
Chapter 23

ECONOMIC EVALUATION OF CAPITAL EXPENDITURES

MULTIPLE CHOICE

Question Nos. 8-11, 15-19, 21, 28, 30, and 31 are AICPA adapted.

Question Nos. 12, 13, 20, and 27 are ICMA adapted.

Question Nos. 14, 22-26, and 29 are CIA adapted.

- E 1. In order to calculate the payback period for a project, it is necessary to know the:
- A. salvage value
 - B. useful life
 - C. minimum desired rate of return
 - D. net present value
 - E. annual cash flow
- C 2. The component of the capital investment decision that would most likely concern an accountant is the:
- A. social responsibility factors
 - B. competition
 - C. time value of money
 - D. imponderables
 - E. legal restrictions
- C 3. The net present value of a proposed project represents the:
- A. cash flows less the original investment
 - B. present value of the cash flows plus the present value of the original investment less the original investment
 - C. present value of the cash flows less the original investment
 - D. present value of the cash flows less the cost of the old machine being replaced
 - E. cash flows less the present value of the cash flows
- B 4. If an initial investment outlay is \$60,000 and the cash flows projected are \$15,000, \$20,000, \$25,000, and \$10,000 in each of the first four years, respectively, the payback period in years would be:
- A. 3.3
 - B. 3.0
 - C. 2.5
 - D. 4.0
 - E. 5.0

SUPPORTING CALCULATION:

$\$15,000 + \$20,000 + \$25,000 = \$60,000$ or 3 years

- C 5. R. D. Inc. purchased a machine for \$240,000. The machine has a useful life of six years, no salvage value, and straight-line depreciation is to be used. The machine is expected to generate cash flows from operations, net of income tax, of \$70,000 in each of the six years. R. D. Inc's cost of capital is 12%. The net present value is:
- A. \$180,000
 - B. \$35,490
 - C. \$47,770
 - D. \$121,680
 - E. \$123,330

SUPPORTING CALCULATION:

$$(\$70,000 \times 4.111) - \$240,000 = \$47,770$$

- E 6. Conte Inc. invested in a machine with a useful life of six years and no salvage value. The machine is expected to produce annual cash flows from operations, net of income tax, of \$2,000. If the estimated internal rate of return is 10%, the amount of the original investment was:
- A. \$9,000
 - B. \$11,280
 - C. \$12,000
 - D. \$5,640
 - E. \$8,710

SUPPORTING CALCULATION:

$$4.355 \times \$2,000 = \$8,710$$

- D 7. If a company's desired long-run proportion of funds to be provided consists of 60% common stock and retained earnings with an after-tax cost of 15%, and 40% bonds with an after-tax cost of 8%, its weighted-average cost of capital will be:
- A. 13.7%
 - B. 15%
 - C. 10.8%
 - D. 12.2%
 - E. 8%

SUPPORTING CALCULATION:

<u>Source</u>	<u>Proportion of Total Funds</u>	<u>After-tax Cost</u>	<u>Weighted- Average Cost</u>
Common Stock.....	.60	.15	.090
Bonds.....	.40	.08	<u>.032</u>
			.122

