

PRACTICE PROBLEMS

- 1 FITCO is considering the purchase of new equipment. The equipment costs \$350,000, and an additional \$110,000 is needed to install it. The equipment will be depreciated straight-line to zero over a five-year life. The equipment will generate additional annual revenues of \$265,000, and it will have annual cash operating expenses of \$83,000. The equipment will be sold for \$85,000 after five years. An inventory investment of \$73,000 is required during the life of the investment. FITCO is in the 40 percent tax bracket and its cost of capital is 10 percent. What is the project NPV?
 - A \$52,122.
 - B \$64,090.
 - C \$97,449.
- 2 After estimating a project's NPV, the analyst is advised that the fixed capital outlay will be revised upward by \$100,000. The fixed capital outlay is depreciated straight-line over an eight-year life. The tax rate is 40 percent and the required rate of return is 10 percent. No changes in cash operating revenues, cash operating expenses, or salvage value are expected. What is the effect on the project NPV?
 - A \$100,000 decrease.
 - B \$73,325 decrease.
 - C \$59,988 decrease.
- 3 When assembling the cash flows to calculate an NPV or IRR, the project's after-tax interest expenses should be subtracted from the cash flows for:
 - A the IRR calculation, but not the NPV calculation.
 - B both the NPV calculation and the IRR calculation.
 - C neither the NPV calculation nor the IRR calculation.
- 4 Standard Corporation is investing \$400,000 of fixed capital in a project that will be depreciated straight-line to zero over its ten-year life. Annual sales are expected to be \$240,000, and annual cash operating expenses are expected to be \$110,000. An investment of \$40,000 in net working capital is required over the project's life. The corporate income tax rate is 30 percent. What is the after-tax operating cash flow expected in year one?
 - A \$63,000.
 - B \$92,000.
 - C \$103,000.
- 5 Five years ago, Frater Zahn's Company invested £38 million—£30 million in fixed capital and another £8 million in working capital—in a bakery. Today, Frater Zahn's is selling the fixed assets for £21 million and liquidating the investment in working capital. The book value of the fixed assets is £15 million and the marginal tax rate is 40 percent. The fifth year's after-tax non-operating cash flow to Frater Zahn's is *closest* to:
 - A £20.6 million.
 - B £23.0 million.
 - C £26.6 million.

The following information relates to Questions 6–8

McConachie Company is considering the purchase of a new 400-ton stamping press. The press costs \$360,000, and an additional \$40,000 is needed to install it. The press will be depreciated straight-line to zero over a five-year life. The press will generate no additional revenues, but it will reduce cash operating expenses by \$140,000 annually. The press will be sold for \$120,000 after five years. An inventory investment of \$60,000 is required during the life of the investment. McConachie is in the 40 percent tax bracket.

- 6 What is the McConachie net investment outlay?
 - A \$400,000.
 - B \$420,000.
 - C \$460,000.
 - 7 McConachie's incremental annual after-tax operating cash flow is *closest* to:
 - A \$116,000.
 - B \$124,000.
 - C \$140,000.
 - 8 What is the terminal year after-tax non-operating cash flow at the end of year five?
 - A \$108,000.
 - B \$132,000.
 - C \$180,000.
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The following information relates to Questions 9–14

Linda Pyle is head of analyst recruiting for PPA Securities. She has been very frustrated by the number of job applicants who, in spite of their stellar pedigrees, seem to have little understanding of basic financial concepts. Pyle has written a set of conceptual questions and simple problems for the human resources department to use to screen for the better candidates in the applicant pool. A few of her corporate finance questions and problems are given below.

- Concept 1 "A company invests in depreciable assets, financed partly by issuing fixed-rate bonds. If inflation is lower than expected, the value of the real tax savings from depreciation and the value of the real after-tax interest expense are both reduced."
- Concept 2 "Sensitivity analysis and scenario analysis are useful tools for estimating the impact on a project's NPV of changing the value of one capital budgeting input variable at a time."
- Concept 3 "When comparing two mutually exclusive projects with unequal lives, the IRR is a good approach for choosing the better project because it does not require equal lives."
- Concept 4 "Project-specific betas should be used instead of company betas whenever the risk of the project differs from that of the company."

Problem “Fontenot Company is investing €100 in a project that is being depreciated straight-line to zero over a two-year life with no salvage value. The project will generate earnings before interest and taxes of €50 each year for two years. Fontenot’s weighted average cost of capital and required rate of return for the project are both 12 percent, and its tax rate is 30 percent.”

- 9 For Concept 1, the statement is correct regarding the effects on:
 - A the real tax savings from depreciation, but incorrect regarding the real after-tax interest expense.
 - B both the real tax savings from depreciation and the real after-tax interest expense.
 - C neither the real tax savings from depreciation nor the real after-tax interest expense.
 - 10 For Concept 2, the statement is correct regarding:
 - A sensitivity analysis, but not correct regarding scenario analysis.
 - B scenario analysis, but not correct regarding sensitivity analysis.
 - C both sensitivity analysis and scenario analysis.
 - 11 Are the statements identified as Concept 3 and Concept 4 correct?
 - A No for Concepts 3 and 4.
 - B No for Concept 3, but yes for Concept 4.
 - C Yes for Concept 3, but no for Concept 4.
 - 12 The after-tax operating cash flows in euros for the Fontenot Company are:
 - A 50 in both years.
 - B 70 in both years.
 - C 85 in both years.
 - 13 The economic income in euros for the Fontenot Company is:
 - A 17.24 in Year 1 and 9.11 in Year 2.
 - B 17.76 in Year 1 and 24.89 in Year 2.
 - C 24.89 in Year 1 and 17.76 in Year 2.
 - 14 The market value added (MVA) in euros for the Fontenot Company is *closest* to:
 - A 38.87.
 - B 39.92.
 - C 43.65.
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The following information relates to Questions 15–20

The capital budgeting committee for Laroche Industries is meeting. Laroche is a North American conglomerate that has several divisions. One of these divisions, Laroche Livery, operates a large fleet of vans. Laroche’s management is evaluating whether it is optimal to operate new vans for two, three, or four years before replacing them. The managers have estimated the investment outlay, annual after-tax operating expenses, and after-tax salvage cash flows for each of the service lives. Because revenues and

some operating costs are unaffected by the choice of service life, they were ignored in the analysis. Laroche Livery's opportunity cost of funds is 10 percent. The following table gives the cash flows in thousands of Canadian dollars (C\$).

Service Life	Investment	Year 1	Year 2	Year 3	Year 4	Salvage
2 years	-40,000	-12,000	-15,000			20,000
3 years	-40,000	-12,000	-15,000	-20,000		17,000
4 years	-40,000	-12,000	-15,000	-20,000	-25,000	12,000

Schoeman Products, another division of Laroche, has evaluated several investment projects and now must choose the subset of them that fits within its C\$40 million capital budget. The outlays and NPVs for the six projects are given below. Schoeman cannot buy fractional projects, and must buy all or none of a project. The currency amounts are in millions of Canadian dollars.

Project	Outlay	PV of Future Cash Flows	NPV
1	31	44	13
2	15	21	6
3	12	16.5	4.5
4	10	13	3
5	8	11	3
6	6	8	2

Schoeman wants to determine which subset of the six projects is optimal.

A final proposal comes from the division Society Services, which has an investment opportunity with a real option to invest further if conditions warrant. The crucial details are as follows:

- The original project:
 - An outlay of C\$190 million at time zero.
 - Cash flows of C\$40 million per year for Years 1–10 if demand is “high.”
 - Cash flows of C\$20 million per year for Years 1–10 if demand is “low.”
- Additional cash flows with the optional expansion project:
 - An outlay of C\$190 million at time one.
 - Cash flows of C\$40 million per year for Years 2–10 if demand is “high.”
 - Cash flows of C\$20 million per year for Years 2–10 if demand is “low.”
- Whether demand is “high” or “low” in Years 1–10 will be revealed during the first year. The probability of “high” demand is 0.50, and the probability of “low” demand is 0.50.
- The option to make the expansion investment depends on making the initial investment. If the initial investment is not made, the option to expand does not exist.
- The required rate of return is 10 percent.

Society Services wants to evaluate its investment alternatives.

The internal auditor for Laroche Industries has made several suggestions for improving capital budgeting processes at the company. The internal auditor's suggestions are as follows:

- Suggestion 1 “In order to put all capital budgeting proposals on an equal footing, the projects should all use the risk-free rate for the required rate of return.”

- Suggestion 2 “Because you cannot exercise both of them, you should not permit a given project to have both an abandonment option and an expansion/growth option.”
- Suggestion 3 “When rationing capital, it is better to choose the portfolio of investments that maximizes the company NPV than the portfolio that maximizes the company IRR.”
- Suggestion 4 “Project betas should be used for establishing the required rate of return whenever the project’s beta is different from the company’s beta.”
- 15 What is the optimal service life for Laroche Livery’s fleet of vans?
- A Two years.
 - B Three years.
 - C Four years.
- 16 The optimal subset of the six projects that Schoeman is considering consists of Projects:
- A 1 and 5.
 - B 2, 3, and 4.
 - C 2, 4, 5, and 6.
- 17 What is the NPV (C\$ millions) of the original project for Society Services without considering the expansion option?
- A -6.11.
 - B -5.66.
 - C 2.33.
- 18 What is the NPV (C\$ millions) of the optimal set of investment decisions for Society Services including the expansion option?
- A 6.34.
 - B 12.68.
 - C 31.03.
- 19 Should the capital budgeting committee accept the internal auditor’s first and second suggestions, respectively?
- A No for Suggestions 1 and 2.
 - B No for Suggestion 1 and Yes for Suggestion 2.
 - C Yes for Suggestion 1 and No for Suggestion 2.
- 20 Should the capital budgeting committee accept the internal auditor’s third and fourth suggestions, respectively?
- A No for Suggestions 3 and 4.
 - B Yes for Suggestions 3 and 4.
 - C No for Suggestion 3 and Yes for Suggestion 4.
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The following information relates to Questions 21–26

Maximilian Böhm is reviewing several capital budgeting proposals from subsidiaries of his company. Although his reviews deal with several details that may seem like minutiae, the company places a premium on the care it exercises in making its investment decisions.

The first proposal is a project for Richie Express, which is investing \$500,000, all in fixed capital, in a project that will have operating income after taxes of \$20,000 and depreciation of \$40,000 each year for the next three years. Richie Express will sell the asset in three years, paying 30 percent taxes on any excess of the selling price over book value. The proposal indicates that a \$647,500 terminal selling price will enable the company to earn a 15 percent internal rate of return on the investment. Böhm doubts that this terminal value estimate is correct.

Another proposal concerns Gasup Company, which does natural gas exploration. A new investment has been identified by the Gasup finance department with the following projected cash flows:

- Investment outlays are \$6 million immediately and \$1 million at the end of the first year.
- After-tax operating cash flows are \$0.5 million at the end of the first year and \$4 million at the end of each of the second, third, fourth, and fifth years. In addition, an after-tax outflow occurs at the end of the five-year project that has not been included in the operating cash flows: \$5 million required for environmental cleanup.
- The required rate of return on natural gas exploration is 18 percent.

The Gasup analyst is unsure about the calculation of the NPV and the IRR because the outlay is staged over two years.

Finally, Dominion Company is evaluating two mutually exclusive projects: The Pinto grinder involves an outlay of \$100,000, annual after-tax operating cash flows of \$45,000, an after-tax salvage value of \$25,000, and a three-year life. The Bolten grinder has an outlay of \$125,000, annual after-tax operating cash flows of \$47,000, an after-tax salvage value of \$20,000, and a four-year life. The required rate of return is 10 percent. The net present value (NPV) and equivalent annual annuity (EAA) of the Pinto grinder are \$30,691 and \$12,341, respectively. Whichever grinder is chosen, it will have to be replaced at the end of its service life. The analyst is unsure about which grinder should be chosen.

Böhm and his colleague Beth Goldberg have an extended conversation about capital budgeting issues, including several comments listed below. Goldberg makes two comments about real options:

- Comment 1 “The abandonment option is valuable, but it should be exercised only when the abandonment value is above the amount of the original investment.”
- Comment 2 “If the cost of a real option is less than its value, this will increase the NPV of the investment project in which the real option is embedded.”

Böhm also makes several comments about specific projects under consideration:

- Comment A The land and building were purchased five years ago for \$10 million. This is the amount that should now be included in the fixed capital investment.”

- Comment B “We can improve the project’s NPV by using the after-tax cost of debt as the discount rate. If we finance the project with 100 percent debt, this discount rate would be appropriate.”
- Comment C “It is generally safer to use the NPV than the IRR in making capital budgeting decisions. However, when evaluating mutually exclusive projects, if the projects have conventional cash flow patterns and have the same investment outlays, it is acceptable to use either the NPV or IRR.”
- Comment D “You should not base a capital budgeting decision on its immediate impact on earnings per share (EPS).”

- 21 What terminal selling price is required for a 15 percent internal rate of return on the Richie project?
- A \$588,028.
 - B \$593,771.
 - C \$625,839.
- 22 The NPV and IRR, respectively, of the Gasup Company investment are *closest* to:
- A \$509,600 and 21.4%.
 - B \$509,600 and 31.3%.
 - C \$946,700 and 31.3%.
- 23 Of the two grinders that the Dominion Company is evaluating, Böhm should recommend the:
- A Bolten grinder because its NPV is higher than the Pinto grinder NPV.
 - B Bolten grinder because its EAA is higher than the Pinto grinder EAA.
 - C Pinto grinder because its EAA is higher than the Bolten grinder EAA.
- 24 Are Goldberg’s comments about real options correct?
- A No for Comment 1 and Comment 2.
 - B No for Comment 1 and Yes for Comment 2.
 - C Yes for Comment 1 and No for Comment 2.
- 25 Is Böhm most likely correct regarding Comment A about the \$10 million investment and Comment B about using the after-tax cost of debt?
- A No for both comments.
 - B Yes for both comments.
 - C No for Comment A and Yes for Comment B.
- 26 Is Böhm most likely correct regarding Comment C that it is acceptable to use either NPV or IRR and Comment D about the immediate impact on EPS?
- A No for both comments.
 - B Yes for both comments.
 - C No for Comment C and Yes for Comment D.
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The following information relates to Questions 27–32

Barbara Simpson is a sell-side analyst with Smith Riccardi Securities. Simpson covers the pharmaceutical industry. One of the companies she follows, Bayonne Pharma, is evaluating a regional distribution center. The financial predictions for the project are as follows:

- Fixed capital outlay is €1.50 billion.
- Investment in net working capital is €0.40 billion.
- Straight-line depreciation is over a six-year period with zero salvage value.
- Project life is 12 years.
- Additional annual revenues are €0.10 billion.
- Annual cash operating expenses are reduced by €0.25 billion.
- The capital equipment is sold for €0.50 billion in 12 years.
- Tax rate is 40 percent.
- Required rate of return is 12 percent.

Simpson is evaluating this investment to see whether it has the potential to affect Bayonne Pharma's stock price. Simpson estimates the NPV of the project to be €0.41 billion, which should increase the value of the company.

Simpson is evaluating the effects of other changes to her capital budgeting assumptions. She wants to know the effect of a switch from straight-line to accelerated depreciation on the company's operating income and the project's NPV. She also believes that the initial outlay might be much smaller than initially assumed. Specifically, she thinks the outlay for fixed capital might be €0.24 billion lower, with no change in salvage value.

When reviewing her work, Simpson's supervisor provides the following comments. "I note that you are relying heavily on the NPV approach to valuing the investment decision. I don't think you should use an IRR because of the multiple IRR problem that is likely to arise with the Bayonne Pharma project. However, the equivalent annual annuity would be a more appropriate measure to use for the project than the NPV. I suggest that you compute an EAA."

