BOOK 4 – CORPORATE FINANCE, PORTFOLIO MANAGEMENT, AND EQUITY INVESTMENTS

LEVEL 1 BOOK 4: CORPORATE FINANCE, PORTFOLIO MANAGEMENT, AND EQUITY INVESTMENTS

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READINGS AND LEARNING OUTCOME STATEMENTS

READINGS

The following material is a review of the Corporate Finance, Portfolio Management, and Equity Investments principles designed to address the learning outcome statements set forth by CFA Institute.

STUDY SESSION 11

Reading Assignments

Corporate Finance, CFA Program Curriculum, Volume 4 (CFA Institute, 2010)

STUDY SESSION 12

Reading Assignments

Portfolio Management, CFA Program Curriculum, Volume 4 (CFA Institute, 2010)

STUDY SESSION 13

Reading Assignments

Equity Investments: Securities Markets, CFA Program Curriculum, Volume 5 (CFA Institute, 2010)

STUDY SESSION 14

Reading Assignments

Equity Investments: Industry and Company Analysis, CFA Program Curriculum, Volume 5 (CFA Institute, 2010)

LEARNING OUTCOME STATEMENTS (LOS)

STUDY SESSION 11

The topical coverage corresponds with the following CFA Institute assigned reading:

44. Capital Budgeting

The candidate should be able to:

a. explain the capital budgeting process, including the typical steps of the process, and distinguish among the various categories of capital projects. (page 10)

b. discuss the basic principles of capital budgeting, including the choice of the proper cash flows. (page 11)

c. explain how the following project interactions affect the evaluation of a capital project: 1) independent versus mutually exclusive projects, 2) project sequencing, and 3) unlimited funds versus capital rationing. (page 13)

d. calculate and interpret the results using each of the following methods to evaluate a single capital project: net present value (NPV), internal rate of return (IRR), payback period, discounted payback period, and profitability index (PI).(page 13)

e. explain the NPV profile, compare and contrast the NPV and IRR methods when evaluating independent and mutually exclusive projects, and describe the problems associated with each of the evaluation methods. (page 21)

f. describe and account for the relative popularity of the various capital budgeting methods and explain the relation between NPV and company value and stock price. (page 23)

The topical coverage corresponds with the following CFA Institute assigned reading:

45. Cost of Capital

The candidate should be able to:

a. calculate and interpret the weighted average cost of capital (WACC) of a company. (page 34)

b. describe how taxes affect the cost of capital from different capital sources. (page 34)

c. describe alternative methods of calculating the weights used in the WACC, including the use of the company's target capital structure. (page 36)

d. explain how the marginal cost of capital and the investment opportunity schedule are used to determine the optimal capital budget. (page 37)

e. explain the marginal cost of capital's role in determining the net present value of a project. (page 38)

f. calculate and interpret the cost of fixed rate debt capital using the yield-to-maturity approach and the debt-rating approach. (page 38)

g. calculate and interpret the cost of noncallable, nonconvertible preferred stock. (page 39)

h. calculate and interpret the cost of equity capital using the capital asset pricing model approach, the dividend discount model approach, and the bond-yield-plus risk-premium approach. (page 40)

i. calculate and interpret the beta and cost of capital for a project. (page 42)

j. explain the country equity risk premium in the estimation of the cost of equity for a company located in a developing market. (page 44)

k. describe the marginal cost of capital schedule, explain why it may be upward-sloping with respect to additional capital, and calculate and interpret its break-points. (page 45)

l. explain and demonstrate the correct treatment of flotation costs. (page 47)

The topical coverage corresponds with the following CFA Institute assigned reading:
46. Working Capital Management
The candidate should be able to:

a. describe primary and secondary sources of liquidity and factors that influence a company's liquidity position. (page 59)

b. compare a company's liquidity measures with those of peer companies. (page 60)

c. evaluate overall working capital effectiveness of a company, using the operating and cash conversion cycles, and compare its effectiveness with other peer companies. (page 62)

d. identify and evaluate the necessary tools to use in managing a company's net daily cash position. (page 62)

e. compute and interpret comparable yields on various securities, compare portfolio returns against a standard benchmark, and evaluate a company's short-term investment policy guidelines. (page 63)

f. assess the performance of a company's accounts receivable, inventory management, and accounts payable functions against historical figures and comparable peer company values. (page 64)

g. evaluate the choices of short-term funding available to a company and recommend a financing method. (page 68)

The topical coverage corresponds with the following CFA Institute assigned reading:
47. Financial Statement Analysis
The candidate should be able to demonstrate the use of pro forma income and balance sheet statements. (page 74)