- B** **8.** The method of project selection that considers the time value of money in a capital budgeting decision computes the:
- A.** accounting rate of return on average investment
 - B.** internal rate of return
 - C.** payback period
 - D.** return on investment
 - E.** accounting rate of return on initial investment
- A** **9.** The net present value and the internal rate of return methods of decision making in capital budgeting are superior to the payback method in that they:
- A.** consider the time value of money
 - B.** are easier to implement
 - C.** consider accrual-based accounting income
 - D.** require less input
 - E.** reflect the effects of depreciation and income taxes
- A** **10.** Which of the following capital expenditure planning and control techniques has been criticized because it might mistakenly imply that earnings are reinvested at the rate of return earned by the investment?
- A.** internal rate of return method
 - B.** accounting rate of return on initial investment method
 - C.** payback method
 - D.** average return on investment method
 - E.** present value method
- A** **11.** A company is considering the purchase of a new conveyor belt system for carrying parts and subassemblies from building to building within its plant complex. It is expected that the system will have a useful life of at least ten years and that it will substantially reduce labor and waiting-time costs. If the company's average cost of capital is about 15% and if some evaluation must be made of cost/benefit relationships (including the effects of interest) to determine the desirability of the purchase, the most relevant quantitative technique for evaluating the investment is:
- A.** present value (or internal rate of return) analysis
 - B.** Program Evaluation and Review Technique (PERT)
 - C.** accounting rate of return analysis
 - D.** cost-volume-profit analysis
 - E.** payback analysis
- D** **12.** Cinzano Inc. wants to use discounted cash flow techniques when analyzing its capital investment projects. The company is aware of the uncertainty involved in estimating future cash flows. A simple method some companies employ to adjust for the uncertainty inherent in their estimates is to:
- A.** ignore salvage values
 - B.** average the expectations of several different managers
 - C.** use accelerated depreciation
 - D.** adjust the minimum desired rate of return
 - E.** increase the estimates of the cash flows

- A 13. Depreciation is incorporated explicitly in the discounted cash flow analysis of an investment proposal because it:
- A. reduces the cash outlay for income taxes
 - B. represents the initial cash outflow spread over the life of the investment
 - C. is a cost of operations that cannot be avoided
 - D. results in an annual cash outflow
 - E. is a cash inflow
- C 14. Deficiencies associated with using the payback method to evaluate investment alternatives include all of the following, *except* that:
- A. the present value of cash inflows is ignored
 - B. inflows of different time periods are treated equally
 - C. it may be used to select those investments yielding a quick return of cash
 - D. cash flows after the payback period are ignored
 - E. all of the above
- B 15. For \$45,000, Harmon Company purchased a new machine with an estimated useful life of five years with no salvage value. The machine is expected to produce cash flow from operations, net of income taxes, as follows:

1st year.....	\$ 9,000
2d year	12,000
3d year	15,000
4th year	9,000
5th year	8,000

Harmon will use the sum-of-the-years-digits' method to depreciate the new machine as follows:

1st year.....	\$15,000
2d year	12,000
3d year	9,000
4th year	6,000
5th year	3,000

What is the payback period?

- A. 3 years
- B. 4 years
- C. 5 years
- D. 2 years
- E. none of the above

SUPPORTING CALCULATION:

$$\$9,000 + \$12,000 + \$15,000 + \$9,000 = \$45,000 \text{ or } 4 \text{ years}$$

- B 16. The capital budgeting method that assumes that funds are reinvested at the company's cost of capital is:
- A. accounting rate of return
 - B. net present value
 - C. internal rate of return
 - D. return on investment
 - E. payback

- A 17. The basis for measuring the cost of capital derived from bonds and preferred stock, respectively, is the:
- after-tax rate of interest for bonds and stated annual dividend rate for preferred stock
 - pretax rate of interest for bonds and stated annual dividend rate less the expected earnings per share for preferred stock
 - pretax rate of interest for bonds and stated annual dividend rate for preferred stock
 - after-tax rate of interest for bonds and stated annual dividend rate less the expected earnings per share for preferred stock
 - none of the above
- D 18. The weighted-average cost of capital approach to decision making is *not* directly affected by the:
- proposed mix of debt, equity, and existing funds used to implement the project
 - stated annual dividend rate for preferred stock
 - value of the common stock
 - current budget for expansion
 - cost of debt outstanding
- D 19. If income tax considerations are ignored, how is depreciation expense used in the following capital budgeting techniques?
- | | <u>Internal Rate of Return</u> | <u>Payback</u> |
|----|--------------------------------|----------------|
| A. | Excluded | Included |
| B. | Included | Excluded |
| C. | Included | Included |
| D. | Excluded | Excluded |
- A 20. Perot Inc. is in the enviable situation of having unlimited capital funds. The best decision rule, in an economic sense, for it to follow would be to invest in all projects in which:
- the net present value is greater than zero
 - the payback is less than four years
 - the accounting rate of return is greater than the earnings as a percentage of sales
 - the payback reciprocal is greater than the internal rate of return
 - the internal rate of return is greater than zero
- A 21. Orab Co. has the chance to invest in a 2-year project expected to produce cash flows from operations, net of income taxes, of \$100,000 in the first year and \$200,000 in the second year. Orab requires an internal rate of return of 20%. The present value of \$1 for one period at 20% is 0.833; for two periods at 20% is 0.694. For this project, Orab should be willing to invest immediately a maximum of:
- \$222,100
 - \$208,200
 - \$283,300
 - \$249,900
 - none of the above