- 27 Simpson should estimate the after-tax operating cash flow for Years 1–6 and 7–12, respectively, to be *closest* to:
- A €0.31 billion and €0.21 billion.
 - B €0.31 billion and €0.25 billion.
 - C €0.35 billion and €0.25 billion.
- 28 Simpson should estimate the initial outlay and the terminal year non-operating cash flow, respectively, to be *closest* to:
- A €1.50 billion and €0.70 billion.
 - B €1.90 billion and €0.70 billion.
 - C €1.90 billion and €0.90 billion.
- 29 Is Simpson's estimate of the NPV of the project correct?
- A Yes.
 - B No. The NPV is –€0.01 billion.
 - C No. The NPV is €0.34 billion.
- 30 A switch from straight-line to accelerated depreciation would:
- A increase the NPV and decrease the first year operating income after taxes.

- B increase the first year operating income after taxes and decrease the NPV.
 C increase both the NPV and first year operating income after taxes.
- 31 If the outlay is lower by the amount that Simpson suggests, the project NPV should increase by an amount *closest* to:
 A €0.09 billion.
 B €0.14 billion.
 C €0.17 billion.
- 32 How would you evaluate the comments by Simpson's supervisor about not using the IRR and about using the EAA? The supervisor is:
 A incorrect about both.
 B correct about IRR and incorrect about EAA.
 C incorrect about IRR and correct about EAA.

The following information relates to Questions 33–38

Mun Hoe Yip is valuing Pure Corporation. Pure is a simple corporation that is going out of business in five years, distributing its income to creditors and bondholders as planned in the financial statements below. Pure has a 19 percent cost of equity, 8 1/3 percent before-tax cost of debt, 12 percent weighted average cost of capital, and 40 percent tax rate, and it maintains a 50 percent debt/value ratio.

Yip is valuing the company using the basic capital budgeting method as well as other methods, such as EP, residual income, and claims valuation. Yip's research assistant, Linda Robinson, makes three observations about the analysis.

- Observation 1 "The present value of the company's economic income should be equal to the present value of the cash flows in the basic capital budgeting approach."
 Observation 2 "The economic income each year is equal to the cash flow minus the economic depreciation."
 Observation 3 "The market value added is the present value of the company's economic profit (EP), which equals the net worth of 77,973."

Year	0	1	2	3	4	5
Balance Sheets:						
Assets	200,000	160,000	120,000	80,000	40,000	0
Liabilities	122,027	107,671	88,591	64,222	33,929	0
Net worth	77,973	52,329	31,409	15,778	6,071	0
Income Statements:						
Sales		180,000	200,000	220,000	240,000	200,000
Variable cash expenses		90,000	100,000	110,000	120,000	100,000
Fixed cash expenses		20,000	20,000	20,000	20,000	20,000
Depreciation		40,000	40,000	40,000	40,000	40,000
EBIT		30,000	40,000	50,000	60,000	40,000
Interest expense		10,169	8,973	7,383	5,352	2,827

(continued)

Year	0	1	2	3	4	5
EBT		19,831	31,027	42,617	54,648	37,173
Taxes at 40 percent		7,932	12,411	17,047	21,859	14,869
Net income before salvage		11,899	18,616	25,570	32,789	22,304
After-tax salvage value						12,000
Net income		11,899	18,616	25,570	32,789	34,304
Statements of Cash Flows:						
Operating cash flows:						
Net income		11,899	18,616	25,570	32,789	34,304
Depreciation		40,000	40,000	40,000	40,000	40,000
Total		51,899	58,616	65,570	72,789	74,304
Financing cash flows:						
Debt repayment		14,357	19,080	24,369	30,293	33,929
Dividends/repurchases		37,542	39,536	41,201	42,496	40,375
Total		-51,899	-58,616	-65,570	-72,789	-74,304
Investing cash flows:						
		0	0	0	0	0
Total cash flows:						
		0	0	0	0	0

- 33 Economic income during year one is *closest* to:
- A 23,186.
 - B 29,287.
 - C 46,101.
- 34 What is EP during Year 1?
- A -12,101.
 - B -6,000.
 - C 6,000.
- 35 What is residual income during Year 1?
- A -2,916.
 - B 2,542.
 - C 8,653.
- 36 What is the value of equity at time zero?
- A 44,055.
 - B 77,973.
 - C 122,027.
- 37 Are Robinson's first two observations, respectively, correct?
- A Yes for both observations.
 - B No for the first and Yes for the second.
 - C Yes for the first and No for the second.
- 38 Which of the following would be Yip's *most appropriate* response to Robinson's third observation?
- A The market value added is not equal to the present value of EP, although the market value of equity is equal to 122,027.

- B** The market value added is equal to the present value of EP, which in this case is 44,055.
- C** The market value added is not equal to the present value of EP, and market value added is equal to 44,055.

The following information relates to Questions 39–44

Carlos Velasquez, CFA, is a financial analyst with Embelesado, S.A., a Spanish manufacturer of sailboats and sailing equipment. Velasquez is evaluating a proposal for Embelesado to build sailboats for a foreign competitor that lacks production capacity and sells in a different market. The sailboat project is perceived to have the same risk as Embelesado's other projects.

The proposal covers a limited time horizon—three years—after which the competitor expects to be situated in a new, larger production facility. The limited time horizon appeals to Embelesado, which currently has excess capacity but expects to begin its own product expansion in slightly more than three years.

Velasquez has collected much of the information necessary to evaluate this proposal in Exhibits 1 and 2.

Exhibit 1 Selected Data for Sailboat Proposal (Currency Amounts in € Millions)

Initial fixed capital outlay	60
Annual contracted revenues	60
Annual operating costs	25
Initial working capital outlay (recovered at end of the project)	10
Annual depreciation expense (both book and tax accounting)	20
Economic life of facility (years)	3
Salvage (book) value of facility at end of project	0
Expected market value of facility at end of project	5

Exhibit 2 Selected Data for Embelesado, S.A.

Book value of long-term debt/total assets	28.6%
Book value of equity/total assets	71.4%
Market value of long-term debt/market value of company	23.1%
Market value of equity/market value of company	76.9%
Coupon rate on existing long-term debt	8.5%
Interest rate on new long-term debt	8.0%
Cost of equity	13.0%
Marginal tax rate	35.0%
Maximum acceptable payback period	2 years

Velasquez recognizes that Embelesado is currently financed at its target capital structure and expects that the capital structure will be maintained if the sailboat project is undertaken. Embelesado's managers disagree, however, about the method that should be used to evaluate capital budgeting proposals.

One of Embelesado's vice presidents asks Velasquez the following questions:

- Question 1 Will projects that meet a corporation's payback criterion for acceptance necessarily have a positive net present value (NPV)?
- Question 2 For mutually exclusive projects, will the NPV and internal rate of return (IRR) methods necessarily agree on project ranking?
- Question 3 For the sailboat project, what will be the effects of using accelerated depreciation (for both book and tax accounting) instead of straight-line depreciation on a) the NPV and b) the total net cash flow in the terminal year?
- Question 4 Assuming a 13 percent discount rate, what will be the increase in the sailboat project's NPV if the expected market value of the facility at end of project is €15 million rather than €5 million?

39 The weighted average cost of capital for Embelesado is *closest* to:

- A 10.78%.
- B 11.20%.
- C 11.85%.

40 The total net cash flow (in € millions) for the sailboat project in its terminal year is *closest* to:

- A 33.00.
- B 39.75.
- C 43.00.

41 The IRR for the sailboat project is *closest* to:

- A 18.5%.
- B 19.7%.
- C 20.3%.

42 The best responses that Velasquez can make to Question 1 and Question 2 are:

	Question 1	Question 2
A	No	No
B	No	Yes
C	Yes	No

43 In response to Question 3, what are the *most likely* effects on the NPV and the total net cash flow in the terminal year, respectively?

	NPV	Total Net Cash Flow in Terminal Year
A	Increase	Increase
B	Increase	Decrease
C	Decrease	Increase

44 In response to Question 4, the increase in the sailboat project's NPV (in € millions) is *closest* to:

- A 4.50.

- B 6.50.
C 6.76.

The following information relates to Questions 45–50

María Hernández is a sell-side analyst covering the electronics industry in Spain. One of the companies she follows, SG Electronics, S.A., has recently announced plans to begin producing and selling a new series of video cameras. Hernández estimates that this project will increase the value of the company and, consequently, she plans on changing her research opinion on the company from a “hold” to a “buy.” Her initial financial predictions for the project are:

- Fixed capital equipment outlay is €2,750,000.
- At the beginning of the project, a required increase in current assets of €200,000 and a required increase in current liabilities of €125,000.
- Straight-line depreciation to zero over a five-year life.
- Project life of five years.
- Incremental annual unit sales of 3,000 at a unit price of €600.
- Annual fixed cash expenses of €125,000; variable cash expenses of €125 per unit.
- The capital equipment is expected to be sold for €450,000 at the end of Year 5. At the end of the project, the net working capital investment will be recovered.
- Tax rate of 40 percent.
- Based on the capital asset pricing model, the required rate of return is 12 percent.

Hernández estimates the expected net present value (NPV) of the project to be €975,538 and the internal rate of return (IRR) to be 24.6 percent. She also performs a sensitivity analysis by changing the input variable assumptions used in her initial analysis.

When reviewing Hernández’s work, her supervisor, Arturo Costa, notes that she did not include changes in the depreciation method, initial fixed capital outlay, or inflation assumptions in her sensitivity analysis. As a result, Costa asks the following questions:

- Question 1 “What would be the effect on the project’s NPV if the initial fixed capital equipment outlay increased from €2,750,000 to €3,000,000, everything else held constant?”
- Question 2 “How would a higher than expected inflation rate affect the value of the real tax savings from depreciation and the value of the real after-tax interest expense, everything else held constant?”
- Question 3 “You are using a required rate of return of 12 percent when the company’s weighted average cost of capital (WACC) is 10 percent. Why are you using a required rate of return for the project greater than the company’s WACC?”

Before ending the meeting, Costa tells Hernández: “Last year the company produced a prototype at a cost of €500,000. Now management is having doubts about the market appeal of the product in its current design, and so they are considering delaying the start of the project for a year, until the prototype can be shown to industry experts.”

- 45 Using Hernández’s initial financial predictions, the estimated annual after-tax operating cash flow is *closest* to:
- A €780,000.
 - B €1,000,000.
 - C €1,075,000.
- 46 Using Hernández’s initial financial predictions, the estimated terminal year after-tax non-operating cash flow is *closest* to:
- A €195,000.
 - B €270,000.
 - C €345,000.
- 47 Hernández’s best response to Costa’s first question is that the project’s NPV would decrease by an amount *closest* to:
- A €142,000.
 - B €178,000.
 - C €250,000.
- 48 Hernández’s *best* response to Costa’s second question is that:
- A real tax savings from depreciation and real interest expense would be lower.
 - B real tax savings from depreciation would be higher and real interest expense would be lower.
 - C real tax savings from depreciation would be lower and real interest expense would be higher.
- 49 Hernández’s *best* response to Costa’s third question is: “Because:
- A the project will plot above the security market line.”
 - B the project’s beta is greater than the company’s beta.”
 - C the project’s IRR is greater than the required rate of return.”
- 50 Should Costa’s end-of-meeting comments result in changes to Hernández’s capital budgeting analysis?
- A No.
 - B Yes, but only to incorporate the possible delay.
 - C Yes, to incorporate both the possible delay and the cost of producing the prototype.
-

SOLUTIONS

- 1 C is correct.

$$\text{Outlay} = \text{FCInv} + \text{NWCInv} - \text{Sal}_0 + T(\text{Sal}_0 - B_0)$$

$$\text{Outlay} = (350,000 + 110,000) + 73,000 - 0 + 0 = \$533,000$$

The installed cost is $\$350,000 + \$110,000 = \$460,000$, so the annual depreciation is $\$460,000/5 = \$92,000$. The annual after-tax operating cash flow for Years 1–5 is

$$\text{CF} = (S - C - D)(1 - T) + D = (265,000 - 83,000 - 92,000)(1 - 0.40) + 92,000$$

$$\text{CF} = \$146,000$$

The terminal year after-tax non-operating cash flow in Year 5 is

$$\text{TNOCF} = \text{Sal}_5 + \text{NWCInv} - T(\text{Sal}_5 - B_5) = 85,000 + 73,000 - 0.40(85,000 - 0)$$

$$\text{TNOCF} = \$124,000$$

The NPV is

$$\text{NPV} = -533,000 + \sum_{t=1}^5 \frac{146,000}{1.10^t} + \frac{124,000}{1.10^5} = \$97,449$$

- 2 B is correct. The additional annual depreciation is $\$100,000/8 = \$12,500$. The depreciation tax savings is $0.40(\$12,500) = \$5,000$. The change in project NPV is

$$-100,000 + \sum_{t=1}^8 \frac{5,000}{(1.10)^t} = -100,000 + 26,675 = -\$73,325$$

- 3 C is correct. Financing costs are not subtracted from the cash flows for either the NPV or the IRR. The effects of financing costs are captured in the discount rate used.
- 4 C is correct. The annual depreciation charge is $\$400,000/10 = \$40,000$. The after-tax operating cash flow in Year 1 should be

$$\begin{aligned} \text{CF} &= (S - C - D)(1 - T) + D \\ &= (240,000 - 110,000 - 40,000)(1 - 0.30) + 40,000 \\ &= 63,000 + 40,000 = \$103,000 \end{aligned}$$

- 5 C is correct. The terminal year after-tax non-operating cash flow is

$$\begin{aligned} \text{TNOCF} &= \text{Sal}_5 + \text{NWCInv} - T(\text{Sal}_5 - B_5) \\ &= 21 + 8 - 0.40(21 - 15) = \text{£}26.6 \text{ million} \end{aligned}$$

- 6 C is correct. The investment outlay is

$$\begin{aligned} \text{Outlay} &= \text{FCInv} + \text{NWCInv} - \text{Sal}_0 + T(\text{Sal}_0 - B_0) \\ &= (360,000 + 40,000) + 60,000 - 0 + 0 = \$460,000 \end{aligned}$$

- 7 A is correct. Depreciation will be $\$400,000/5 = \$80,000$ per year. The annual after-tax operating cash flow is

$$\begin{aligned} \text{CF} &= (S - C - D)(1 - T) + D \\ &= [0 - (-140,000) - 80,000](1 - 0.40) + 80,000 = \$116,000 \end{aligned}$$

- 8 B is correct. The terminal year non-operating cash flow is

$$\begin{aligned}\text{TNOCF} &= \text{Sal}_5 + \text{NWCInv} - T(\text{Sal}_5 - B_5) \\ &= 120,000 + 60,000 - 0.40(120,000 - 0) = \$132,000\end{aligned}$$

- 9 C is correct. The value of the depreciation tax savings is increased, and the value of the real after-tax interest expense is also increased. Due to the lower inflation, the value has increased (essentially discounting at a lower rate).
- 10 A is correct. The statement is correct for sensitivity analysis, but not for scenario analysis (in which several input variables are changed for each scenario).
- 11 B is correct. Either the least-common multiple of lives or the equivalent annual annuity approach should be used (both use the NPV, not the IRR). Concept 4 is correct as given.
- 12 C is correct. The problem gives EBIT not EBITDA.

$$\text{CF} = (\text{S} - \text{C} - \text{D})(1 - \text{T}) + \text{D} = 50(1 - 0.3) + 50 = \text{€}85 \text{ each year}$$

- 13 A is correct. Economic income is the cash flow plus the change in value, or economic income is the cash flow minus the economic depreciation (we will use the second expression):

$$V_0 = \frac{85}{1.12} + \frac{85}{1.12^2} = 143.65 \quad V_1 = \frac{85}{1.12} = 75.89 \quad V_2 = 0$$

$$\begin{aligned}\text{Economic income (Year 1)} &= \text{CF}_1 - (V_0 - V_1) \\ &= 85 - (143.65 - 75.89) \\ &= 85 - 67.76 = \text{€}17.24\end{aligned}$$

$$\begin{aligned}\text{Economic income (Year 2)} &= \text{CF}_2 - (V_1 - V_2) \\ &= 85 - (75.89 - 0) \\ &= 85 - 75.89 = \text{€}9.11\end{aligned}$$

- 14 C is correct.

$$\begin{aligned}\text{EP} &= \text{NOPAT} - \$\text{WACC} = \text{EBIT}(1 - \text{T}) - \text{WACC} \times \text{Capital} \\ \text{EP(Year 1)} &= 50(1 - 0.30) - 0.12(100) = 35 - 12 = \text{€}23 \\ \text{EP(Year 2)} &= 50(1 - 0.30) - 0.12(50) = 35 - 6 = \text{€}29 \\ \text{MVA} &= \frac{\text{EP(Year 1)}}{1 + \text{WACC}} + \frac{\text{EP(Year 2)}}{(1 + \text{WACC})^2} = \frac{23}{1.12} + \frac{29}{1.12^2} = \text{€}43.65\end{aligned}$$

(An alternative way to get MVA is simply to find the NPV of the investment project.)

