

LO.a: Calculate the yearly cash flows of expansion and replacement capital projects and evaluate how the choice of depreciation method affects those cash flows.

The following information relates to questions 1 and 2.

SZL Company is considering the replacement of old equipment with new more efficient equipment. The following table gives the specifications of the projects:

Old Equipment		New Equipment	
Current book value	\$300,000	Cost	\$900,000
Current market value	\$500,000	Life	10 years
Remaining life	10 years	Annual sales	\$550,000
Annual sales	\$400,000	Cash operating expenses	\$180,000
Cash operating expenses	\$160,000	Annual depreciation	\$90,000
Annual depreciation	\$30,000	Additional investment in net working capital	\$100,000
Expected salvage value	\$75,000	Expected salvage value	\$180,000

- SZL corporate tax rate is 30%, and required rate of return is 10%. The initial outlay required for replacing the old equipment with the new equipment is *closest* to:
 - \$560,000.
 - \$500,000.
 - \$1,000,000.
- The incremental after-tax operating cash-flows and NPV of the replacement project are *closest* to:
 - \$100,000; \$120,000.
 - \$109,000; \$177,000.
 - \$109,000; \$150,000
- Domez Company is considering an investment of \$500,000 in a new project. The company currently uses straight-line depreciation but wants to evaluate the effect of a switch from straight-line to accelerated depreciation on the project's NPV. The following table gives the depreciation and tax savings from both the depreciation methods. The project life is 5 years.

Year	Straight-line Depreciation	Tax savings \$ (Corporate Tax Rate 40%)	Accelerated Depreciation MACRS 3-Year Property	Tax Savings (\$)
1	100,000	40,000	166,650	66,660
2	100,000	40,000	222,250	88,900
3	100,000	40,000	74,050	29,620
4	100,000	40,000	37,050	14,820
5	100,000	40,000	0	0
PV at 10%		\$151,632	PV at 10%	

The change from straight-line to accelerated depreciation would

- A. have no effect on the NPV.
- B. subtract \$14,815 from the NPV.
- C. add \$14,815 to the NPV.

LO.b: Explain how inflation affects capital budgeting analysis.

4. Which of the following statements is *least accurate*? If inflation is higher than expected, the profitability of an investment is lower, because it:
 - A. shifts wealth from the taxpayer to the government.
 - B. increases real taxes, by reducing value of the depreciation tax shelter.
 - C. decreases real taxes, by increasing value of the depreciation tax shelter.
5. Which of the following statements is *correct*? If inflation is lower than expected for a company that has issued debt, then
 - A. real payments to bondholders are higher than expected.
 - B. real payments to the bondholders are lower than expected.
 - C. wealth is shifted from bondholders to the issuing company.

LO.c: Evaluate capital projects and determine the optimal capital project in situations of 1) mutually exclusive projects with unequal lives, using either the least common multiple of lives approach or the equivalent annual annuity approach, and 2) capital rationing.

6. The *most appropriate* methods used to evaluate two mutually exclusive projects with unequal lives that will be replaced repeatedly are:
 - A. least common multiple of lives approach and EAA approach.
 - B. NPV and IRR.
 - C. IRR and payback period.
7. SNoY Company is evaluating two mutually exclusive projects with unequal lives. The following table gives the projects' assumptions:

	Acoustic Equipment 1	Acoustic Equipment 2
Investment	\$120,000	\$145,000
Annual after-tax operating cash flows	\$54,000	\$55,520
After-tax salvage value	\$30,000	\$23,000
Life	3-years	4-years
NPV at 10%	36,829	
EAA	14,810	

SNoY should choose which equipment, assuming that both projects can be replicated?

- A. Acoustic Equipment 2 because its NPV is higher than the Acoustic Equipment 1.
- B. Acoustic Equipment 1 because its EAA is higher than Acoustic Equipment 2.
- C. Acoustic Equipment 2 because its EAA is higher than Acoustic Equipment 1.

8. Brune Company has a budget of \$10 million and must choose an optimal subset from the following five profitable projects that fits within its capital budget. The outlays and NPVs of the five projects are given below. Brune cannot buy fractional projects and its required rate of return is 10%.

Project	Outlay (\$ million)	PV of Future After-Tax Cash Flows (\$ million)	NPV (\$ million)
1	7.00	11.000	4.000
2	3.75	5.250	1.500
3	2.50	3.750	1.250
4	3.25	4.225	0.975
5	3.00	4.125	1.125

Brune will *most likely* select projects:

- A. 2, 4, and 5.
- B. 1 and 5.
- C. 1 and 3.

LO.d: Explain how sensitivity analysis, scenario analysis, and Monte Carlo simulation can be used to assess the stand-alone risk of a capital project.

