	15,000
3	11,000

8. **Calculating NPV [LO1]** For the cash flows in the previous problem, suppose the firm uses the NPV decision rule. At a required return of 11 percent, should the firm accept this project? What if the required return is 25 percent?
9. **Calculating NPV and IRR [LO1, 5]** A project that provides annual cash flows of \$17,300 for nine years costs \$79,000 today. Is this a good project if the required return is 8 percent? What if it's 20 percent? At what discount rate would you be indifferent between accepting the project and rejecting it?
10. **Calculating IRR [LO5]** What is the IRR of the following set of cash flows?

Year	Cash Flow
0	-\$16,400
1	7,100
2	8,400
3	6,900

11. **Calculating NPV [LO1]** For the cash flows in the previous problem, what is the NPV at a discount rate of zero percent? What if the discount rate is 10 percent? If it is 20 percent? If it is 30 percent?
12. **NPV versus IRR [LO1, 5]** Garage, Inc., has identified the following two mutually exclusive projects:

Year	Cash Flow (A)	Cash Flow (B)
0	-\$29,000	-\$29,000
1	14,400	4,300
2	12,300	9,800
3	9,200	15,200
4	5,100	16,800

- a. What is the IRR for each of these projects? Using the IRR decision rule, which project should the company accept? Is this decision necessarily correct?
- b. If the required return is 11 percent, what is the NPV for each of these projects? Which project will the company choose if it applies the NPV decision rule?
- c. Over what range of discount rates would the company choose project A? Project B? At what discount rate would the company be indifferent between these two projects? Explain.

5. **OCF from Several Approaches [LO1]** A proposed new project has projected sales of \$125,000, costs of \$59,000, and depreciation of \$12,800. The tax rate is 35 percent. Calculate operating cash flow using the four different approaches described in the chapter and verify that the answer is the same in each case.
- ✖ 6. **Calculating Depreciation [LO1]** A piece of newly purchased industrial equipment costs \$975,000 and is classified as seven-year property under MACRS. Calculate the annual depreciation allowances and end-of-the-year book values for this equipment.
- ✖ 7. **Calculating Salvage Value [LO1]** Consider an asset that costs \$640,000 and is depreciated straight-line to zero over its eight-year tax life. The asset is to be used in a five-year project; at the end of the project, the asset can be sold for \$175,000. If the relevant tax rate is 35 percent, what is the aftertax cash flow from the sale of this asset?
8. **Calculating Salvage Value [LO1]** 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 \$6,100,000 and will be sold for \$1,300,000 at the end of the project. If the tax rate is 35 percent, what is the aftertax salvage value of the asset?
9. **Calculating Project OCF [LO1]** Keiper, Inc., is considering a new three-year expansion project that requires an initial fixed asset investment of \$2.7 million. 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 \$2,080,000 in annual sales, with costs of \$775,000. If the tax rate is 35 percent, what is the OCF for this project?
- ✖ 10. **Calculating Project NPV [LO1]** In the previous problem, suppose the required return on the project is 12 percent. What is the project's NPV?
11. **Calculating Project Cash Flow from Assets [LO1]** In the previous problem, suppose the project requires an initial investment in net working capital of \$300,000, and the fixed asset will have a market value of \$210,000 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?
12. **NPV and Modified ACRS [LO1]** 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?
13. **Project Evaluation [LO1]** Dog Up! Franks is looking at a new sausage system with an installed cost of \$480,000. 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 \$70,000. The sausage system will save the firm \$160,000 per year in pretax operating costs, and the system requires an initial investment in net working capital of \$29,000. If the tax rate is 34 percent and the discount rate is 10 percent, what is the NPV of this project?
- ✖ 14. **Project Evaluation [LO1]** Your firm is contemplating the purchase of a new \$580,000 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 \$210,000 before taxes per year in order processing costs, and you will be able to reduce working capital by \$75,000 (this is a one-time reduction). If the tax rate is 35 percent, what is the IRR for this project?
15. **Project Evaluation [LO1]** In the previous problem, suppose your required return on the project is 15 percent and your pretax cost savings are \$200,000 per year. Will you accept the project? What if the pretax cost savings are \$150,000 per year? At what level of pretax cost savings would you be indifferent between accepting the project and not accepting it?