- 15 B is correct. The way to solve the problem is to calculate the equivalent annual annuity and choose the service life with the lowest annual cost. For a two-year service life, the NPV is

$$\text{NPV} = -40,000 + \frac{-12,000}{1.10^1} + \frac{-15,000}{1.10^2} + \frac{20,000}{1.10^2} = -46,776.86$$

The EAA (PV = -46,776.86, $N = 2$, and $i = 10\%$) is -26,952.38.

For a three-year service life, the NPV is

$$\begin{aligned}\text{NPV} &= -40,000 + \frac{-12,000}{1.10^1} + \frac{-15,000}{1.10^2} + \frac{-20,000}{1.10^3} + \frac{17,000}{1.10^3} \\ &= -65,559.73\end{aligned}$$

The EAA (PV = -65,559.73, $N = 3$, and $i = 10\%$) is -26,362.54.

For a four-year service life, the NPV is

$$\begin{aligned} \text{NPV} &= -40,000 + \frac{-12,000}{1.10^1} + \frac{-15,000}{1.10^2} + \frac{-20,000}{1.10^3} + \frac{-25,000}{1.10^4} \\ &\quad + \frac{12,000}{1.10^4} = -87,211.26 \end{aligned}$$

The EAA (PV = -87,211.26, $N = 4$, and $i = 10\%$) is -27,512.61.

The three-year service life has the lowest annual cost. Laroche should replace the vans every three years.

- 16 A is correct. To help the selection process, use the profitability index for each project, which shows the total present value per dollar invested.

Project	Outlay	PV of Future Cash Flows	NPV	PI	PI Rank
1	31	44	13	1.419	1
2	15	21	6	1.400	2
3	12	16.5	4.5	1.375	(tie) 3
4	10	13	3	1.300	6
5	8	11	3	1.375	(tie) 3
6	6	8	2	1.333	5

Try to incorporate the high PI projects into the budget using trial and error. These trials include the following:

Set of Projects	Total Outlay	Total NPV
1 and 5	39	16
2, 3, and 4	37	13.5
2, 3, and 5	35	13.5
2, 4, 5, and 6	39	14

Among the sets of projects suggested, the optimal set is the one with the highest NPV, provided its total outlay does not exceed C\$40 million. The set consisting of Projects 1 and 5 produces the highest NPV.

- 17 B is correct.

If demand is “high,” the NPV is

$$\text{NPV} = -190 + \sum_{t=1}^{10} \frac{40}{1.10^t} = \text{C\$}55.783 \text{ million}$$

If demand is “low,” the NPV is

$$\text{NPV} = -190 + \sum_{t=1}^{10} \frac{20}{1.10^t} = -\text{C\$}67.109 \text{ million}$$

The expected NPV is $0.50(55.783) + 0.50(-67.109) = -\text{C\$}5.663 \text{ million}$.

- 18 B is correct. Assume we are at time = 1. The NPV of the expansion (at time 1) if demand is “high” is

$$\text{NPV} = -190 + \sum_{t=1}^9 \frac{40}{1.10^t} = \text{C\$}40.361 \text{ million}$$

The NPV of the expansion (at time 1) if demand is “low” is

$$\text{NPV} = -190 + \sum_{t=1}^9 \frac{20}{1.10^t} = -\text{C\$}74.820 \text{ million}$$

The optimal decision is to expand if demand is “high” and not expand if “low.”

Because the expansion option is exercised only when its value is positive, which happens 50 percent of the time, the expected value of the expansion project, at time zero, is

$$\text{NPV} = \frac{1}{1.10} 0.50(40.361) = \text{C\$}18.346 \text{ million}$$

The total NPV of the initial project and the expansion project is

$$\text{NPV} = -\text{C\$}5.663 \text{ million} + \text{C\$}18.346 \text{ million} = \text{C\$}12.683 \text{ million}$$

The optional expansion project, handled optimally, adds sufficient value to make this a positive NPV project.

- 19** A is correct. Both suggestions are bad. In valuing projects, expected cash flows should be discounted at required rates of return that reflect their risk, not at a risk-free rate that ignores risk. Even though both options cannot be simultaneously exercised, they can both add value. If demand is high, you can exercise the growth option, and if demand is low, you can exercise the abandonment option.
- 20** B is correct. Both suggestions are good. Choosing projects with high IRRs might cause the company to concentrate on short-term projects that reduce the NPV of the company. Whenever the project risk differs from the company risk, a project-specific required rate of return should be used.
- 21** C is correct. The after-tax operating cash flow for each of the next three years is $\$20,000 + \$40,000 = \$60,000$. The book value in three years will be $\$380,000$ (the original cost less three years’ depreciation). So the terminal year after-tax non-operating cash flow will be $\text{Sal}_3 - 0.30(\text{Sal}_3 - \$380,000)$, where Sal_3 is the selling price. For a 15 percent return, the PV of future cash flows must equal the investment:

$$500,000 = \frac{60,000}{1.15} + \frac{60,000}{1.15^2} + \frac{60,000}{1.15^3} + \frac{\text{Sal}_3 - 0.30(\text{Sal}_3 - 380,000)}{1.15^3}$$

There are several paths to follow to solve for Sal_3 .

$$363,006.5 = \frac{\text{Sal}_3 - 0.30(\text{Sal}_3 - 380,000)}{1.15^3}$$

$$\text{Sal}_3 - 0.30(\text{Sal}_3 - 380,000) = 552,087.5$$

$$0.70 \text{ Sal}_3 = 438,087.5$$

$$\text{Sal}_3 = \$625,839$$

- 22** A is correct. The cash flows (in \$ million) for the 5-year gas project are as follows:

Time	Outlays	After-Tax Operating Cash Flows	Total After-Tax Cash Flows
0	6.0	0.0	−6.0
1	1.0	0.5	−0.5
2	0.0	4.0	4.0
3	0.0	4.0	4.0

Time	Outlays	After-Tax Operating Cash Flows	Total After-Tax Cash Flows
4	0.0	4.0	4.0
5	5.0	4.0	-1.0

Given the required rate of return of 18 percent, the NPV can be calculated with Equation 2 or with a financial calculator:

$$\text{NPV} = -6.0 + \frac{-0.5}{1.18} + \frac{4.0}{1.18^2} + \frac{4.0}{1.18^3} + \frac{4.0}{1.18^4} + \frac{-1.0}{1.18^5}$$

$$\text{NPV} = \$509,579$$

Similarly, the IRR can be calculated from Equation 3:

$$-6.0 + \frac{-0.5}{1+r} + \frac{4.0}{(1+r)^2} + \frac{4.0}{(1+r)^3} + \frac{4.0}{(1+r)^4} + \frac{-1.0}{(1+r)^5} = 0$$

Solving for r with a financial calculator or spreadsheet software will yield 21.4 percent for the internal rate of return. Note that in spite of the fact that we are dealing with a nonconventional cash flow pattern, the IRR has a unique solution. The NPV profile declines as the required rate of return increases, and the NPV value crosses the x -axis (required rate of return) only one time, at 21.4 percent.

- 23** C is correct. Because the mutually exclusive projects have unequal lives, the EAA should be used instead of the NPV. The NPV and EAA for the Pinto grinder are correct. For the Bolten grinder, the NPV is

$$\text{NPV} = -125,000 + \sum_{t=1}^4 \frac{47,000}{1.10^t} + \frac{20,000}{1.10^4} = 37,644$$

To find the Bolten EAA, take the NPV for Bolten and annualize it for four years ($N = 4$, $PV = 37,644$, and $i = 10\%$). The Bolten EAA is \$11,876. Consequently, the Pinto grinder has the better EAA of \$12,341.

- 24** B is correct. Goldberg's first comment is wrong. A project should be abandoned in the future only when its abandonment value is more than the discounted value of the remaining cash flows. Goldberg's second comment is correct.
- 25** A is correct. The \$10 million original cost is a sunk cost and not relevant. The correct investment is today's opportunity cost, the market value today. The correct discount rate is the project required rate of return.
- 26** C is correct. Even if they are the same size, a short-term project with a high IRR can have a lower NPV than a longer-term project. The immediate impact on EPS does not capture the full effect of the cash flows over the project's entire life.
- 27** A is correct. The annual depreciation charge for Years 1–6 is $1.5/6 = 0.25$. Annual after-tax operating cash flows for Years 1–6 are:

$$\text{CF} = (S - C - D)(1 - T) + D$$

$$\text{CF} = [0.10 - (-0.25) - 0.25](1 - 0.40) + 0.25$$

$$\text{CF} = 0.06 + 0.25 = €0.31 \text{ billion}$$

Annual after-tax operating cash flows for Years 7–12 are:

$$\text{CF} = (S - C - D)(1 - T) + D$$

$$CF = [0.10 - (-0.25) - 0](1 - 0.40) + 0$$

$$CF = \text{€}0.21 \text{ billion}$$

28 B is correct.

Outlay at time zero is:

$$\text{Outlay} = \text{FCInv} + \text{NWCInv} - \text{Sal}_0 + T(\text{Sal}_0 - B_0)$$

$$\text{Outlay} = 1.50 + 0.40 - 0 + 0 = \text{€}1.90 \text{ billion}$$

Terminal year after-tax non-operating cash flow is

$$\text{TNOCF} = \text{Sal}_{12} + \text{NWCInv} - T(\text{Sal}_{12} - B_{12})$$

$$\text{TNOCF} = 0.50 + 0.40 - 0.40(0.50 - 0) = \text{€}0.70 \text{ billion}$$

29 B is correct. The cash flows, computed in the first two questions, are as follows:

Time 0	–€1.90 billion
Time 1–6	€0.31 billion
Time 7–12	€0.21 billion
Time 12	€0.70 billion

The NPV is

$$\text{NPV} = -1.90 + \sum_{t=1}^6 \frac{0.31}{1.12^t} + \sum_{t=7}^{12} \frac{0.21}{1.12^t} + \frac{0.70}{1.12^{12}}$$

$$\begin{aligned} \text{NPV} &= -1.90 + 1.2745 + 0.4374 + 0.1797 \\ &= -\text{€}0.0084 \text{ billion} \approx -\text{€}0.01 \text{ billion} \end{aligned}$$

30 A is correct. Accelerated depreciation shifts depreciation expense toward the earlier years so that first-year operating income after taxes will be lower. However, because depreciation is a noncash expense, it must be added back to operating income after taxes in order to obtain after-tax operating cash flow. This process shifts cash flows from later years to earlier years, increasing the NPV.

31 C is correct. The outlay is lower by €0.24, which will decrease the annual depreciation by €0.04 for the first six years. The annual additional taxes from the loss of the depreciation tax shelter are €0.04(0.40) = €0.016. The after-tax cash flows are higher by €0.24 at time zero (because of the smaller investment) and lower by €0.016 for the first six years. The NPV increases by

$$\text{NPV} = +0.24 - \sum_{t=1}^6 \frac{0.016}{1.12^t} = 0.24 - 0.0658 = 0.1742 = \text{€}0.17 \text{ billion}$$

32 A is correct. Both of the supervisor's comments are incorrect. Because the Bayonne Pharma project is a conventional project (an outflow followed by inflows), the multiple IRR problem cannot occur. The EAA is preferred over the NPV when dealing with mutually exclusive projects with differing lives, a scenario which is not relevant for this decision. The Bayonne Pharma project is free-standing, so the NPV approach is appropriate.

33 B is correct.

$$\text{Economic income} = \text{Cash flow} - \text{Economic depreciation}$$

$$\text{Economic income (Year 1)} = CF_1 - (V_0 - V_1)$$

After-tax operating cash flow (CF) = $(S - C - D)(1 - T) + D + \text{After-tax salvage}$
 $= \text{EBIT}(1 - T) + D + \text{After-tax salvage}$

Year	1	2	3	4	5
EBIT	30,000	40,000	50,000	60,000	40,000
EBIT(1 - 0.40)	18,000	24,000	30,000	36,000	24,000
D	40,000	40,000	40,000	40,000	40,000
After-tax salvage					12,000
CF	58,000	64,000	70,000	76,000	76,000

$$CF_1 = 58,000$$

$$V_0 = \frac{58,000}{1.12} + \frac{64,000}{1.12^2} + \frac{70,000}{1.12^3} + \frac{76,000}{1.12^4} + \frac{76,000}{1.12^5} = 244,054.55$$

$$V_1 = \frac{64,000}{1.12} + \frac{70,000}{1.12^2} + \frac{76,000}{1.12^3} + \frac{76,000}{1.12^4} = 215,341.10$$

$$\text{Economic income (Year 1)} = 58,000 - (244,054.55 - 215,341.10)$$

$$\text{Economic income (Year 1)} = 58,000 - 28,713.45 = 29,286.55$$

34 B is correct.

$$EP = \text{NOPAT} - \$\text{WACC}$$

$$\text{NOPAT} = \text{EBIT}(1 - \text{Tax rate}) = 30,000(1 - 0.40) = 18,000$$

$$\$WACC = \text{WACC} \times \text{Capital} = 0.12(200,000) = 24,000$$

$$EP = 18,000 - 24,000 = -6,000$$

35 A is correct.

$$RI_t = NI_t - r_e B_{t-1}$$

$$RI_1 = 11,899 - 0.19(77,973) = 11,899 - 14,815 = -2,916$$

36 C is correct. The value of equity is the PV of cash distributions to equity:

$$PV = \frac{37,542}{1.19} + \frac{39,536}{1.19^2} + \frac{41,201}{1.19^3} + \frac{42,496}{1.19^4} + \frac{40,375}{1.19^5} = 122,027$$

37 B is correct. Robinson's first statement is wrong. The value of an asset is the present value of its future cash flows. Economic income each year is the cash flow minus economic depreciation, $EI = CF - ED$. For this company, which is declining in value each year, the economic depreciation is positive and EI is less than CF each year. Consequently, the present value of economic income (EI) will be less than the present value of future cash flows (CF). Robinson's second statement is correct.