SUPPORTING CALCULATION:

$$(\$100,000 \times .833) + (\$200,000 \times .694) = \$222,100$$

- A 22. The three frequently used methods for ranking investment proposals are payback, net present value, and internal rate of return. One of the three is defined as the interest rate that equates the present value of expected cash flows and the cost of the project. A second method finds the present value of expected cash flows and subtracts the initial cost of the project. The following terms that match these respective definitions are:
- A. internal rate of return and net present value
 - B. internal rate of return and payback
 - C. net present value and internal rate of return
 - D. net present value and payback
 - E. none of the above
- E 23. Your company is comparing internal rate of return to net present value computations as alternative criteria for evaluating potential capital investments. Which of the following best describes these computations?
- A. The internal rate of return method ignores the initial cost of the investment in its computations.
 - B. The net present value method ignores the company's cost of capital.
 - C. The net present value method is more appropriate to use during periods of inflation.
 - D. The two methods will give the same rankings because they both consider the time value of money.
 - E. The internal rate of return method assumes that the positive cash flows generated each year are reinvested at the computed rate of return for the investment being evaluated.
- C 24. A project has a cost of \$5,000 and is expected to produce a cash flow of \$1,220 a year for five years. Using the table given, what is the internal rate of return? (Note: Annuity factors are rounded to two places.)

	Future Value of an Annuity of \$1 per Period for 5 Periods	Present Value of an Annuity of \$1 per Period for 5 Periods
7%	5.75	4.10
8%	5.87	3.99
9%	5.98	3.89
10%	6.11	3.79

- A. 9%
- B. 10%
- C. 7%
- D. 8%
- E. none of the above

SUPPORTING CALCULATION:

$$4.10 \times \$1,220 = \$5,002 \therefore 7\% \text{ IRR}$$

- E 25. At a company's cost of capital of 15%, a prospective investment has a negative net present value. Based on this information, it can be concluded that:
- the internal rate of return is greater than 15%
 - the payback period is shorter than the life of the asset
 - the accounting rate of return is less than 15%
 - the accounting rate of return is greater than 15%
 - the internal rate of return is less than 15%
- D 26. Risk can be controlled in capital budgeting situations by assuming a:
- high accounting rate of return
 - large net present value
 - high net income
 - short payback period
 - all of the above
- D 27. The net present value (NPV) method and the internal rate of return (IRR) method are used to analyze capital expenditures. The IRR method, as contrasted with the NPV method:
- is considered inferior because it fails to calculate compounded interest rate
 - is an internal rate of return method, while the NPV method is not
 - almost always gives a different decision as to the acceptability of a given proposal
 - assumes that the rate of return on the reinvestment of the cash proceeds is at the internal rate of return of the project analyzed rather than at the cost of capital used
 - is preferred in practice because it is able to handle multiple desired hurdle rates, which is impossible with the NPV method
- D 28. The net present value capital budgeting technique can be used when cash flows from period to period are:
- | | <u>Uniform</u> | <u>Uneven</u> |
|----|----------------|---------------|
| A. | no | yes |
| B. | no | no |
| C. | yes | no |
| D. | yes | yes |
- C 29. Which of the following is always true of the net present value (NPV) approach?
- If a project is found to be acceptable under the NPV approach, it would also be acceptable under the internal rate of return (IRR) approach.
 - The NPV and the IRR approaches will always rank projects in the same order.
 - If a project is found to be acceptable under the NPV approach, it would also be acceptable under the payback approach.
 - The NPV and the payback approaches will always rank projects in the same order.
 - None of the above
- A 30. If income tax considerations are ignored, how is depreciation expense used in the following capital budgeting techniques?
- | | <u>Internal Rate of Return</u> | <u>Net Present Value</u> |
|----|--------------------------------|--------------------------|
| A. | Excluded | Excluded |
| B. | Excluded | Included |
| C. | Included | Excluded |
| D. | Included | Included |