9. Sensitivity analysis is a stand-alone risk analysis method of a project which:
- A. determines the impact on NPV by changing one input variable at a time.
 - B. calculates NPV of a project by changing a group of variables simultaneously.
 - C. measures NPV of the project by simulating a probability distribution of outcomes.
10. Monte Carlo simulation is used to:
- A. determine a distribution of outcomes based on NPV by grouping a number of input variables to create a scenario.
 - B. determines the probability distributions for NPV or IRR by randomly choosing input variables and calculating project NPV or IRR.
 - C. calculates the effect on NPV and IRR by changing an input variable one at a time.

LO.e: Explain and calculate the discount rate, based on market risk methods, to use in valuing a capital project.

11. Fairmont Corp. is considering three projects. The risk free rate is 4% and the market return is 11%. The following table gives the beta of the three projects:

	Project A	Project B	Project C
beta	0.65	0.95	1.15

If Fairmont uses a required rate of return of 10.65% for all its projects, then this rate is *most likely*:

- A. too high for Project A, causing Project A to be rejected.
- B. too low for Project B, causing Project B to be accepted.
- C. too high for Project C, causing Project C to be rejected.

LO f: Describe types of real options and evaluate a capital project using real options.

12. Which of the following statements is *correct*?
- A. Real options are like financial options – they deal with financial assets.
 - B. A real option should be utilized when its value exceeds its cost to the company.
 - C. Real options are not contingent on future events.
13. An abandonment option may be exercised when:
- A. future financial cash flows of a project are strong.
 - B. the value from abandoning a project exceeds the present value of cash flow from continuing it.
 - C. the cash flow from abandoning a project exceeds the future cost of the project.

14. Normura Corp. is evaluating the following project:

Initial outlay	\$300,000
Project life	4 years
Annual after-tax operating cash flows	50% probability - \$60,000 50% probability - \$120,000 for 4 years
Salvage value	0
Required rate of return	10%
NPV @ 10% without using abandonment option	-\$14,712
Abandonment option in 1 year	After 1 st year cash flows, abandon project, receive salvage value \$240,000

The expected NPV of the project using the optimal abandonment strategy is *closest* to:

- A. \$18,000.
 - B. \$30,000.
 - C. \$27,000.
15. When an entire investment is viewed as an option such as drilling of an oil well, it is *best* known as a:
- A. fundamental option.
 - B. flexibility option
 - C. timing option.

LO g: Describe common capital budgeting pitfalls

16. Common capital budgeting *pitfalls* are:
- A. using real options whenever applicable.
 - B. basing investment decisions on earnings per share, underestimating overhead costs, using inappropriate discount rate.
 - C. considering all investment alternatives.

LO h: Calculate and interpret accounting income and economic income in the context of capital budgeting.

17. Economic income for a given year is defined as:
- A. After-tax cash flow plus economic depreciation.

- B. after-tax cash flow plus change in salvage value.
- C. after-tax cash flow plus the change in market value.

18. Accounting income differs from economic income because:

- A. accounting depreciation is based on original investment cost, and accounting net income considers interest expense.
- B. accounting depreciation is based on the market value of an investment.
- C. accounting depreciation calculates the salvage value after following the declines in the market value of an asset.

19. Consider the following investment and cash flows of JBX Company:

Investment	€200 million
Depreciation	Straight-line to zero
Life	2 years
Salvage value	0
Earnings before interest and taxes (for each year)	€100 million
JBX required rate of return	12%
Tax rate	30%

The economic income in million, euros for JBX is *closest* to?

- A. 40 in Year 1 and 20 in Year 2.
- B. 35 in Year 1 and 18 in Year 2.
- C. 25 in Year 1 and 12 in Year 2.

LO i: Distinguish among the economic profit, residual income, and claims valuation models for capital budgeting and evaluate a capital project using each.

20. Economic profit is given by:

- A. net operating profit after tax – dollar cost of capital.
- B. net income – capital investment.
- C. earnings before interest and taxes + dollar cost of capital.

The following information relates to questions 21 and 22:

GTI considers \$400 investment for 2 years, depreciated straight-line to zero with no salvage value at the end of 2 years. The relevant information regarding the project is as follows:

End of Year:	0	1	2
Balance Sheet in \$			
Assets	400	200	0
Liabilities	249	139	0
Net worth	151	61	0

Income Statement in \$

Year	1	2
EBIT	100	150
Interest expense	20	11
Net income	56	97

21. The company tax rate is 30%, WACC is 10%. and required rate of return on equity is 14.40%. The economic profit for Year 1 and Year 2 is *closest* to:
- A. \$30 in Year 1 and \$85 in Year 2.
 - B. \$16 in Year 1 and \$77 in Year 2.
 - C. \$100 in Year 1 and \$150 in Year 2.
22. The residual income for GTI for Year 1 and Year 2 is:
- A. \$56 in Year 1 and \$97 in Year 2
 - B. \$34 in Year 1 and \$88 in Year 2.
 - C. \$48 in Year 1 and \$96 in Year 2.
23. The claims valuation approach *most likely* values the:
- A. assets.
 - B. equity.
 - C. liabilities and equity.