38 B is correct. Market value added is equal to the present value of EP. Its value, however, is not equal to the book value of equity. The calculation of MVA is shown below:

Year	1	2	3	4	5*
EBIT	30,000	40,000	50,000	60,000	60,000
NOPAT = EBIT(1 - 0.40)	18,000	24,000	30,000	36,000	36,000
Capital (beginning)	200,000	160,000	120,000	80,000	40,000

(continued)

Year	1	2	3	4	5*
\$WACC = 0.12 × Capital	24,000	19,200	14,400	9,600	4,800
EP = NOPAT – \$WACC	–6,000	4,800	15,600	26,400	31,200

* The fifth year figures include the effects of salvage. Before-tax salvage of 20,000 (= 12,000/(1 – 0.40)) is added to EBIT. The after-tax salvage of 12,000 is included in NOPAT.

$$MVA = \frac{-6,000}{1.12} + \frac{4,800}{1.12^2} + \frac{15,600}{1.12^3} + \frac{26,400}{1.12^4} + \frac{31,200}{1.12^5} = 44,054.55$$

- 39 B is correct. The weighted average cost of capital for Embelesado is calculated as:

$$\begin{aligned} WACC &= (\text{Market weight of debt} \times \text{After-tax cost of debt}) + \\ &\quad (\text{Market weight of equity} \times \text{Cost of equity}) \\ WACC &= w_d k_d (1 - T) + w_{cs} k_{cs} = 0.231(8.0\%)(1 - 0.35) + 0.769(13.0\%) \\ &= 1.201\% + 9.997\% \\ WACC &= 11.198\% = 11.20\% \end{aligned}$$

- 40 C is correct. The terminal year cash flow is:

Revenues	€60.00
Less operating costs	25.00
Less depreciation expenses	20.00
= Taxable Income	15.00
Less taxes @ 35%	(5.25)
= Net Income	9.75
Plus depreciation expenses	20.00
= After-tax operating CF	29.75
+ Recover WC	10.00
+ Ending market value	5.00
Less taxes on sale proceeds @ 35%	(1.75)*
= Terminal Year CF	€43.00

* The tax on the sale proceeds is 35% times the gain of €5.00 = €1.75

- 41 C is correct. This is the IRR for a project with the following cash flows: (€70,000) in Year 0, €29,750 at Years 1 and 2, and €43,000 at Year 3.

	Years 1 & 2	Year 3
Revenues	€60,000	€60,000
Less operating costs	25,000	25,000
Less depreciation expense	20,000	20,000
= Taxable income	15,000	15,000
Less taxes @ 35%	5,250	5,250
= Net income	9,750	9,750
Plus depreciation expense	20,000	20,000
= After-tax operating CF	€29,750	29,750
+ Recover WC		10,000
+ Salvage value		5,000

	Years 1 & 2	Year 3
– Less taxes on sal. value @ 35%		1,750
= Terminal year CF		€43,000

The IRR of 20.29% is readily found with a financial calculator:

$$70,000 = \frac{29,750}{(1 + IRR)^1} + \frac{29,750}{(1 + IRR)^2} + \frac{43,000}{(1 + IRR)^3}$$

You can also “reverse-engineer” the answer using the choices given in the question.

- 42** A is correct. Projects with shorter paybacks do not necessarily have a positive NPV. For mutually exclusive projects, the NPV and IRR criteria will not necessarily provide the same project ranking.
- 43** B is correct. Additional depreciation in earlier time periods will shield Embelesado from additional taxes, thus increasing the net cash flows in earlier years of the project and increasing the project's NPV. However, this also means that there will be less depreciation expense in the terminal year of the project, thus shielding less income and increasing taxes. Terminal-year net cash flow will likely decrease.
- 44** A is correct. The entire €10 million will be subject to taxes, resulting in an additional €6.5 million after taxes. As indicated below, when discounted at 13 percent for three years, this has a present value of €4.5048 (rounded to €4.50 million):

$$PV = \frac{10.0(1 - 0.35)}{(1.13)^3} = \frac{6.50}{(1.13)^3} = 4.50$$

- 45** B is correct. Using equation $CF = (S - C) \times (1 - T) + TD$, the numbers are:

$$\begin{aligned} \text{Sales} &= P \times Q = €600 \times 3,000 = €1,800,000 \\ \text{Costs} &= \text{Variable cost} \times Q + \text{Fixed costs} = (125 \times 3,000) + €125,000 \\ &= 500,000 \\ \text{Depreciation expense} &= €2,750,000 \div 5 = €550,000 \\ CF &= (1,800,000 - 500,000) \times (1 - 0.40) + (550,000 \times 0.40) \\ &= 780,000 + 220,000 = €1,000,000 \end{aligned}$$

- 46** C is correct. The terminal year non-operating cash flow includes the after-tax salvage value and the recovery of net working capital = $€450,000 \times (1 - 0.40) + €75,000 = €345,000$.

$$\begin{aligned} &(\text{Note: Terminal year recovery of net working capital investment} \\ &= \text{Decrease in current assets} - \text{Decrease in current liabilities} = \\ &€200,000 - €125,000 = €75,000.) \end{aligned}$$

- 47** B is correct. Calculations: The outlay is higher by €250,000, which will increase annual depreciation by €50,000 over the 5-year period. The annual additional tax savings from the higher depreciation expense is: $50,000 \times (0.40) = 20,000$. Therefore NPV should decrease by:

$$NPV = -250,000 + \sum_{t=1}^5 \frac{20,000}{1.12^t} = -250,000 + 72,095.524 = -177,904$$

- 48** A is correct. Higher than expected inflation increases the corporation's real taxes because it reduces the value of the depreciation tax shelter; it also decreases the real interest expense because payments to bondholders in real terms are lower than expected.
- 49** B is correct. When a project is more or less risky than the company, project beta and not WACC should be used to establish the required rate of return for the capital project. In this case, the required rate of return is greater than the WACC, which means the project beta (risk) is greater than the company's beta.
- 50** B is correct. Timing options (e.g., delay investing) should be included in the NPV analysis, but sunk costs should not.

PRACTICE PROBLEMS

- 1 If investors have homogeneous expectations, the market is efficient, and there are no taxes, no transactions costs, and no bankruptcy costs, the Modigliani and Miller Proposition I states that:
 - A bankruptcy risk rises with more leverage.
 - B managers cannot change the value of the company by using more or less debt.
 - C managers cannot increase the value of the company by employing tax saving strategies.
- 2 According to Modigliani and Miller's Proposition II without taxes:
 - A the capital structure decision has no effect on the cost of equity.
 - B investment and the capital structure decisions are interdependent.
 - C the cost of equity increases as the use of debt in the capital structure increases.
- 3 Suppose the weighted average cost of capital of the Gadget Company is 10 percent. If Gadget has a capital structure of 50 percent debt and 50 percent equity, a before-tax cost of debt of 5 percent, and a marginal tax rate of 20 percent, then its cost of equity capital is *closest* to:
 - A 12 percent.
 - B 14 percent.
 - C 16 percent.
- 4 The current weighted average cost of capital (WACC) for Van der Welde is 10 percent. The company announced a debt offering that raises the WACC to 13 percent. The *most likely* conclusion is that for Van der Welde:
 - A the company's prospects are improving.
 - B equity financing is cheaper than debt financing.
 - C the company's debt/equity ratio has moved beyond the optimal range.
- 5 All else equal, the use of long-maturity debt is expected to be *greater* in those markets in which:
 - A inflation is low.
 - B capital markets are passive and illiquid.
 - C the legal system's protection of bondholders' interests is weak.
- 6 According to the pecking order theory:
 - A new debt is preferable to new equity.
 - B new debt is preferable to internally generated funds.
 - C new equity is always preferable to other sources of capital.
- 7 According to the static trade-off theory:
 - A debt should be used only as a last resort.
 - B companies have an optimal level of debt.
 - C the capital structure decision is irrelevant.

The following information relates to Questions 8–13

Barbara Andrade is an equity analyst who covers the entertainment industry for Greengable Capital Partners, a major global asset manager. Greengable owns a significant position with a large unrealized capital gain in Mosely Broadcast Group (MBG). On a recent conference call, MBG's management states that they plan to increase the proportion of debt in the company's capital structure. Andrade is concerned that any changes in MBG's capital structure will negatively affect the value of Greengable's investment.

To evaluate the potential impact of such a capital structure change on Greengable's investment, she gathers the information about MBG given in Exhibit 1.

Exhibit 1 Current Selected Financial Information for MBG

Yield to maturity on debt	8.00%
Market value of debt	\$100 million
Number of shares of common stock	10 million
Market price per share of common stock	\$30
Cost of capital if all equity-financed	10.3%
Marginal tax rate	35%

Andrade expects that an increase in MBG's financial leverage will increase its costs of debt and equity. Based on an examination of similar companies in MBG's industry, Andrade estimates MBG's cost of debt and cost of equity at various debt-to-total capital ratios, as shown in Exhibit 2.

Exhibit 2 Estimates of MBG's before Tax Costs of Debt and Equity

Debt-to-Total Capital Ratio (%)	Cost of Debt (%)	Cost of Equity (%)
20	7.7	12.5
30	8.4	13.0
40	9.3	14.0
50	10.4	16.0

- 8 MBG is *best described* as currently:
 - A 25% debt-financed and 75% equity-financed.
 - B 33% debt-financed and 66% equity-financed.
 - C 75% debt-financed and 25% equity-financed.
- 9 Based on Exhibit 1, the current after-tax cost of debt for MBG is *closest* to:
 - A 2.80%.
 - B 5.20%.
 - C 7.65%.
- 10 Based on Exhibit 1, MBG's current cost of equity capital is *closest* to:
 - A 10.30%.

- B 10.80%.
C 12.75%.
- 11 Based on Exhibits 1 and 2, what debt-to-total capital ratio would minimize MBG's weighted average cost of capital?
A 20%.
B 30%.
C 40%.
- 12 Holding operating earnings constant, an increase in the marginal tax rate to 40 percent would:
A result in a lower cost of debt capital.
B result in a higher cost of debt capital.
C not affect the company's cost of capital.
- 13 According to the pecking order theory, MBG's announced capital structure change:
A is optimal because debt is cheaper than equity on an after-tax basis.
B may be optimal if new debt is issued after new equity is made complete use of as a source of capital.
C may be optimal if new debt is issued after internally generated funds are made complete use of as a source of capital.

The following information relates to Questions 14–19

Lindsay White, CFA, is an analyst with a firm in London, England. She is responsible for covering five companies in the Consumer Staples industry. White believes the domestic and global economies will grow slightly below average over the next two years, but she is also concerned about the possibility of a mild recession taking hold. She has been asked to review the companies that she covers, and she has collected information about them, presented in Exhibit 1. White has estimated that earnings before interest and taxes (EBIT) will remain constant for all five companies for the foreseeable future. Currency is in terms of the British pound (£). The marginal corporate tax rate is 30% for all five companies.

Exhibit 1 Selected Company Financial Data

	Aquarius	Bema	Garth	Holte	Vega
EBIT (£)	600,000	600,000	400,000	400,000	400,000
Debt-to-equity ratio (market value)	0.60	0.00	0.00	0.71	0.62
Debt (market value) (£)	2,000,000	0	0	2,000,000	2,000,000
S&P debt rating	A+	n.a.	n.a.	A–	A
Weighted average cost of capital	—	10%	10%	—	—

Based on conversations with management of the five companies, as well as on her own independent research and analysis, White notes the following:

Aquarius:

- has lower bonding costs than does Bema.
- has a higher percentage of tangible assets to total assets than does Bema.
- has a higher degree of operating leverage than does Bema.

Garth:

- invests significantly less in research and development than does Holte.
- has a more highly developed corporate governance system than does Holte.
- has more business risk than does Holte.

In addition, White has reached various conclusions regarding announcements by Bema, Garth, and Vega:

Announcement	Bema has announced that it will issue debt and use the proceeds to repurchase shares. As a result of this debt-financed share repurchase program, Bema indicates that its debt/equity ratio will increase to 0.6 and its before-tax cost of debt will be 6%.
Conclusion	As a result of the announced program, Bema's total market value should decrease relative to Aquarius's.
Announcement	Garth has announced that it plans to abandon the prior policy of all-equity financing by the issuance of £1 million in debt in order to buy back an equivalent amount of equity. Garth's before-tax cost of debt is 6%.
Conclusion	This change in capital structure is reasonable, but Garth should take care subsequently to maintain a lower D/E ratio than Holte.
Announcement	Vega has announced that it intends to raise capital next year, but is unsure of the appropriate method of raising capital.
Conclusion	White has concluded that Vega should apply the pecking order theory to determine the appropriate method of raising capital.

- 14 Based on the Modigliani and Miller (MM) propositions with corporate taxes, Aquarius's WACC is *closest* to:
- A 3.38%.
 - B 7.87%.
 - C 11.25%.
- 15 Based on MM propositions with corporate taxes, what is Bema's weighted average cost of capital after the completion of its announced debt-financed share repurchase program?
- A 6.52%.
 - B 7.83%.
 - C 8.88%.
- 16 Based on Exhibit 1 and White's notes, which of the following is *least* consistent with White's conclusion regarding Bema's announcement?

- A Bema's bonding costs will be higher than Aquarius's.
 - B Bema will have a lower degree of operating leverage than does Aquarius.
 - C Bema will have a lower percentage of tangible assets to total assets than does Aquarius.
- 17 Based on the MM propositions with corporate taxes, Garth's cost of equity after the debt issuance is *closest* to:
- A 10.00%.
 - B 10.85%.
 - C 11.33%.
- 18 Based on Exhibit 1 and White's notes, which of the following is *most* consistent with White's conclusion regarding Garth's announcement?
- A Garth has more business risk than does Holte.
 - B Garth invests significantly less in research and development than does Holte.
 - C Garth has a more highly developed corporate governance system than does Holte.
- 19 Based on White's conclusion regarding determining the appropriate method of raising capital, Vega should raise capital in the following order:
- A debt, internal financing, equity.
 - B equity, debt, internal financing.
 - C internal financing, debt, equity.

SOLUTIONS

- 1 B is correct. Proposition I, or the capital structure irrelevance theorem, states that the level of debt versus equity in the capital structure has no effect on company value in perfect markets.
- 2 C is correct. The cost of equity rises with the use of debt in the capital structure, e.g., with increasing financial leverage.
- 3 C is correct. Using Equation 1 from the reading:

$$0.10 = (0.50)(0.05)(1 - 0.20) + (0.50)r_e$$

$$r_e = 0.16 \text{ or } 16 \text{ percent}$$

- 4 C is correct. If the company's WACC increases as a result of taking on additional debt, the company has moved beyond the optimal capital range. The costs of financial distress may outweigh any tax benefits to the use of debt.
- 5 A is correct. The use of long-maturity debt is expected to be inversely related to the level of inflation.
- 6 A is correct. According to the pecking order theory, internally generated funds are preferable to both new equity and new debt. If internal financing is insufficient, managers next prefer new debt, and finally new equity.
- 7 B is correct. The static trade-off theory indicates that there is a trade-off between the tax shield from interest on debt and the costs of financial distress, leading to an optimal amount of debt in a company's capital structure.
- 8 A is correct. The market value of equity is $(\$30)(10,000,000) = \$300,000,000$. With the market value of debt equal to $\$100,000,000$, the market value of the company is $\$100,000,000 + \$300,000,000 = \$400,000,000$. Therefore, the company is $\$100,000,000/\$400,000,000 = 0.25$ or 25% debt-financed.
- 9 B is correct.

$$r_d(1 - t) = 0.08(1 - 0.35) = 0.052 = 5.20\%$$

- 10 B is correct.

$$r_e = r_0 + (r_0 - r_d)(1 - t)\frac{D}{E}$$

$$= 0.103 + (0.103 - 0.08)(1 - 0.35)\left(\frac{\$100\text{million}}{\$300\text{million}}\right)$$

$$= 0.108 = 10.80\%$$

- 11 B is correct. Let $V = D + E$:

$$r_{wacc} = \left(\frac{D}{V}\right)r_d(1 - t) + \left(\frac{E}{V}\right)r_e$$

$$\text{At } D/V = 20\%, r_a = (0.2)(0.077)(1 - 0.35) + (0.8)(0.125) = 0.1100$$

$$= 11.00\%$$

$$\text{At } D/V = 30\%, r_a = (0.3)(0.084)(1 - 0.35) + (0.7)(0.130) = 0.1074$$

$$= 10.74\%$$

$$\text{At } D/V = 40\%, r_a = (0.4)(0.093)(1 - 0.35) + (0.6)(0.140) = 0.1082$$

$$= 10.82\%$$

$$\text{At } D/V = 50\%, r_a = (0.5)(0.104)(1 - 0.35) + (0.5)(0.160) = 0.1138$$

$$= 11.38\%$$

- 12 A is correct. The after-tax cost of debt decreases as the marginal tax rate increases.
- 13 C is correct. If internally generated funds have already been fully used, the use of new debt may be optimal, according to the pecking order theory of capital structure.