- D 31. A proposed project has an expected economic life of eight years. In the calculation of the net present value (NPV) of the project, salvage value would be:**
- A. excluded from the calculation of the NPV**
 - B. included as a cash inflow at the estimated salvage value**
 - C. included as a cash inflow at the future amount of the estimated salvage value**
 - D. included as a cash inflow at the present value of the estimated salvage value**
 - E. none of the above**

PROBLEMS

PROBLEM

1.

Payback Period; Rate of Return; Net Present Value. The management of Elite Cookies Inc. is considering the purchase of a new shaping machine. The machine will cost \$100,000 and will have a useful life of 10 years with a salvage value of \$10,000 at the end of ten years. The investment will result in cost savings of \$16,000 per year for each year of the machine's life. The tax rate is zero, and the appropriate discount rate for the company is 10%. (The present value factor for \$1 received at the end of 10 years is .386, and the factor for \$1 received annually for 10 years is 6.145.)

Required:

- (1) Compute the payback period.
 - (2) Compute the accounting rate of return on the average investment.
 - (3) Compute the net present value.
- (Round answers to two decimal places.)

SOLUTION

- (1) $\$100,000 / \$16,000 = 6.25$ years payback period
- (2) $[(\$160,000 - \$90,000) / 10 \text{ yrs.}] / [(\$100,000 + \$10,000) / 2] = 12.73\%$ accounting rate of return on average investment
- (3)

Net present value	=	Present value of ten annual cash inflows of \$16,000	+	Present value of inflow from salvage in tenth year	-	Original investment
\$2,180	=	(\$16,000 x 6.145)	+	(\$10,000 x .386)	-	(\$100,000)

PROBLEM

2.

Effect of Inflation on Investment Decision. Ranchero Company is evaluating a capital budgeting proposal that will require an initial cash investment of \$100,000. The project will have a 3-year life. The net after-tax cash inflows from the project, before any adjustment for the effects of inflation, are expected to be as follows:

<u>Year</u>	<u>Unadjusted Estimate of Cash Inflows</u>
1	\$50,000
2	40,000
3	30,000

No salvage is expected at the end of the project. The anticipated inflation rate is 10% each year. The company's cost of capital rate is 16%.

Required:

- (1) Compute the estimated cash inflow for each year, adjusted for the anticipated effect of inflation.
- (2) Determine the net present value of the cash flows before and after the adjustment for the anticipated effects of inflation.

(The present values of \$1 @ 16% at the end of years 1, 2, and 3 respectively are .862, .743, and .641. The present value of an annuity of \$1 @ 16% for 3 years is 2.246.)