Solutions

1. A is correct. The initial outlay is the investment in the new equipment plus the additional investment in the net working capital less the after-tax proceeds from selling the old equipment:

$$\text{Outlay} = FCInv + NWCInv - \text{Sal}_0 + T(\text{Sal}_0 - B_0) = 900,000 + 100,000 - 500,000 + 0.3(500,000 - 300,000) = \$560,000. \text{ Section 6.}$$
2. B is correct. The incremental after-tax operating cash flows are: $CF = (S - C - D)(1 - T) + D$

$$CF = [(550,000 - 400,000) - (180,000 - 160,000) - (90,000 - 30,000)](1 - 0.30) + (90,000 - 30,000) = \$109,000$$
The terminal year after-tax non-operating cash flow is: $TNOCF = \text{Sal}_T + NWCInv - T(\text{Sal}_T - B_T) = (180,000 - 75,000) + 100,000 - 0.30[(180,000 - 75,000) - (0 - 0)] = \$173,500.$
Using FC: $CF_0 = -560,000$; $CF_1 - CF_9 = 109,000$; $CF_{10} = 109,000 + 173,500 = 282,500$; $I = 10$, $NPV \text{ CPT} = 176,650. \text{ Section 6.}$
3. C is correct. The present value of tax savings from straight-line depreciation is given as \$151,632. The present value of tax savings from accelerated depreciation is calculated by using FC: $CF_0 = 0$, $CF_1 = 66,660$, $CF_2 = 88,900$, $CF_3 = 29,620$, $CF_4 = 14,820$; $I = 10$, $NPV \text{ CPT} = 166,447$. The tax savings from accelerated depreciation increased by (\$166,447 - \$151,632) \$14,815 from straight-line depreciation. The tax deferral due to accelerated depreciation adds to the NPV of the project. Section 6.
4. C is correct. If inflation is higher than expected the corporation's real taxes increase because it reduces the value of the depreciation tax shelter. Section 6.4.
5. A is correct. For an issuing corporation if inflation is lower than expected, then real payments to bondholders are higher than expected. Lower-than-expected inflation shifts wealth from the issuing corporation to bondholders. Section 6.4.
6. A is correct. For comparing two mutually exclusive projects with unequal lives, least-common multiple of lives, or the equivalent annuity approach should be used which both use NPV. Section 7.
7. B is correct. Because the two mutually exclusive projects have unequal lives, EAA approach is applied. The NPV and EAA are calculated using FC for Acoustic Equipment 2. $CF_0 = -145,000$; $CF_1 - CF_3 = 55,520$; $CF_4 = 55,520 + 23,000 = 78,520$; $I = 10$, $NPV \text{ CPT} = 46,700$; Annuitizing the Acoustic Equip. 2 NPV to find EAA:
 $N = 4$; $PV = 46,700$; $I/Y = 10$; $\text{CPT PMT} = 14,733$. The EAA for Equipment 1 is better at \$14,810 compared to the EAA of \$14,733 for Equipment 2. Hence Equipment 1 should be chosen. Section 7.1.2.
8. C is correct. Ranking the project with PI. $PI = \text{PV of Cash Flows} / \text{Investment (absolute value)}$

Project	Outlay	PV of Future	NPV	PI	PI Rank
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	(\$ million)	After-Tax Cash Flows (\$ million)	(\$ million)		
1	7.00	11.000	4.000	1.571	1
2	3.75	5.250	1.500	1.400	3
3	2.50	3.750	1.250	1.500	2
4	3.25	4.225	0.975	1.300	5
5	3.00	4.125	1.125	1.375	4

Projects 1 & 3 incorporating the high PI give the highest NPV = 5.25 million and do not exceed the \$10 million capital budget. Section 7.2.