14 B is correct. $V_L = \frac{\text{EBIT}(1-t)}{r_{wacc}}$

Because $D/E = 0.60$ and $D = £2\text{m}$, then $E = £2\text{m}/(0.60) = £3,333,333$

So, Value of company (V_L) = $D + E = £2,000,000 + £3,333,333 = £5,333,333$

Because $V_L = \frac{\text{EBIT}(1-t)}{r_{wacc}} = \frac{(600,000)(1-0.30)}{r_{wacc}} = 5,333,333$

So, $r_{wacc} = \frac{(600,000)(1-0.30)}{5,333,333} = 0.0787 = 7.87\%$

15 C is correct. $r_e = r_0 + (r_0 - r_d)(1-t)\left(\frac{D}{E}\right)$, and $r_{wacc} = \left(\frac{D}{V}\right)r_d(1-t) + \left(\frac{E}{V}\right)r_e$

$$r_e = r_0 + (r_0 - r_d)(1-t)\left(\frac{D}{E}\right) = 10 + (10 - 6)(1 - 0.30)(0.60) \\ = 10 + 1.68 = 11.68\%$$

Therefore,

$$r_{wacc} = \left(\frac{D}{V}\right)r_d(1-t) + \left(\frac{E}{V}\right)r_e = \left(\frac{0.6}{1.6}\right)(6)(1 - 0.30) + \left(\frac{1.0}{1.6}\right)(11.68) \\ = 1.58 + 7.30 = 8.88\%$$

- 16 B is correct. If Bema's degree of operating leverage declines relative to that of Aquarius, Bema's business risk will also decline relative to Aquarius. All else being equal, this decline would be expected to *increase* Bema's market value relative to Aquarius; e.g., by decreasing Bema's cost of equity.
- 17 C is correct.

$$r_e = r_0 + (r_0 - r_d)(1-t)\left(\frac{D}{E}\right) \\ V_U = \frac{\text{EBIT}(1-t)}{r_0} = \frac{400,000(1-0.30)}{0.10} = 2,800,000 \\ V_L = V_U + tD = (2.8 \text{ million}) + (0.30)(1 \text{ million}) = 3.10 \text{ million} \\ E = V_L - D = (3.10 \text{ million}) - (1 \text{ million}) = 2.10 \text{ million} \\ r_e = r_0 + (r_0 - r_d)(1-t)\left(\frac{D}{E}\right) = 10 + (10 - 6)(1 - 0.30)\left(\frac{1}{2.10}\right) \\ = 10 + 1.33 = 11.33\%$$

- 18 A is correct. The statement implies that Garth possesses a lower ability to assume debt than does Holte, all else being equal.
- 19 C is correct. According to the pecking order theory, managers prefer internal financing. If internal financing is not sufficient, managers next prefer debt, and finally equity.

PRACTICE PROBLEMS

- 1 The payment of a 10% stock dividend by a company will result in an increase in that company's:
 - A current ratio.
 - B financial leverage.
 - C contributed capital.
- 2 If a company's common shares trade at very low prices, that company would be *most likely* to consider the use of a:
 - A stock split.
 - B stock dividend.
 - C reverse stock split.
- 3 In a recent presentation, Doug Pearce made two statements about dividends:

Statement 1 "A stock dividend will increase share price on the ex-dividend date, all other things being equal."

Statement 2 "One practical concern with a stock split is that it will reduce the company's price-to-earnings ratio."

Are Pearce's two statements about the effects of the stock dividend and stock split correct?

 - A No for both statements.
 - B Yes for Statement 1 and no for Statement 2.
 - C No for Statement 1 and yes for Statement 2.
- 4 All other things being equal, the payment of an internally financed cash dividend is *most likely* to result in:
 - A a lower current ratio.
 - B a higher current ratio.
 - C the same current ratio.
- 5 Match the phrases in Column A with the corresponding dividend theory in Column B. Note that you may use the answers in Column B more than once.

Column A	Column B
1. Bird in the hand	a) Dividend policy matters
2. Homemade dividends	b) Dividend policy is irrelevant
3. High tax rates on dividends	

- 6 Which of the following assumptions is *not* required for Miller and Modigliani's (MM) dividend theory?
 - A Shareholders have no transaction costs when buying and selling shares.
 - B There are no taxes.
 - C Investors sort themselves into dividend clienteles.
- 7 The clientele effect implies that:
 - A investors prefer high dividend paying shares.
 - B investors have varying preferences regarding dividends.
 - C low tax bracket investors are indifferent to dividends.

- 8 Sophie Chan owns 100,000 shares of PAT Company. PAT is selling for €40 per share, so Chan's investment is worth €4,000,000. Chan reinvests the gross amount of all dividends received to purchase additional shares. Assume that the clientele for PAT shares consists of tax-exempt investors. If PAT pays a €1.50 dividend, Chan's new share ownership after reinvesting dividends at the ex-dividend price is *most* likely to be closest to:
- A 103,600.
 - B 103,750.
 - C 103,900.
- 9 Which of the following is *most* likely to signal negative information concerning a company?
- A Share repurchase.
 - B Decrease in the quarterly dividend rate.
 - C A two-for-one stock split.
- 10 WL Corporation is located in a jurisdiction that has a 40% corporate tax rate on pretax income and a 30% personal tax rate on dividends. WL distributes all its after-tax income to shareholders. What is the effective tax rate on WL pretax income distributed in dividends?
- A 42%.
 - B 58%.
 - C 70%.
- 11 Which of the following factors is *least likely* to be associated with a company having a low dividend payout ratio?
- A High flotation costs on new equity issues.
 - B High tax rates on dividends.
 - C Low growth prospects.
- 12 The dividend policy of Berkshire Gardens Inc. can be represented by a gradual adjustment to a target dividend payout ratio. Last year Berkshire had earnings per share of US\$3.00 and paid a dividend of US\$0.60 a share. This year it estimates earnings per share will be US\$4.00. Find its dividend per share for this year if it has a 25% target payout ratio and uses a five-year period to adjust its dividend.
- A US\$0.68.
 - B US\$0.80.
 - C US\$0.85.
- 13 The Apex Corp. has a target capital structure of 40% debt and 60% equity. Its capital budget for next year is estimated to be US\$40 million. Estimated net income is US\$30 million. If Apex follows a residual dividend policy, its dividend is expected to be:
- A US\$6 million.
 - B US\$12 million.
 - C US\$18 million.
- 14 Beta Corporation is a manufacturer of inflatable furniture. Which of the following scenarios best reflects a stable dividend policy for Beta?
- A Maintaining a constant dividend payout ratio of 40–50%.
 - B Maintaining the dividend at US\$1.00 a share for several years given no change in Beta's long-term prospects.

- C Increasing the dividend 5% a year over several years to reflect the two years in which Beta recognized mark-to-market gains on derivative positions.
- 15 A company has 1 million shares outstanding and earnings are £2 million. The company decides to use £10 million in idle cash to repurchase shares in the open market. The company's shares are trading at £50 per share. If the company uses the entire £10 million of idle cash to repurchase shares at the market price, the company's earnings per share will be *closest* to:
- A £2.00.
B £2.30.
C £2.50.
- 16 Devon Ltd. common shares sell at US\$40 a share, and their estimated price-to-earnings ratio (P/E) is 32. If Devon borrows funds to repurchase shares at its after-tax cost of debt of 5%, its EPS is *most likely* to:
- A increase.
B decrease.
C remain the same.
- 17 A company can borrow funds at an after-tax cost of 4.5%. The company's stock price is US\$40 per share, earnings per share is US\$2.00, and the company has 15 million shares outstanding. If the company borrows just enough to repurchase 2 million shares of stock at the prevailing market price, that company's earnings per share is *most likely* to:
- A increase.
B decrease.
C remain the same.
- 18 Crozet Corporation plans to borrow just enough money to repurchase 100,000 shares. The following information relates to the share repurchase:
- | | |
|-----------------------------------|-------------|
| Shares outstanding before buyback | 3.1 million |
| Earnings per share before buyback | US\$4.00 |
| Share price at time of buyback | US\$50 |
| After-tax cost of borrowing | 6% |
- Crozet's earnings per share after the buyback will be *closest* to:
- A US\$4.03.
B US\$4.10.
C US\$4.23.
- 19 A company with 20 million shares outstanding decides to repurchase 2 million shares at the prevailing market price of €30 per share. At the time of the buyback, the company reports total assets of €850 million and total liabilities of €250 million. As a result of the buyback, that company's book value per share will *most likely*:
- A increase.
B decrease.
C remain the same.
- 20 An analyst gathered the following information about a company:

Number of shares outstanding	10 million
Earnings per share	US\$2.00
P/E	20
Book value per share	US\$30

If the company repurchases 1 million shares at the prevailing market price, the resulting book value per share will be *closest* to:

- A US\$26.
 - B US\$27.
 - C US\$29.
- 21 If a company's objective is to support its stock price in the event of a market downturn, it would be advised to authorize:
- A an open market share repurchase plan to be executed over the next five years.
 - B a tender offer share repurchase at a fixed price effective in 30 days.
 - C a Dutch auction tender offer effective in 30 days.
- 22 A company has positive free cash flow and is considering whether to use the entire amount of that free cash flow to pay a special cash dividend or to repurchase shares at the prevailing market price. Shareholders' wealth under the two options will be equivalent unless the:
- A company's book value per share is less than the prevailing market price.
 - B company's book value per share is greater than the prevailing market price.
 - C tax consequences and/or information content for each alternative is different.
- 23 Assume that a company is based in a country that has no taxes on dividends or capital gains. The company is considering either paying a special dividend or repurchasing its own shares. Shareholders of the company would have:
- A greater wealth if the company paid a special cash dividend.
 - B greater wealth if the company repurchased its shares.
 - C the same wealth under either a cash dividend or share repurchase program.
- 24 Investors may prefer companies that repurchase their shares instead of paying a cash dividend when:
- A capital gains are taxed at lower rates than dividends.
 - B capital gains are taxed at the same rate as dividends.
 - C the company needs more equity to finance capital expenditures.

The following information relates to Questions 25–27

Janet Wu is treasurer of Wilson Chemical Company, a manufacturer of specialty chemicals used in industrial manufacturing and increasingly in technology applications. Wilson Chemical is selling one of its older divisions for US\$70 million cash. Wu is considering whether to recommend a special dividend of US\$70 million or a repurchase of 2 million shares of Wilson common stock in the open market. She is reviewing some possible effects of the buyback with the company's financial analyst.

Wilson has a long-term record of gradually increasing earnings and dividends. Wilson's board has also approved capital spending of US\$15 million to be entirely funded out of this year's earnings.

Book value of equity	US\$750 million (US\$30 a share)
Shares outstanding	25 million
12-month trading range	US\$25–US\$35
Current share price	US\$35
After-tax cost of borrowing	7%
Estimated full year earnings	US\$25 million
Last year's dividends	US\$9 million
Target capital structure (market value)	35% debt, 65% equity

- 25 Wilson's share buyback could be a signal that the company:
- A is decreasing its financial leverage.
 - B views its shares as undervalued in the marketplace.
 - C has more investment opportunities than it could fund internally.
- 26 Assume that Wilson Chemical funds its capital spending out of its estimated full year earnings. If Wilson uses a residual dividend policy, determine Wilson's implied dividend payout ratio.
- A 36%.
 - B 40%.
 - C 60%.
- 27 The most likely tax environment in which Wilson Chemical's shareholders would prefer that Wilson repurchase its shares (share buybacks) instead of paying dividends is one in which:
- A the tax rate on capital gains and dividends is the same.
 - B capital gains tax rates are higher than dividend income tax rates.
 - C capital gains tax rates are lower than dividend income tax rates.

The following information relates to questions 28–33

John Ladan is an analyst in the research department of an international securities firm. Ladan is currently analyzing Yeta Products, a publicly traded global consumer goods company located in the United States. Selected data for Yeta are presented in Exhibit 1.

Exhibit 1 Selected Financial Data for Yeta Products

Most Recent Fiscal Year		Current	
Pretax income	\$280 million	Shares outstanding	100 million
Net income after tax	\$182 million	Book value per share	\$25.60
Cash flow from operations	\$235 million	Share price	\$20.00

(continued)

Exhibit 1 (Continued)

Most Recent Fiscal Year	Current
Capital expenditures	\$175 million
Earnings per share	\$1.82

Yeta currently does not pay a dividend, and the company operates with a target capital structure of 40% debt and 60% equity. However, on a recent conference call, Yeta's management indicated that they are considering four payout proposals:

Proposal #1: Issue a 10% stock dividend.

Proposal #2: Repurchase \$40 million in shares using idle cash.

Proposal #3: Repurchase \$40 million in shares by borrowing \$40 million at an after-tax cost of borrowing of 8.50%.

Proposal #4: Initiate a regular cash dividend based on a residual dividend policy.

- 28 The implementation of Proposal #1 would generally lead to shareholders:
- A having to pay tax on the dividend received.
 - B experiencing a decrease in the total cost basis of their shares.
 - C having the same proportionate ownership as before implementation.
- 29 If Yeta's management implemented Proposal #2 at the current share price shown in Exhibit 1, Yeta's book value per share after implementation would be *closest* to:
- A \$25.20.
 - B \$25.71.
 - C \$26.12.
- 30 Based on Exhibit 1, if Yeta's management implemented Proposal #3 at the current share price, earnings per share would:
- A decrease.
 - B remain unchanged.
 - C increase.
- 31 Based on Exhibit 1 and Yeta's target capital structure, the total dividend that Yeta would have paid last year under a residual dividend policy is *closest* to:
- A \$77 million.
 - B \$112 million.
 - C \$175 million.
- 32 Based on Yeta's target capital structure, Proposal #4 will *most likely*:
- A increase the default risk of Yeta's debt.
 - B increase the agency conflict between Yeta's shareholders and managers.
 - C decrease the agency conflict between Yeta's shareholders and bondholders.
- 33 The implementation of Proposal #4 would *most likely* signal to Ladan and other investors that future earnings growth can be expected to:
- A decrease.
 - B remain unchanged.
 - C increase.