SOLUTION

(1)

<u>Year</u>	<u>Unadjusted Estimate of Cash Inflows</u>	<u>Inflation Adjustment</u>	<u>Inflation Adjusted Estimate of Cash Inflows</u>
1	\$ 50,000	1.100	\$ 55,000
2	40,000	1.210	48,400
3	30,000	1.331	39,930
	<u>\$ 120,000</u>		<u>\$ 143,330</u>

(2)

<u>Year</u>	<u>Unadjusted Cash Flows</u>	<u>Adjusted Cash Flows</u>	<u>PV of \$1 @ 16%</u>	<u>PV of Unadjusted Cash Flows</u>	<u>PV of Adjusted Cash Flows</u>
0	\$(100,000)	\$(100,000)	1.000	\$ (100,000)	\$ (100,000)
1	50,000	55,000	.862	43,100	47,410
2	40,000	48,400	.743	29,720	35,961
3	30,000	39,930	.641	19,230	25,595
Net present value of investment				<u>\$ (7,950)</u>	<u>\$ 8,966</u>

PROBLEM

3.

Payback Period; Net Present Value; Internal Rate of Return. The president of Eradicator Corp. is considering the purchase of new demolition equipment costing \$100,000, with a useful life of five years and no salvage value. The new equipment would yield an annual after-tax cash flow of \$29,129. An appropriate discount rate for this type of equipment is 12%. (The present value of an annuity of a dollar @ 12% for five years is 3.605. The present value of a dollar @ 12% received at the end of the fifth year is .567.)

Required:

- (1) Compute the payback period to the nearest tenth of a year.
- (2) Compute the net present value to the nearest whole dollar.
- (3) Compute the internal rate of return on the purchase.
- (4) Should the equipment be purchased?

SOLUTION

- (1) $\$100,000/\$29,129 = 3.4$ years payback period
- (2) $(\$29,129 \times 3.605) - \$100,000 = \$5,010$ net present value
- (3) $\$100,000/\$29,129 = 3.433$ discount factor
Present value of \$1 received annually for 5 years at 14% interest has a factor equal to 3.433. The internal rate of return on the purchase is 14%.
- (4) Yes. The net present value is positive and the internal rate of return (14%) is more than the discount rate (12%).

PROBLEM

4.

Cost of Capital. Molloy Company wishes to compute a weighted-average cost of capital for use in evaluating capital expenditure proposals. Earnings, capital structure, and current market prices of the company's securities are:

Earnings:

Earnings before interest and tax.....	\$ 400,000
Interest expense on bonds.....	<u>100,000</u>
Pretax earnings	\$ 300,000
Income tax (40%).....	<u>120,000</u>
After-tax earnings.....	\$ 180,000
Preferred stock dividends	<u>75,000</u>
Earnings available to common stockholders	\$ 105,000
Common stock dividends.....	<u>50,000</u>
Retained earnings	\$ <u><u>55,000</u></u>

Capital structure:

Mortgage bonds, 12%, 20 years	\$ 500,000
Preferred stock, 15%, \$100 par	500,000
Common stock, no par, 25,000 shares.....	300,000
Retained earnings (equity of common stockholders)	<u>700,000</u>
	\$ <u><u>2,000,000</u></u>

Market price of the company's securities:

Preferred stock	\$100
Common stock.....	30

Required: Determine the company's cost of capital to the nearest hundredth of a percent.

SOLUTION

<u>Funds—Source</u>	<u>Proportion of Funds</u>	<u>After-tax Cost</u>	<u>Weighted Cost</u>
Bonds.....	.25	.07 ¹	.018
Preferred stock.....	.25	.15 ²	.0375
Common stock and retained earnings	<u>.50</u>	.14 ³	<u>.070</u>
	1.00		<u>.1255</u> or 12.55%

Computations:

$$^1.12 - (.12 \times .4)$$

$$^2\$15/\$100 = .15$$

$$^3\$105,000/25,000 = \$4.20; \$4.20/\$30 = .14$$

PROBLEM

5.

Investment Analysis; Uniform Cash Flow. Denali Company is evaluating a capital budgeting proposal, requiring an initial investment of \$45,000. The project will have a five-year life. The after-tax annual cash inflow from this investment is \$12,000. The cost of capital is 10%. (The present value of \$1 @ 10% received at the end of five years is .621. (The present value of \$1 @ 10% received each year for five years is 3.791.)