The topical coverage corresponds with the following CFA Institute assigned reading:
48. The Corporate Governance of Listed Companies: A Manual for Investors
The candidate should be able to:

a. define and describe corporate governance. (page 83)

b. discuss and critique characteristics and practices related to board and committee independence, experience, compensation, external consultants, and frequency of elections, and determine whether they are supportive of shareowner protection. (page 83)

c. describe board independence and explain the importance of independent board members in corporate governance. (page 84)

d. identify factors that indicate a board and its members possess the experience required to govern the company for the benefit of its shareowners. (page 85)

e. explain the provisions that should be included in a strong corporate code of ethics and the implications of a weak code of ethics with regard to related-party transactions and personal use of company assets. (page 86)

f. state the key areas of responsibility for which board committees are typically created and explain the criteria for assessing whether each committee is able to adequately represent shareowner interests. (page 87)

g. evaluate, from a shareowner's perspective, company policies related to voting rules, shareowner sponsored proposals, common stock classes, and takeover defenses. (page 89)

STUDY SESSION 12

The topical coverage corresponds with the following CFA Institute assigned reading:

49. The Asset Allocation Decision

The candidate should be able to:

a. describe the steps in the portfolio management process and explain the reasons for a policy statement. (page 104)

b. explain why investment objectives should be expressed in terms of risk and return and list the factors that may affect an investor's risk tolerance. (page 105)

c. describe the return objectives of capital preservation, capital appreciation, current income, and total return. (page 105)

d. describe the investment constraints of liquidity, time horizon, tax concerns, legal and regulatory factors, and unique needs and preferences. (page 106)

e. describe the importance of asset allocation, in terms of the percentage of a portfolio's return that can be explained by the target asset allocation, and explain how political and economic factors result in differing asset allocations by investors in various countries. (page 107)

The topical coverage corresponds with the following CFA Institute assigned reading:

50. An Introduction to Portfolio Management

The candidate should be able to:

a. define risk aversion and discuss evidence that suggests that individuals are generally risk averse. (page 111)

b. list the assumptions about investor behavior underlying the Markowitz model. (page 112)

c. compute and interpret the expected return, variance, and standard deviation for an individual investment and the expected return and standard deviation for a portfolio. (page 113)

d. compute and interpret the covariance of rates of return and show how it is related to the correlation coefficient. (page 115)

e. list the components of the portfolio standard deviation formula. (page 118)

f. describe the efficient frontier and explain the implications for incremental returns as an investor assumes more risk. (page 122)

g. explain the concept of an optimal portfolio and show how each investor may have a different optimal portfolio. (page 123)

The topical coverage corresponds with the following CFA Institute assigned reading:

51. An Introduction to Asset Pricing Models

The candidate should be able to:

a. explain the capital market theory, including its underlying assumptions, and explain the effect on expected returns, the standard deviation of returns, and possible risk-return combinations when a risk-free asset is combined with a portfolio of risky assets. (page 130)

b. identify the market portfolio and describe the role of the market portfolio in the formation of the capital market line (CML). (page 133)

c. define systematic and unsystematic risk and explain why an investor should not expect to receive additional return for assuming unsystematic risk. (page 133)

d. explain the capital asset pricing model, including the security market line (SML) and beta and describe the effects of relaxing its underlying assumptions. (page 135)

e. calculate, using the SML, the expected return on a security and evaluate whether the security is overvalued, undervalued, or properly valued. (page 141)

STUDY SESSION 13

The topical coverage corresponds with the following CFA Institute assigned reading:
52. Organization and Functioning of Securities Markets
The candidate should be able to:
a. describe the characteristics of a well-functioning securities market. (page 153)
b. distinguish between primary and secondary capital markets and explain how secondary markets support primary markets. (page 153)
c. distinguish between call and continuous markets. (page 154)
d. compare and contrast the structural differences among national stock exchanges, regional stock exchanges, and the over-the-counter (OTC) markets. (page 154)
e. compare and contrast major characteristics of various exchange markets, including exchange membership, types of orders, and market makers. (page 156)
f. describe the process of selling a stock short and discuss an investor's likely motivation for selling short. (page 157)
g. describe the process of buying a stock on margin, compute the rate of return on a margin transaction, define maintenance margin, and determine the stock price at which the investor would receive a margin call. (page 157)

The topical coverage corresponds with the following CFA Institute assigned reading:
53. Security-Market Indexes
The candidate should be able to:
a. compare and contrast the characteristics of, and discuss the source and direction of bias exhibited by, each of the three predominant weighting schemes used in constructing stock market indices and compute a price-weighted, a value-weighted, and an unweighted index series for three stocks. (page 165)
b. compare and contrast major structural features of domestic and global stock indices, bond indices, and composite stock-bond indices. (page 171)
c. state how low correlations between global markets support global investment. (page 172)