SOLUTIONS

- 1 C is correct. A stock dividend is accounted for as a transfer of retained earnings to contributed capital.
- 2 C is correct. A reverse stock split would increase the price per share of the stock to a higher, more marketable range that could possibly increase the number of investors who would consider buying the stock.
- 3 A is correct. Both statements are incorrect. A stock dividend will decrease the price per share, all other things being equal. A stock split will reduce the price and earnings per share proportionately, leaving the price-to-earnings ratio the same.
- 4 A is correct. By reducing corporate cash, a cash dividend reduces the current ratio, whereas a stock dividend (whatever the size) has no effect on the current ratio.
- 5 The appropriate matches are as follows:

Column A	Column B
1. Bird in the hand	a) Dividend policy matters
2. Homemade dividends	b) Dividend policy is irrelevant
3. High tax rates on dividends	a) Dividend policy matters

- 6 C is correct. The MM dividend theory assumes no taxes or transaction costs, but it does not assume a clientele effect.
- 7 B is correct. The clientele effect implies that there are varying preferences for dividends among distinct investor groups.
- 8 C is correct. Because the clientele for PAT investors has the same tax rate (zero) for dividends and capital gains, the ex-dividend stock price of PAT should decline by the amount of the dividend to $€40 - €1.50 = €38.50$. Chan will purchase $€150,000/€38.50 = 3,896$ additional shares. This increases her total shares owned to 103,896. Chan's new share ownership is closest to 103,900.
- 9 B is correct. A decrease in the quarterly dividend rate is likely to signal negative information. A decrease is typically understood as signaling poor future business prospects.
- 10 B is correct. The effective tax rate can be computed as 1 minus the fraction of 1 unit of earnings that investors retain after all taxes, or $1 - (1 - 0.40)(1 - 0.30) = 0.58$ or 58% effective tax rate. Another way to obtain the solution: Corporate taxes = $1.00 \times 0.40 = 0.40$ and Personal taxes = $0.60 \text{ in dividends} \times 0.30 = 0.18$, so Total tax = $0.40 + 0.18 = 0.58$, a 58% effective rate.
- 11 C is correct. With low growth prospects, a company would typically have a high payout ratio, returning funds to its shareholders rather than retaining funds.
- 12 A is correct. The estimated dividend per share is US\$0.68.

Previous DPS = US\$0.60

Expected EPS = US\$4

Target payout ratio = 0.25

Five-year adjustment factor = $1/5 = 0.2$

$$\begin{aligned}
 \text{Expected dividend} &= \text{Previous dividend} + (\text{Expected earnings} \\
 &\quad \times \text{Target payout ratio} - \text{Previous dividend}) \times \\
 &\quad \text{Adjustment factor} \\
 &= \$0.60 + [(\$4.00 \times 0.25 - \$0.60) \times 0.2] \\
 &= \$0.60 + \$0.08 \\
 &= \$0.68
 \end{aligned}$$

- 13** A is correct. Using the residual dividend policy, with a target capital structure of 40% debt and 60% equity, 60% or US\$24 million of the US\$40 million in capital expenditures will be financed with equity; US\$30 million net income – US\$24 million retained earnings = US\$6 million for dividends.
- 14** B is correct. Choice A is consistent with a target payout ratio policy. Choice C is not correct because the earnings increases described are not sustainable long term.
- 15** C is correct. At the current market price, the company can repurchase 200,000 shares ($\text{£}10 \text{ million} / \text{£}50 = 200,000 \text{ shares}$). The company would have 800,000 shares outstanding after the repurchase (1 million shares – 200,000 shares = 800,000 shares).
- EPS before the buyback is $\text{£}2.00$ ($\text{£}2 \text{ million} / 1 \text{ million shares} = \text{£}2.00$). Total earnings after the buyback are the same because the company uses idle (nonearning) cash to purchase the shares, but the number of shares outstanding is reduced to 800,000. EPS increases to $\text{£}2.50$ ($\text{£}2 \text{ million} / 800,000 \text{ shares} = \text{£}2.50$).
- 16** B is correct. If the P/E is 32, the earnings-to-price ratio (earnings yield or E/P) is $1/32 = 3.125\%$. When the cost of capital is greater than the earnings yield, earnings dilution will result from the buyback.
- 17** A is correct. The company's earnings yield (E/P) is $\text{US}\$2/\text{US}\$40 = 0.05$. When the earnings yield is greater than the after-tax cost of borrowed funds, EPS will increase if shares are repurchased using borrowed funds.
- 18** A is correct.

Total earnings before buyback: $\text{US}\$4.00 \times 3,100,000 \text{ shares} = \text{US}\$12,400,000$

Total amount of borrowing: $\text{US}\$50 \times 100,000 \text{ shares} = \text{US}\$5,000,000$

After-tax cost of borrowing the amount of funds needed: $\text{US}\$5,000,000 \times 0.06 = \text{US}\$300,000$

Number of shares outstanding after buyback: $3,100,000 - 100,000 = 3,000,000$

EPS after buyback: $(\text{US}\$12,400,000 - \text{US}\$300,000) / 3,000,000 \text{ shares} = \text{US}\4.03

The P/E before the buyback is $\text{US}\$50/\text{US}\$4 = 12.5$; thus, the E/P is 8%. The after-tax cost of debt is 6%; therefore, EPS will increase.

- 19** C is correct. The company's book value before the buyback is €850 million in assets – €250 million in liabilities = €600 million. Book value per share is $\text{€}600 \text{ million} / 20 \text{ million} = \text{€}30 \text{ per share}$. The buyback will reduce equity by 2 million shares at the prevailing market price of €30 per share. The book value of equity will be reduced to €600 million – €60 million = €540 million, and the number of shares will be reduced to 18 million; $\text{€}540 \text{ million} / 18 \text{ million} = \text{€}30$ book value per share. If the prevailing market price is equal to the book value per share at the time of the buyback, book value per share is unchanged.

- 20 C is correct. The prevailing market price is $\text{US\$}2.00(20) = \text{US\$}40.00$ per share; thus, the buyback would reduce equity by $\text{US\$}40$ million. Book value of equity before the buyback is $\text{US\$}300$ million. Book value of equity after the buyback would be $\text{US\$}300 \text{ million} - \text{US\$}40 \text{ million} = \text{US\$}260 \text{ million}$. The number of shares outstanding after the buyback would be 9 million. Thus, book value per share after the buyback would be $\text{US\$}260 \text{ million} / 9 \text{ million} = \text{US\$}28.89 \approx \text{US\$}29$.
- 21 A is correct. Of the three methods, only an authorized open market share repurchase plan allows the company the flexibility to time share repurchases to coincide with share price declines.
- 22 C is correct. For the two options to be equivalent with respect to shareholders' wealth, the amount of cash distributed, the taxation, and the information content must be the same for both options.
- 23 C is correct. When there are no taxes, there are no tax differences between dividends and capital gains. All other things being equal, the effect on shareholder wealth of a dividend and a share repurchase should be the same.
- 24 A is correct. When capital gains are taxed at lower rates than dividends, investors may prefer companies that return cash to shareholders through share repurchases rather than dividends.
- 25 B is correct. Management sometimes undertakes share repurchases when it views shares as being undervalued in the marketplace.
- 26 B is correct. Earnings available for dividends = Earnings – Capital spending = $\text{US\$}25 \text{ million} - \text{US\$}15 \text{ million} = \text{US\$}10 \text{ million}$; $\text{US\$}10 \text{ million} / \text{US\$}25 \text{ million} = 40\%$ dividend payout ratio.
- 27 C is correct. Shareholders would prefer that the company repurchase its shares instead of paying dividends when the tax rate on capital gains is lower than the tax rate on dividends.
- 28 C is correct. The implementation of Proposal #1, a stock dividend, would not affect a shareholder's proportionate ownership because all shareholders would receive the same proportionate increase in shares. Stock dividends, which are generally not taxable to shareholders, do not impact an investor's total cost basis (they merely reduce the cost basis per share).
- A is incorrect because stock dividends are generally not taxable to shareholders. A stock dividend merely divides the "pie" (the market value of shareholders' equity) into smaller pieces.
- B is incorrect because an investor's total cost basis will not be affected by a stock dividend; a stock dividend merely reduces the cost basis per share.
- 29 B is correct. If Yeta implemented Proposal #2, a repurchase of $\$40$ million in shares, the resulting book value per share (BVPS) would be $\$25.71$, calculated as follows:
- 1 Yeta has a current BVPS of $\$25.60$; therefore, total book value of equity is $\$2,560 \text{ million} (= \$25.60 \times 100,000,000 \text{ shares})$.
 - 2 The number of shares Yeta would repurchase is $\$40 \text{ million} / \$20.00 \text{ per share} = 2 \text{ million shares}$.
 - 3 Yeta shareholders' book value of equity after the buyback would be $\$2,520 \text{ million} (= \$2,560 \text{ million} - \$40 \text{ million})$.
 - 4 The number of shares after the buyback would be $98 \text{ million} (= 100 \text{ million} - 2 \text{ million})$.
 - 5 The BVPS after the buyback would be $\$2,520 \text{ million} / 98 \text{ million} = \25.71 .

A is incorrect because \$25.20 incorrectly uses 100 million shares instead of 98 million shares in calculating BVPS after the buyback: $\$2,520 \text{ million} / 100 \text{ million} = \25.20 .

C is incorrect because \$26.12 incorrectly uses \$2,560 million (current book value) instead of \$2,520 million as the book value of equity in calculating BVPS after the buyback. The BVPS after the buyback is incorrectly calculated as $\$2,560 \text{ million} / 98 \text{ million} = \26.12 .

- 30** C is correct. In the case of external funding, a company's earnings per share will increase if the stock's earnings yield, which is the ratio of earnings per share to share price, exceeds the after-tax cost of borrowing. Yeta's earnings yield is 9.10% ($= \$1.82 / \20.00), which exceeds the after-tax cost of borrowing of 8.50%.

A is incorrect because EPS will increase (not decrease) if the stock's earnings yield ($= \$1.82 / \20.00) exceeds the after-tax cost of borrowing. Yeta's earnings yield of 9.10% exceeds the after-tax cost of borrowing of 8.50%.

B is incorrect because EPS will increase (not remain unchanged) if the stock's earnings yield ($= \$1.82 / \20.00) exceeds the after-tax cost of borrowing. Yeta's earnings yield of 9.10% exceeds the after-tax cost of borrowing of 8.50%.

- 31** A is correct. The dividend under a residual dividend policy would be \$77 million, calculated as follows:

	\$ Millions
Net income after tax (earnings)	\$182
Capital spending	\$175
Financing from new debt ($0.4 \times \$175$)	\$70
Financing from retained earnings ($0.6 \times \$175$)	\$105

B is incorrect because \$112 million incorrectly subtracts financing from new debt rather than financing from retained earnings in the calculation of dividend paid:

	\$ Millions
Net income after tax (earnings)	\$182
Capital spending	\$175
Financing from new debt ($0.4 \times \$175$)	\$70
Financing from retained earnings ($0.6 \times \$175$)	\$105
Residual earnings = dividend paid ($\$182 - \70)	\$112

C is incorrect because \$175 million incorrectly uses net income before taxes rather than net income after taxes (earnings) in the calculation:

	\$ Millions
Net income before taxes	\$280
Capital spending	\$175
Financing from new debt ($0.4 \times \$175$)	\$70
Financing from retained earnings ($0.6 \times \$175$)	\$105
Residual earnings = dividend paid ($\$280 - \105)	\$175

- 32** A is correct. Yeta is financed by both debt and equity; therefore, paying dividends can increase the agency conflict between shareholders and bondholders. The payment of dividends reduces the cash cushion available for the disbursement of fixed required payments to bondholders. All else equal, dividends increase the default risk of debt.
- B is incorrect because the agency conflict between shareholders and managers would decrease (not increase) with the payment of dividends. Paying out free cash flow to equity in dividends would constrain managers in their ability to overinvest by taking on negative net present value (NPV) projects.
- C is incorrect because paying dividends can increase (not decrease) the agency conflict between shareholders and bondholders. The payment of dividends would reduce the cash cushion available to Yeta for the disbursement of fixed required payments to bondholders. The payment of dividends transfers wealth from bondholders to shareholders and increases the default risk of debt.
- 33** C is correct. Dividend initiations convey positive information and are associated with future earnings growth, whereas dividend omissions or reductions convey negative information and are associated with future earnings problems.
- A is incorrect because dividend initiations convey positive information and are associated with an expected increase (not a decrease) in future earnings growth. Dividend omissions or reductions convey negative information and are associated with future earnings problems.
- B is incorrect because dividend initiations convey positive information and are associated with an expectation that future earnings growth will increase (not remain unchanged). In contrast, dividend omissions or reductions convey negative information and are associated with future earnings problems.

PRACTICE PROBLEMS

The following information relates to Questions 1 and 2

Liz Kite is a research analyst for a global equity investment firm. She is conducting research on two publicly traded companies, Company A and Company B.

Company A has a large number of shareholders, with no single investor owning more than 5% of the outstanding shares. Company B is managed by a family who owns 60% of the outstanding shares. Both companies offer a single share class with equivalent voting rights.

- 1 **Determine** the relative level of risk (high or low) of principal–agent problems being present at each company. **Justify** your response.
- 2 **Discuss** drawbacks *most likely* associated with the ownership structure of Company B.

- 3 Clayton Streett is a consultant specializing in corporate governance issues. His current assignment is to evaluate the effectiveness of the board of Jess-Kait Worldwide. Streett seeks to determine if aspects of the company's corporate governance warrant a higher than average risk premium for the company's shares.

Jess-Kait Worldwide has a one-tier board structure, with the CEO serving as the chair of the board. Of the 20 board members, 8 are executive and 12 are non-executive (i.e., independent). The executive members primarily serve on the compliance and investment committees, while the non-executive members primarily serve on the audit, compensation, and board selection committees. The executive board members have all served on the board for more than 20 years, while the non-executive members' average tenure is only 5 years.

Determine which board considerations would *most likely* warrant a higher than average risk premium for the shares of Jess-Kait Worldwide. **Justify** each response.

- i. Structure
- ii. Independence
- iii. Committees
- iv. Composition

Determine which board considerations would *most likely* warrant a higher than average risk premium for the shares of Jess-Kait Worldwide. Justify each response.

Board Consideration	Higher Risk Premium?	Justification
i) Structure	Yes	
	No	

Determine which board considerations would *most likely* warrant a higher than average risk premium for the shares of Jess-Kait Worldwide. Justify each response.

Board Consideration	Higher Risk Premium?	Justification
ii) Independence	Yes	
	No	
iii) Committees	Yes	
	No	
iv) Composition	Yes	
	No	

The following information relates to Questions 4 and 5

Chambers Carlisle was recently hired as an analyst for a fixed-income fund with a short-term investment horizon. Carlisle focuses on bonds in the materials sector and incorporates environmental, social, and governance (ESG) factors into his analysis. His previous employer was a buy-and-hold equity fund, where Carlisle included ESG factors in his analysis of equities in the materials sector.

- 4 Discuss** how Carlisle's ESG analysis in his new position *most likely* differs from that in his previous position.

Carlisle identifies the ESG risk factors that are relevant to companies in the materials sector. He conducts his research by reviewing public documents, such as company annual reports, regulatory filings, and proxy reports.

- 5 Discuss** the challenges *most likely* associated with Carlisle's research approach.
-

The following information relates to Questions 6 and 7

Dalanta Transportation operates a rail transportation business in the Southwest United States. Competition in the region for rail transport has intensified in the last few years, resulting in decreasing profit margins. Dalanta has received multiple warnings from state and federal regulators and faces potential fines for violating clean air regulations due to excessive greenhouse gas emissions (GHG) by the company's aging fleet of trains. As a result, the company has been the target of highly publicized criticism from environmental activist groups.