9. A is correct. Sensitivity analysis is a stand-alone risk analysis method which calculates the effect on the NPV of a project by changing the value of one input variable at a time. A base case NPV is calculated, and then typically a high and low value of the input variables with respect to the base case are estimated. NPV is computed again by changing one variable at a time, from its base case value to its high or low value. Different NPVs are computed for all high and low variables, and their impact on NPV is found to determine the project's riskiness. Section 7.3.
10. B is correct. Simulation (Monte Carlo) Analysis estimates the probability distribution of NPV or IRR (outcomes) for a project. The analyst can assume many stochastic input variables and NPV or IRR are calculated repeatedly to find their distributions. Section 7.3.3.
11. A is correct. Using equation 10: $r_i = R_F + \beta_i[E(R_M) - R_F]$ where r_i = required return for project R_F = risk-free rate of return, β_i = beta of project, $[E(R_M) - R_F]$ = market risk premium. Required rate of return of Project A: $r_A = 0.04 + 0.65(0.11 - 0.04) = 8.55\%$. Using the same equation, $r_B = 10.65\%$ and $r_C = 12.05\%$. Given a required return of 10.65%, Project A will be rejected. Section 7.4.
12. B is correct. A company should use a real option when its value exceeds the cost of the option. Section 7.5.
13. B is correct. An abandonment option is exercised when the cash flow from abandoning the project exceeds the present value of cash flows from continuing it. Section 7.5.
14. C is correct. Abandon the project after 1 year if the subsequent cash flows are lower than the abandonment value. If at the end of first year low cash flow of \$60,000 occur, abandon the project for \$240,000 because the PV of \$60,000, for 3 years at 10% is \$149,211. If high cash flow of \$120,000 occur at the end of first year then do not abandon. NPV if high cash flow occur: $CF_0 = -300,000$; $CF_1 - CF_4 = 120,000$; $I = 10$; CPT NPV = 80,383.85. If low cash flow occurs at 1st year-end and using the abandonment option NPV is: $CF_0 = -300,000$; $CF_1 = 60,000 + 240,000 = 300,000$; $I = 10$; CPT NPV = -27,272.73. Expected NPV using the optimal abandonment strategy is: $0.5(80,384) + 0.5(-27,273) = 26,555.50$. Section 7.5.

15. A is correct. When the whole investment is an option, it is a fundamental option. For example, the value of an oil well is contingent upon the price of oil. This means the payoffs from the investment are contingent on the underlying asset. If oil prices are high one would go ahead and drill and vice versa. Section 7.5.
16. B is correct. If decisions are based on accounting income rather than cash flows, then the projects chosen are not in the long-run economic interest of the company. Underestimating or overestimating overhead costs lead to poor investment decisions. Discount rate errors by not incorporating project risk will impact the value of NPV of the project and lead to incorrect investment decisions. Section 7.6.
17. C is correct. Economic income is the profit realized from an investment. For a given year economic income is the after-tax cash flows from an investment plus the change in market value: $\text{Economic income} = \text{Cash flow} + (\text{Ending market value} - \text{Beginning market value})$. Section 8.2.
18. A is correct. Accounting income differs from the economic income for two reasons:
- accounting depreciation is calculated on the original cost of the investment instead of its market value.
 - accounting net income is the after-tax income remaining after paying interest expenses on the company's debt. Section 8.2.
19. B is correct. $\text{Economic income} = \text{Cash flow} - (\text{Beginning market value} - \text{Ending market value}) = \text{Cash flow} - (V_0 - V_1)$. Depreciation = $200/2 = €100$ mil. Cash flow = $\text{EBIT} (1 - \text{Tax rate}) + \text{Depr.} = 100 (1 - 0.30) + 100 = €170$ mil.
 $V_0 = \text{PV of } 170 \text{ mil for each year} = CF_0 = 0; CF_1 - CF_2 = 170; I = 12; \text{NPV CPT} = 287.31 \text{ mil.}$
 Similarly $V_1 = 170/1.12 = 151.79 \text{ mil.}$ And $V_2 = 0$
 $\text{Economic income Year 1} = 170 - (287.31 - 151.79) = €34.48 \text{ mil.}$
 $\text{Economic income Year 2} = 170 - (151.79 - 0) = €18.21 \text{ mil.}$ Section 8.2.
20. A is correct. Economic profit = EP = net operating profit after tax – dollar cost of capital.
 Or, $\text{EP} = \text{NOPAT} - \$\text{WACC} = \text{EBIT} (1 - \text{Tax rate}) - \WACC . Section 8.3.1.
21. A is correct. Section 8.3.1.

Year	1	2
Capital	\$400	\$200
NOPAT = EBIT (1 - 0.30)	\$70	\$105
\$WACC (0.10 x Capital)	\$40	\$20
EP	\$30	\$85

22. B is correct. Residual Income = Net Income – Equity charge or $RI_t = NI_t - r_e B_{t-1}$ where
 RI_t = residual income during period t.
 NI_t = net income during period t.
 $r_e B_{t-1}$ = equity charge for period t = required rate of return on equity times beginning book value of equity.

Year	1	2
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NI	\$56	\$97
B_{t-1}	\$151	\$61
$r_e B_{t-1}$	$0.144 \times 151 = \$22$	\$9
RI_t	\$34	\$88

Section 8.3.2.

23. C is correct. The claims valuation approach values the liabilities and equity, claims against the assets, which are on the right side of the balance sheet. Section 8.3.3.