Required:

- (1) What is the payback period?
- (2) Compute the net present value of the project.
- (3) What amount should Denali have invested five years ago, at 10% compounded annually, to have \$45,000 now?

SOLUTION

- (1) \$45,000 initial outlay/\$12,000 annual outflow = 3.75 payback years

(2)	Cash inflow (\$12,000 x 3.791).....	\$ 45,492
	Investment	<u>45,000</u>
	Net present value.....	<u>\$ 492</u>

- (3) \$45,000 x .621 = \$27,945

PROBLEM

6.

Use of Net Present Value to Evaluate Asset Acquisition. Jurassic Park is considering the acquisition of a new ride at a cost of \$250,000. The ride has an estimated useful life of 7 years, but it qualifies as 5-year property for tax purposes under MACRS. The annual pretax cash inflows from the new ride, net of annual operating expenses, is expected to be \$50,000 in each of the 7 years the ride will be used. At the end of the 7-year period, company executives believe that the ride can be sold for \$60,000. The company is in a 40% income tax bracket, and its weighted-average cost of capital is 15%.

Required:

- (1) Determine the net present value of the investment in the new ride. (Use the MACRS rates and net present value factors provided below.)
- (2) Should the investment be made?

MACRS 5-year Property Recovery		Present Value of		Present Value of an	
Percentage		\$1 @ 15%		Annuity of \$1 @ 15%	
Year	Percentage	1		1	
1	.200	2	.870	2	1.626
2	.320	3	.756	3	2.283
3	.192	4	.658	4	2.855
4	.115	5	.572	5	3.352
5	.115	6	.497	6	3.784
6	.058	7	.432	7	4.160
			.376		

SOLUTION

(1)	(1)	(2)	(3)
Year	Tax Basis of New Ride	5-year Property Recovery Rate	Tax Depreciation on New Ride (1) x (2)
1	\$250,000	0.200	\$ 50,000
2	250,000	0.320	80,000
3	250,000	0.192	48,000
4	250,000	0.115	28,750
5	250,000	0.115	28,750
6	250,000	0.058	14,500
			<u>\$ 250,000</u>

	(1)	(2)	(3)	(4)	(5))
	Annual	Tax	Increase	Income	Increase)
	Pretax	Depreciation	(Decrease)	Tax	(Decrease))
	Cash		in Taxable	Rate	in Income)
<u>Year</u>	<u>Inflows</u>	<u>Deduction</u>	<u>Income</u>		<u>Tax</u>)
			<u>(1) - (2)</u>		<u>(3) x (4)</u>)
1	\$50,000	\$50,000	0	40%	0)
2	50,000	80,000	(30,000)	40%	(12,000))
3	50,000	48,000	2,000	40%	800)
4	50,000	28,750	21,250	40%	8,500)
5	50,000	28,750	21,250	40%	8,500)
6	50,000	14,500	35,500	40%	14,200)
7	50,000	0	50,000	40%	20,000)

(	(6)	(7)	(8)
(	After-tax	Present	Present
(	Cash	Value of	Value of
(	Inflows	\$1 @ 15%	After-tax
(	<u>(1)-(5)</u>		<u>Cash</u>
(	50,000	0.870	<u>Inflows</u>
(	62,000	0.756	<u>(6) x (7)</u>
(	49,200	0.658	43,500
(	41,500	0.572	46,872
(	41,500	0.497	32,374
(	35,800	0.432	23,738
(	30,000	0.376	20,626
(			15,466
(			<u>11,280</u>

Present value of periodic after-tax cash inflows	\$ 193,856
Plus present value of after-tax salvage [\$60,000 x (1-40%) x .376]	<u>13,536</u>
Present value of cash inflows over useful life of new ride	\$ 207,392
Less initial cash outflow (cost of ride)	<u>250,000</u>
Net present value of investment	<u>\$ (42,608)</u>

- (2) No. The negative net present value indicates that the rate of return on this proposed ride will be less than the company's weighted-average cost of capital.