- 6 Discuss** the potential effects of environmental, social, and governance (ESG) factors on Dalanta's financial performance.

Dalanta's CEO hires a consultant to help the company address the ESG issues. The CEO had planned to issue a conventional bond to finance the replacement of the oldest half of the fleet of trains, but the consultant recommends that Dalanta issue a green bond to finance the purchase of new trains.

- 7 **Discuss** *one* advantage and *one* disadvantage to Dalanta if the company follows the consultant's financing recommendation.
-

SOLUTIONS

1 Risk of principal–agent problems:

- Company A has dispersed ownership and dispersed voting power. This results in weak shareholders and strong managers, which suggests a high risk of principal–agent problems.
- Company B has concentrated ownership and concentrated voting power. This results in strong shareholders and weak managers, which suggests a low risk of principal–agent problems.

Company A has a large number of shareholders, with no single shareholder owning more than 5% of the outstanding shares. The combination of dispersed ownership and dispersed voting power is generally associated with shareholders who lack the power to exercise control over managers. These shareholders are referred to as weak shareholders, and such managers are referred to as strong managers. Under this combination, there is a high risk that managers will seek to utilize a company's resources to pursue their own interests rather than those of the shareholders. This conflict is known as a principal–agent problem.

Company B is managed by a family who owns a majority of the outstanding voting shares. One of the benefits of family control through concentrated ownership and management is a low risk of principal–agent problems. Family control can, however, lead to principal–principal problems as the rights of minority shareholders may receive only modest consideration.

2 Drawbacks of Company B's ownership structure include the following:

- Poor transparency
- Lack of management accountability
- Modest consideration for minority shareholder rights
- Difficulty in attracting quality talent for management positions

Company B is managed by a family who owns a majority of the outstanding voting shares. Drawbacks to family ownership may include poor transparency, lack of management accountability, modest consideration for minority shareholder rights, and difficulty in attracting quality talent for management positions.

3

Determine which board considerations would *most likely* warrant a higher than average risk premium for the shares of Jess-Kait Worldwide. Justify each response.

Board Consideration	Higher Risk Premium?	Justification
i) Structure	Yes	The structure of Jess-Kait's board is one-tier, with the CEO also serving as chair of the board. This CEO duality may raise concerns that the monitoring and oversight role of the board may be compromised. This negative attribute would likely warrant a higher than average risk premium.
	No	

(continued)

Determine which board considerations would *most likely* warrant a higher than average risk premium for the shares of Jess-Kait Worldwide. Justify each response.

Board Consideration	Higher Risk Premium?	Justification
ii) Independence	Yes	Jess-Kait's board is comprised of 20 members, 12 of whom are independent. Having a majority of the board members be independent is a positive attribute and likely would not warrant a higher than average risk premium.
	No	
iii) Committees	Yes	When evaluating a board's committees, Streett should assess whether the key governance committees, such as the audit, compensation, and board selection committees, are sufficiently independent. With the non-executive board members primarily serving on these three important committees, there appears to be sufficient independence. This positive attribute likely would not warrant a higher than average risk premium.
	No	
iv) Composition	Yes	The executive board members have all served on the board for at least 20 years, which is a long tenure for board members. Long-tenured board members could become controlling, self-serving, or resistant to the introduction of new practices or policies that may be beneficial to stakeholders. This situation is especially troubling due to the fact that the non-executive board members' average tenure is only 5 years. This negative attribute would likely warrant a higher than average risk premium.
	No	

- 4 The investment horizon for the fixed-income securities in his new position is short term in nature, while his prior position had a long-term investment horizon.

ESG integration in fixed-income analysis generally focuses on mitigating downside risks, while ESG integration in equity analysis also includes identifying potential opportunities.

When deciding what ESG factors to consider in their analysis, analysts must consider the investment horizon. Some ESG issues may affect a company's performance in the short term, while other issues may affect it more in the long term. An investor with a short-term investment horizon may find that longer-term issues have little impact on a security's valuation in the near term. Since Carlisle's new job focuses on short-term fixed income, he is likely more concerned with short-term ESG issues than long-term ESG issues. In his previous position, the buy-and-hold nature of the equity fund implies a long-term investment horizon, so Carlisle would likely have considered both short-term and long-term ESG issues.

Carlisle's current position is in fixed-income analysis, while his previous position was in equity analysis. From a risk/reward perspective, the use of ESG integration typically differs for equity and fixed-income analysis. In equity analysis,

ESG integration is used to both identify potential opportunities and mitigate downside risk, whereas in fixed-income analysis, ESG integration is generally focused only on mitigating downside risk.

5 Challenges:

- ESG information and metrics may be reported inconsistently by companies.
- ESG-related disclosures are voluntary for many companies, and the level of voluntary disclosure varies.

A primary challenge when integrating ESG factors into investment analysis is identifying and obtaining information that is relevant and useful. Carlisle's research approach involves reviewing public documents, such as company annual reports, regulatory filings, and proxy reports. A challenge he will face is that ESG information and metrics may be reported inconsistently by companies. Another challenge is that a number of ESG-related disclosures are voluntary for many companies, and the level of voluntary disclosure varies.

6 Potential effects:

- Increased costs to comply with regulatory requirements
- Potential fines for violating clean air regulations
- Damage to corporate reputation that could potentially decrease sales

Dalanta must address the clean air regulations. The costs to comply with these regulations could be significant, but the potential fines for failing to comply with these regulations could also be significant. These expenses would have a negative effect on Dalanta's financial performance. Finally, the company received highly publicized criticism from environmental activist groups. Such criticism could damage Dalanta's reputation and have a negative effect on sales, especially considering the increasingly competitive landscape for rail transport in the region.

7 Advantages and disadvantages:

Advantages:

- Green bonds can command a premium over comparable conventional bonds
- Lower cost of capital due to green bond premium

Disadvantages:

- Additional costs related to the monitoring and reporting of the use of the bond's proceeds
- Lack of liquidity of green bonds when purchased and held by buy-and-hold investors

Dalanta's financing of the new trains using green bonds may provide advantages compared to conventional bonds. Some green bonds can command a premium, or tighter credit spread, versus comparable conventional bonds due to market demand. This tighter credit spread could have a positive effect on Dalanta's cost of capital and valuation. However, issuing green bonds could result in Dalanta incurring additional costs related to the monitoring and reporting of the use of the bond's proceeds. In addition, liquidity risk is associated with green bonds that are purchased and held by buy-and-hold investors.

PRACTICE PROBLEMS

The following information relates to Questions 1–6

Modern Auto, an automobile parts supplier, has made an offer to acquire Sky Systems, creator of software for the airline industry. The offer is to pay Sky Systems' shareholders the current market value of their stock in Modern Auto's stock. The relevant information it used in those calculations is given below:

	Modern Auto	Sky Systems
Share price	\$40	\$25
Number of outstanding shares (millions)	40	15
Earnings (millions)	\$100	\$30

Although the total earnings of the combined company will not increase and are estimated to be \$130 million, Charles Wilhelm (treasurer of Modern Auto) argues that there are two attractive reasons to merge. First, Wilhelm says, "The merger of Modern Auto and Sky Systems will result in lower risk for our shareholders because of the diversification effect." Second, Wilhelm also says, "If our EPS increases, our stock price will increase in line with the EPS increase because our P/E will stay the same."

Sky Systems managers are not interested in the offer by Modern Auto. The managers, instead, approach HiFly, Inc., which is in the same industry as Sky Systems, to see if it would be interested in acquiring Sky Systems. HiFly is interested, and both companies believe there will be synergies from this acquisition. If HiFly were to acquire Sky Systems, it would do so by paying \$400 million in cash.

HiFly is somewhat concerned whether antitrust regulators would consider the acquisition of Sky Systems an antitrust violation. The market in which the two companies operate consists of eight competitors. The largest company has a 25 percent market share. HiFly has the second largest market share of 20 percent. Five companies, including Sky Systems, each have a market share of 10 percent. The smallest company has a 5 percent market share.

- The acquisition of Sky Systems by Modern Auto and the acquisition of Sky Systems by HiFly, respectively, would be examples of a:
 - vertical merger and a horizontal merger.
 - conglomerate merger and a vertical merger.
 - conglomerate merger and a horizontal merger.
- If Sky Systems were to be acquired by Modern Auto under the terms of the original offer, the post-merger EPS of the new company would be *closest* to:
 - \$2.00.
 - \$2.32.
 - \$2.63.
- Are Wilhelm's two statements about his shareholders benefiting from the diversification effect of the merger and about the increase in the stock price, respectively, correct?

	The Merger Will Result in Lower Risk for Shareholders	Stock Price Will Increase in Line with the EPS Increase
A	No	No
B	No	Yes
C	Yes	No

- 4 Which of the following defenses *best* describes the role of HiFly in the acquisition scenario?
- A** Crown jewel.
- B** Pac-Man®.
- C** White knight.
- 5 Suppose HiFly acquires Sky Systems for the stated terms. The gain to Sky Systems shareholders resulting from the merger transaction would be *closest* to:
- A** \$25 million.
- B** \$160 million.
- C** \$375 million.
- 6 If HiFly and Sky Systems attempt to merge, the increase in the Herfindahl–Hirschman Index (HHI) and the probable action by the Department of Justice and the FTC, respectively, in response to the merger announcement are:

	Increase in the HHI	Probable Response of Department of Justice and FTC
A	290	To challenge the merger
B	290	To investigate the merger
C	400	To challenge the merger

The following information relates to Questions 7–12

Kinetic Corporation is considering acquiring High Tech Systems. Jim Smith, the vice president of finance at Kinetic, has been assigned the task of estimating a fair acquisition price for High Tech. Smith is aware of several approaches that could be used for this purpose. He plans to estimate the acquisition price based on each of these approaches, and has collected or estimated the necessary financial data.

High Tech has 10 million shares of common stock outstanding and no debt. Smith has estimated that the post-merger free cash flows from High Tech, in millions of dollars, would be 15, 17, 20, and 23 at the end of the following four years. After Year 4, he projects the free cash flow to grow at a constant rate of 6.5 percent a year. He determines that the appropriate rate for discounting these estimated cash flows is 11 percent. He also estimates that after four years High Tech would be worth 23 times its free cash flow at the end of the fourth year.

Smith has determined that three companies—Alpha, Neutron, and Techno—are comparable to High Tech. He has also identified three recent takeover transactions—Quadrant, ProTech, and Automator—that are similar to the takeover of High Tech

under consideration. He believes that price-to-earnings, price-to-sales, and price-to-book value per share of these companies could be used to estimate the value of High Tech. The relevant data for the three comparable companies and for High Tech are as follows:

Valuation Variables	Alpha	Neutron	Techno	High Tech
Current stock price (\$)	44.00	23.00	51.00	31.00
Earnings/share (\$)	3.01	1.68	2.52	1.98
Sales/share (\$)	20.16	14.22	18.15	17.23
Book value/share (\$)	15.16	7.18	11.15	10.02

The relevant data for the three recently acquired companies are given below:

Valuation Variables	Quadrant	ProTech	Automator
Stock price pre-takeover (\$)	24.90	43.20	29.00
Acquisition stock price (\$)	28.00	52.00	34.50
Earnings/share (\$)	1.40	2.10	2.35
Sales/share (\$)	10.58	20.41	15.93
Book value/share (\$)	8.29	10.14	9.17

While discussing his analysis with a colleague, Smith makes two comments. Smith's first comment is: "If there were a pre-announcement run-up in Quadrant's price because of speculation, the takeover premium should be computed based on the price prior to the run-up." His second comment is: "Because the comparable transaction approach is based on the acquisition price, the takeover premium is implicitly recognized in this approach."

- 7 What is the present value per share of High Tech stock using the discounted cash flow approach if the terminal value of High Tech is based on using the constant growth model to determine terminal value?
 - A \$39.38.
 - B \$40.56.
 - C \$41.57.
- 8 What is the value per share of High Tech stock using the discounted cash flow approach if the terminal value of High Tech is based on using the cash flow multiple method to determine terminal value?
 - A \$35.22.
 - B \$40.56.
 - C \$41.57.
- 9 The average stock price of High Tech for the three relative valuation ratios (if it is traded at the mean of the three valuations) is *closest* to:
 - A \$35.21.
 - B \$39.38.
 - C \$40.56.
- 10 Taking into account the mean takeover premium on recent comparable takeovers, what would be the estimate of the fair acquisition price of High Tech based on the comparable company approach?
 - A \$35.22.
 - B \$40.83.
 - C \$41.29.

- 11 The fair acquisition price of High Tech using the comparable transaction approach is *closest* to:
- A \$35.22.
 - B \$40.86.
 - C \$41.31.
- 12 Are Smith's two comments about his analysis correct?
- A Both of his comments are correct.
 - B Both of his comments are incorrect.
 - C His first comment is correct, and his second comment is incorrect.

The following information relates to Questions 13–18 and is based on “Corporate Governance” and this reading

Mark Zin and Stella Lee are CEO and CFO, respectively, of Moonbase Corporation. They are concerned that Moonbase is undervalued and subject to a hostile takeover bid. To assess the value of their own firm, they are reviewing current financial data for Jupiter PLC, Saturn Corporation, and Voyager Corporation, three firms they believe are comparable to Moonbase.

Relative Valuation Ratio	Jupiter	Saturn	Voyager
P/E	23.00	19.50	21.50
P/B	4.24	5.25	4.91
P/CF	12.60	11.40	13.30

Zin believes Moonbase should trade at similar multiples to these firms and that each valuation ratio measure is equally valid. Moonbase has a current stock price of \$34.00 per share, earnings of \$1.75 per share, book value of \$8.50 per share, and cash flow of \$3.20 per share. Using the average of each of the three multiples for the three comparable firms, Zin finds that Moonbase is undervalued.

Lee states that the low valuation reflects current poor performance of a subsidiary of Moonbase. She recommends that the board of directors consider divesting the subsidiary in a manner that would provide cash inflow to Moonbase.

Zin proposes that some action should be taken before a hostile takeover bid is made. He asks Lee if changes can be made to the corporate governance structure in order to make it more difficult for an unwanted suitor to succeed.

In response, Lee makes two comments of actions that would make a hostile takeover more difficult. Lee's first comment is “Moonbase can institute a poison pill that allows our shareholders, other than the hostile bidder, to purchase shares at a substantial discount to current market value.” Lee's second comment is: “Moonbase can instead institute a poison put. The put allows shareholders the opportunity to redeem their shares at a substantial premium to current market value.”

Zin is also concerned about the general attitude of outside investors with the governance of Moonbase. He has read brokerage reports indicating that the Moonbase governance ratings are generally low. Zin believes the following statements describe characteristics that should provide Moonbase with a strong governance rating.

- Statement 1 Moonbase's directors obtain advice from the corporate counsel to aid them in assessing the firm's compliance with regulatory requirements.
- Statement 2 Five of the ten members of the board of directors are not employed by Moonbase and are considered independent. Though not employed by the company, two of the independent directors are former executives of the company and thus can contribute useful expertise relevant for the business.
- Statement 3 The audit committee of the board is organized so as to have sufficient resources to carry out its task, with an internal staff that reports routinely and directly to the audit committee.

Zin is particularly proud of the fact that Moonbase has begun drafting a "Statement of Corporate Governance" (SCG) that would be available on the company website for viewing by shareholders, investment analysts, and any interested stakeholders. In particular, the SCG pays special attention to policies that ensure effective contributions from the board of directors. These policies include:

- Policy 1 Training is provided to directors prior to joining the board and periodically thereafter.
- Policy 2 Statements are provided of management's assessment of the board's performance of its fiduciary responsibilities.
- Policy 3 Statements are provided of directors' responsibilities regarding oversight and monitoring of the firm's risk management and compliance functions.