The topical coverage corresponds with the following CFA Institute assigned reading:
54. Efficient Capital Markets
The candidate should be able to:
a. define an efficient capital market and describe and contrast the three forms of the efficient market hypothesis (EMH). (page 178)
b. describe the tests used to examine each of the three forms of the EMH, identify various market anomalies and explain their implications for the EMH, and explain the overall conclusions about each form of the EMH. (page 179)
c. explain the implications of stock market efficiency for technical analysis, fundamental analysis, the portfolio management process, the role of the portfolio manager, and the rationale for investing in index funds. (page 183)
d. define behavioral finance and describe prospect theory, over-confidence bias, confirmation bias, and escalation bias. (page 184)

The topical coverage corresponds with the following CFA Institute assigned reading:

55. Market Efficiency and Anomalies

The candidate should be able to:

a. explain the three limitations to achieving fully efficient markets. (page 193)

b. describe four problems that may prevent arbitrageurs from correcting anomalies. (page 194)

c. explain why an apparent anomaly may be justified and describe the common biases that distort testing for mispricings. (page 194)

d. explain why a mispricing may persist and why valid anomalies may not be profitable. (page 197)

STUDY SESSION 14

The topical coverage corresponds with the following CFA Institute assigned reading:

56. An Introduction to Security Valuation

The candidate should be able to:

a. explain the top-down approach, and its underlying logic, to the security valuation process. (page 204)

b. state the various forms of investment returns. (page 205)

c. calculate and interpret the value of both a preferred stock and a common stock using the dividend discount model (DDM). (page 205)

d. show how to use the DDM to develop an earnings multiplier model and explain the factors in the DDM that affect a stock's price-to-earnings (P/E) ratio. (page 212)

e. explain the components of an investor's required rate of return (i.e., the real risk-free rate, the expected rate of inflation, and a risk premium) and discuss the risk factors to be assessed in determining an equity risk premium for use in estimating the required return for the investment in each country. (page 214)

f. estimate the dividend growth rate, given the components of the required rate of return incorporating the earnings retention rate and current stock price. (page 216)

g. describe a process for developing estimated inputs to be used in the DDM, including the required rate of return and expected growth rate of dividends. (page 218)

The topical coverage corresponds with the following CFA Institute assigned reading:

57. Industry Analysis

The candidate should be able to describe how structural economic changes (e.g., demographics, technology, politics, and regulation) may affect industries. (page 219)

The topical coverage corresponds with the following CFA Institute assigned reading:

58. Company Analysis and Stock Valuation

The candidate should be able to:

a. differentiate between 1) a growth company and a growth stock, 2) a defensive company and a defensive stock, 3) a cyclical company and a cyclical stock, 4) a speculative company and a speculative stock, and 5) a value stock and a growth stock. (page 229)

b. describe and estimate the expected earnings per share (EPS) and earnings multiplier for a company and use the multiple to make an investment decision regarding the company. (page 231)

The topical coverage corresponds with the following CFA Institute assigned reading:

59. Introduction to Price Multiples

The candidate should be able to:

a. discuss the rationales for, and the possible drawbacks to, the use of price-to-earnings ratio (P/E), price-to-book value (P/BV), price-to-sales ratio (P/S), and price-to-cash flow (P/CF) in equity valuation. (page 237)

b. calculate and interpret P/E, P/BV, P/S, and P/CF. (page 237)

Capital Budgeting

Exam Focus

If you recollect little from your basic financial management course in college (or if you didn't take one), you will need to spend some time on this review and go through the examples quite carefully. To be prepared for the exam, you need to know how to calculate all of the measures used to evaluate capital projects and the decision rules associated with them. Be sure you can interpret an NPV profile; one could be given as part of a question. Finally, know the reasoning behind the facts that (1) IRR and NPV give the same accept/reject decision for a single project and (2) IRR and NPV can give conflicting rankings for mutually exclusive projects.

LOS 44.a: Explain the capital budgeting process, including the typical steps of the process, and distinguish among the various categories of capital projects.

The **capital budgeting process** is the process of identifying and evaluating capital projects, that is, projects where the cash flow to the firm will be received over a period longer than a year. Any corporate decisions with an impact on future earnings can be examined using this framework. Decisions about whether to buy a new machine, expand business in another geographic area, move the corporate headquarters to Cleveland, or replace a delivery truck, to name a few, can be examined using a capital budgeting analysis.

For a number of good reasons, capital budgeting may be the most important responsibility that a financial manager has. First, since a capital budgeting decision often involves the purchase of costly long-term assets with lives of many years, the decisions made may determine the future success of the firm. Second, the principles underlying the capital budgeting process also apply to other corporate decisions, such as working capital management and making strategic mergers and acquisitions. Finally, making good capital budgeting decisions is consistent with management's primary goal of maximizing shareholder value.

The capital budgeting process has four administrative steps:

Step 1: Idea generation. The most important step in the capital budgeting process is generating good project ideas. Ideas can come from a number of sources including senior management, functional divisions, employees, or outside the company.