Zin concludes the discussion by announcing that Johann Steris, a highly regarded ex-CFO of a major corporation, is under consideration as a member of an expanded board of directors. Zin states that Steris meets all the requirements as an independent director including the fact that he will not violate the interlocking directorship requirement. Steris also will bring experience as a member of the compensation committee of the board of another firm. He also comments that Steris desires to serve on either the audit or compensation committee of the Moonbase board and that good governance practice suggests that Steris would not be prohibited from serving on either committee.

- 13 The value the CEO estimated based on comparable company analysis is *closest* to:
- A \$37.33.
 - B \$39.30.
 - C \$40.80.
- 14 The divestiture technique that Lee is recommending is *most likely*:
- A a spin-off.
 - B a split-off.
 - C an equity carve-out.
- 15 With regard to poison pills and puts, Lee's comments are:
- A correct.
 - B incorrect with regard to the poison put.
 - C incorrect with regard to the poison pill.
- 16 Which statement by Zin provides the *most* support for a strong governance rating?
- A Statement 1.
 - B Statement 2.

- C Statement 3.
- 17 Which policy of the Statement of Corporate Governance is *least likely* to ensure effective contributions from the board of directors?
- A Policy 1.
- B Policy 2.
- C Policy 3.
- 18 Is Zin's comment that good governance practice does not preclude Steris from serving on either of the two committees of the Moonbase board correct?
- A Yes.
- B No, good governance practice precludes Steris from serving on the audit committee.
- C No, good governance practice precludes Steris from serving on the compensation committee.

The following information relates to Questions 19–24

Josh Logan is a buy-side equity analyst who follows Durtech. Logan's supervisor believes that Durtech is a likely takeover candidate and has asked Logan to estimate the company's value per share in the event of an "all stock" takeover bid. Logan plans to estimate Durtech's value per share using three approaches: discounted cash flow, comparable company analysis, and comparable transaction analysis.

Durtech has 1.2 million common shares outstanding and no outstanding long-term debt or preferred stock. Logan estimates that Durtech's free cash flows at the end of the next three years will be \$5.0 million, \$6.0 million, and \$7.0 million, respectively. After Year 3, he projects that free cash flow will grow at 5 percent per year. He determines the appropriate discount rate for this free cash flow stream is 15 percent per year.

Applying discounted cash flow analysis to the information above, Logan determines that Durtech's fair enterprise value is \$61.8 million. In a separate analysis based on ratios, Logan estimates that at the end of the third year, Durtech will be worth ten times its Year 3 free cash flow.

Logan's supervisor is troubled by the sensitivity of his enterprise value calculation to the terminal growth rate assumption. She asks Logan:

"What is the percentage change in your fair enterprise value of \$61.8 million if you use a terminal growth rate of zero percent rather than 5 percent?"

Logan gathers data on two companies comparable to Durtech: Alphatech and Betatech. He believes that price-to-earnings, price-to-sales, and price-to-book-value per share of these companies should be used to value Durtech. The relevant data for the three companies are given in Exhibit 1.

Exhibit 1 Valuation Variables for Durtech and Comparable Companies

Valuation Variables	Alphatech	Betatech	Durtech
Current stock price (\$)	72.00	45.00	24.00
Earnings per share (\$)	2.00	1.50	1.00

Exhibit 1 (Continued)

Valuation Variables	Alphatech	Betatech	Durtech
Sales per share (\$)	32.00	22.50	16.00
Book value per share (\$)	18.00	10.00	8.00

Logan also identifies one recent takeover transaction and analyzes its takeover premium (the amount by which its takeover price per share exceeds its current stock price). Omegatech is comparable to the possible transaction on Durtech. Omegatech had a stock price of \$44.40 per share prior to a newspaper report of a takeover rumor. After the takeover rumor was reported, the price rose immediately to \$60.30 per share. Eventually, the takeover offer was accepted by Omegatech's shareholders for \$55.00 per share. One-year trailing earnings per share for Omegatech immediately prior to the takeover were \$1.25 per share.

In order to evaluate the risk of government antitrust action, Logan computes the Herfindahl–Hirschman Index (HHI) for the industry group that includes Durtech. He computes the pre-merger value of the HHI to be 1400. As shown in Exhibit 2, Logan also computes the post-merger industry HHI assuming three possible merger scenarios with Durtech.

Exhibit 2 Post-Merger Industry HHI (Assuming Merger with Durtech)

Durtech Merger Partner	Post-Merger Industry HHI
Alphatech	1500
Betatech	1510
Gammatech	1520

Based upon this analysis, Logan concludes that the industry is moderately concentrated and that a merger of Durtech (with any of the companies listed in Exhibit 2) will face a possible government challenge.

- 19 Using the discounted cash flow approach and assuming that Durtech's terminal value is based upon the cash flow multiple method, Logan's best estimate of Durtech's current value per share is *closest* to:
- A \$49.60.
 - B \$51.50.
 - C \$53.51.
- 20 Logan's best response to the supervisor's question concerning the sensitivity of the enterprise value to the terminal growth rate assumption, is *closest* to:
- A -36.5%.
 - B -28.5%.
 - C -24.8%.
- 21 Based on Exhibit 1 and the mean of each of the valuation ratios, Logan's estimate of Durtech's value per share should be *closest* to:
- A \$30.44.
 - B \$33.67.

- C** \$34.67.
- 22** Based upon the premium on a recent comparable transaction, Logan's best estimate of the takeover premium for Durtech is *closest* to:
- A** 19.9%.
 - B** 23.9%.
 - C** 35.8%.
- 23** Using comparable transaction analysis, Logan's estimate of the fair acquisition value per share for Durtech is *closest* to:
- A** \$35.52.
 - B** \$42.59.
 - C** \$44.00.
- 24** The best justification for Logan's conclusion concerning possible government antitrust action is that:
- A** the post- and pre-merger HHI are both between 1000 and 1800.
 - B** the change in the HHI is 100 or more and the post-merger HHI is between 1000 and 1800.
 - C** the change in the HHI is 100 or more and the pre-merger HHI is between 1000 and 1800.
-

SOLUTIONS

1 C is correct. These are conglomerate and horizontal mergers, respectively.

2 C is correct. EPS is \$2.63.

Because Modern Auto's stock price is \$40 and Sky Systems' stock price is \$25, Modern Auto will acquire Sky Systems by exchanging 1 of its shares for $40/25 = 1.60$ shares of Sky Systems. There are 15 million shares of Sky Systems. Their acquisition will take $15/1.60 = 9.375$ million shares of Modern Auto. The total number of shares after the merger = 49.375 million. The EPS after the merger = $130/49.375 = \$2.63$.

3 A is correct. Both of the statements by Wilhelm are wrong.

The first statement is wrong because diversification by itself does not lower risk for shareholders. Investors can diversify very cheaply on their own by purchasing stocks of different companies (for example, a Modern Auto shareholder could purchase stocks of Sky Systems).

The second statement is also wrong. The P/E ratio will not necessarily remain the same following the merger and is more likely to decline. The pre-merger P/E for Modern Auto is $40/2.50 = 16$. After the merger, the EPS would be \$130 million/49.375 million shares, or 2.6329. The post-merger P/E will probably fall to $40/2.6329 = 15.19$.

4 C is correct. HiFly is a white knight.

5 A is correct.

$$\text{Target shareholders' gain} = \text{Premium} = P_T - V_T$$

P_T = Price paid for the target company = \$400 million as provided in the vignette

V_T = Pre-merger value of the target = \$25 share price \times 15 million shares = \$375 million

$$\$400 \text{ million} - \$375 \text{ million} = \$25 \text{ million}$$

6 C is correct. The pre- and post-merger HHI measures are 1,550 and 1,950, respectively. Not only is the HHI increasing by 400 points, but the industry concentration level also moves from moderately to highly concentrated. The probable action by the regulatory authorities is thus a challenge.

Pre-Merger			Post-Merger		
Company	Market Share (%)	Market Share Squared	Company	Market Share (%)	Market Share Squared
1	25	625	1	25	625
2 (HiFly)	20	400	2 & 3	30	900
3 (Sky)	10	100	4	10	100
4	10	100	5	10	100
5	10	100	6	10	100
6	10	100	7	10	100
7	10	100	8	5	25
8	5	25			
HHI =		1,550	HHI =		1,950

- 7 C is correct. The estimated stock value is \$41.57.

The value of High Tech = Total PV (present value) of free cash flows during the first four years + PV of the terminal value of High Tech at the end of the fourth year using the constant growth model.

Total PV of free cash flows during the first four years = $15/1.11 + 17/1.11^2 + 20/1.11^3 + 23/1.11^4 = \57.09 million.

Based on the constant growth model, the terminal value (TV) of High Tech at the end of the fourth year is $TV = FCF \text{ at the end of the fifth year} / (k - g) = (23 \times 1.065) / (0.11 - 0.065) = \544.33 million.

PV of the terminal value = $544.33/1.11^4 = \$358.57$ million.

Estimated value of High Tech = $57.09 + 358.57 = \$415.66$ million.

Estimated stock price = $415.66 \text{ million} / 10 \text{ million shares} = \41.57 .

- 8 B is correct. The estimated stock price is \$40.56.

Total PV of free cash flows during the first four years = $15/1.11 + 17/1.11^2 + 20/1.11^3 + 23/1.11^4 = \57.09 million.

Based on the cash flow multiple method, the terminal value of High Tech four years later = $23 \times 23 = \$529$ million.

PV of the terminal value = $529/1.11^4 = \$348.47$ million.

Estimated value of High Tech = Total PV of free cash flows during the first four years + PV of the terminal value at the end of the fourth year = $57.09 + 348.47 = \$405.55$ million.

Estimated stock price = $405.55 \text{ million} / 10 \text{ million shares} = \40.56 .

- 9 A is correct. The estimated value is \$35.21.

First, calculate the relative valuation ratios for the three comparable companies and their means.

Relative Valuation Ratio	Alpha	Neutron	Techno	Mean
P/E	14.62	13.69	20.24	16.18
P/S	2.18	1.62	2.81	2.20
P/BV	2.90	3.20	4.57	3.56

Then apply the means to the valuation variables for High Tech to get the estimated stock price for High Tech based on the comparable companies.

Valuation Variables	High Tech	Mean Multiple for Comparables	Estimated Stock Price
Current stock price	31.00		
Earnings/share	1.98	16.18	32.04
Sales/share	17.23	2.20	37.91
Book value/share	10.02	3.56	35.67

The mean estimated stock price is $(32.04 + 37.91 + 35.67) / 3 = \35.21 .

- 10 C is correct. The price is \$41.29.

The takeover premiums on three recent comparable takeovers are:

$$(28.00 - 24.90) / 24.90 = 12.45\%$$

$$(52.00 - 43.20) / 43.20 = 20.37\%$$

$$(34.50 - 29.00) / 29.00 = 18.97\%$$

$$\text{Mean takeover premium} = 17.26\%$$

Using the comparable company approach, the stock price of High Tech if it is traded at the mean of the comparable company valuations is \$35.21. Considering the mean takeover premium, the estimated fair acquisition price for High Tech is $35.21 \times 1.1726 = \$41.29$.

- 11 B is correct. The fair acquisition price is \$40.86. First, calculate the relative valuation ratios based on the acquisition price for the three comparable transactions and their means.

Relative Valuation Ratio	Quadrant	ProTech	Automator	Mean
P/E	20.00	24.76	14.68	19.81
P/S	2.65	2.55	2.17	2.46
P/BV	3.38	5.13	3.76	4.09

Then apply the means to the valuation variables for High Tech to get the estimated acquisition price for High Tech based on the comparable transactions.

Valuation Variables	High Tech	Mean Multiple Paid for Comparables	Estimated Acquisition Price
Earnings/share	1.98	19.81	39.22
Sales/share	17.23	2.46	42.39
Book value/share	10.02	4.09	40.98

The mean estimated acquisition stock price is $(39.22 + 42.39 + 40.98)/3 = \40.86 .

- 12 A is correct. Both of Smith's statements are correct.

If there was a pre-announcement run-up in Quadrant's price because of speculation, the takeover premium should be computed based on the price prior to the run-up. Because the comparable transaction approach is based on the acquisition price, the takeover premium is implicitly recognized in this approach.

- 13 B is correct. Value is \$39.30.

Average P/E ratio is $21.33 = (23.00 + 19.50 + 21.50)/3$

Value based on P/E ratio = $21.33 (1.75) = 37.33$

Average P/B ratio is $4.80 = (4.24 + 5.25 + 4.91)/3$

Value based on P/B ratio = $4.80 (8.50) = 40.80$

Average P/CF ratio is $12.43 = (12.60 + 11.40 + 13.30)/3$

Value based on P/CF ratio = $12.43 (3.20) = 39.79$

Since Zin believes each valuation ratio is equally valid, value is a simple average of the three values.

Value = $(37.33 + 40.80 + 39.79)/3 = 39.30$

- 14 C is correct. An equity carve-out involves sale of equity in a new legal entity to outsiders, and would thus result in a cash inflow for Moonbase. A spin-off or a split-off does not generate a cash flow to the firm.
- 15 B is correct. The first comment about the poison pill is correct, but the second comment is incorrect. Shareholders do not "put" their shares to the company; rather bondholders can exercise the put in the event of a hostile takeover. Bondholders have the right to sell their bonds back to the target at a redemption price that is pre-specified in the bond indenture, typically at or above par value.

- 16 C is correct. Statement 3 provides the most support for a strong governance rating. The statement describes the manner in which the audit committee should work. The other two statements do not support a strong governance rating as each casts doubt about the independence of the board from management's control.
- 17 B is correct. The second policy is least likely to ensure effective contributions from the board. The board through self-assessment, and not management, should assess the board's performance.
- 18 A is correct. As an independent director, without an interlocking relationship and with the expertise required, Steris would be eligible to serve on either of the two committees.

- 19 A is correct.

PV of first three cash flows: $5/1.15 + 6/1.15^2 + 7/1.15^3 = 13.49$

Terminal value: $7 \times 10 = 70$

PV of terminal value: $= 70/1.15^3 = 46.03$

Value = $13.49 + 46.03 = 59.52$

Value per share = $59.52/1.2 = 49.60$

- 20 B is correct.

Terminal value at 5 percent: $7(1.05)/(.15 - .05) = 73.50M$

Terminal value at 0 percent: $7/.15 = 46.67M$

Change in present value: $(46.67 - 73.50)/1.15^3 = -17.64$

Percentage change: $-17.64/61.8 = -28.5\%$

- 21 B is correct.

Step 1. Compute Valuation Ratios

Valuation Ratio	Alphatech	Betatech	Mean
P/E	36.00	30.00	33.00
P/S	2.25	2.00	2.125
P/BV	4.00	4.50	4.25

Step 2. Apply to Durtech's Variables

Valuation Ratio	Durtech	Mean Multiple	Estimated Stock Price
Earnings per share	1.00	33.00	33.00
Sales per share	16.00	2.125	34.00
Book value per share	8.00	4.25	34.00

Step 3. Determine Mean Value: $(33 + 34 + 34)/3 = \$33.67$ per share

- 22 B is correct. A comparable transaction sells for premium of $55/44.4 - 1 = 23.9\%$.
- 23 C is correct. Omegatech's transaction P/E ratio: $55/1.25 = 44$. So estimated fair acquisition value per share is $44 \times 1 = \$44.00$.
- 24 B is correct. Possible government action is based upon the change in the HHI and the post-merger HHI.