Step 2: Analyzing project proposals. Since the decision to accept or reject a capital project is based on the project's expected future cash flows, a cash flow forecast must be made for each product to determine its expected profitability.

Step 3: Create the firm-wide capital budget. Firms must prioritize profitable projects according to the timing of the project's cash flows, available company resources, and the company's overall strategic plan. Many projects that are attractive individually may not make sense strategically.

Step 4: Monitoring decisions and conducting a post-audit. It is important to follow up on all capital budgeting decisions. An analyst should compare the actual results to the projected results, and project managers should explain why projections did or did not match actual performance. Since the capital budgeting process is only as good as the estimates of the inputs into the model used to forecast cash flows, a post-audit should be used to identify systematic errors in the forecasting process and improve company operations.

Categories of Capital Budgeting Projects

Capital budgeting projects may be divided into the following categories:

- *Replacement projects to maintain the business* are normally made without detailed analysis. The only issues are whether the existing operations should continue and, if so, whether existing procedures or processes should be maintained.
- *Replacement projects for cost reduction* determine whether equipment that is obsolete, but still usable, should be replaced. A fairly detailed analysis is necessary in this case.
- *Expansion projects* are taken on to grow the business and involve a complex decision-making process since they require an explicit forecast of future demand. A very detailed analysis is required.
- *New product or market development* also entails a complex decision-making process that will require a detailed analysis due to the large amount of uncertainty involved.
- *Mandatory projects* may be required by a governmental agency or insurance company and typically involve safety-related or environmental concerns. These projects typically generate little to no revenue, but they accompany new revenue-producing projects undertaken by the company.
- *Other projects.* Some projects are not easily analyzed through the capital budgeting process. Such projects may include a pet project of senior management (e.g., corporate perks), or a high-risk endeavor that is difficult to analyze with typical capital budgeting assessment methods (e.g., research and development projects).

LOS 44.b: Discuss the basic principles of capital budgeting, including the choice of the proper cash flows.

The capital budgeting process involves five key principles:

1. *Decisions are based on cash flows, not accounting income.* The relevant cash flows to consider as part of the capital budgeting process are **incremental cash flows**, the changes in cash flows that will occur if the project is undertaken.

   Sunk costs are costs that cannot be avoided, even if the project is not undertaken. Since these costs are not affected by the accept/reject decision, they should not be included in the analysis. An example of a sunk cost is a consulting fee paid to a

marketing research firm to estimate demand for a new product prior to a decision on the project.

Externalities are the effects the acceptance of a project may have on other firm cash flows. The primary one is a negative externality called **cannibalization**, which occurs when a new project takes sales from an existing product. When considering externalities, the full implication of the new project (loss in sales of existing products) should be taken into account. An example of cannibalization is when a soft drink company introduces a diet version of an existing beverage. The analyst should subtract the lost sales of the existing beverage from the expected new sales of the diet version when estimated incremental project cash flows. A positive externality exists when doing the project would have a positive effect on sales of a firm's other product lines.

A project has a **conventional cash flow pattern** if the sign on the cash flows changes only once, with one or more cash outflows followed by one or more cash inflows. An **unconventional cash flow pattern** has more than one sign change. For example, a project might have an initial investment outflow, a series of cash inflows, and a cash outflow for asset retirement costs at the end of the project's life.

2. *Cash flows are based on opportunity costs.* **Opportunity** costs are cash flows that a firm will lose by undertaking the project under analysis. These are cash flows generated by an asset the firm already owns that would be forgone if the project under consideration is undertaken. Opportunity costs should be included in project costs. For example, when building a plant, even if the firm already owns the land, the cost of the land should be charged to the project since it could be sold if not used.

3. *The timing of cash flows is important.* Capital budgeting decisions account for the time value of money, which means that cash flows received earlier are worth more than cash flows to be received later.

4. *Cash flows are analyzed on an after-tax basis.* The impact of taxes must be considered when analyzing all capital budgeting projects. Firm value is based on cash flows they get to keep, not those they send to the government.

5. *Financing costs are reflected in the project's required rate of return.* Do not consider financing costs specific to the project when estimating incremental cash flows. The discount rate used in the capital budgeting analysis takes account of the firm's cost of capital. Only projects that are expected to return more than the cost of the capital needed to fund them will increase the value of the firm.

LOS 44.c: Explain how the following project interactions affect the evaluation of a capital project: 1) independent versus mutually exclusive projects, 2) project sequencing, and 3) unlimited funds versus capital rationing.

Independent Versus Mutually Exclusive Projects

Independent projects are projects that are unrelated to each other and allow for each project to be evaluated based on its own profitability. For example, if projects A and B are independent, and both projects are profitable, then the firm could accept both projects. **Mutually exclusive** means that only one project in a set of possible projects can be accepted and that the projects compete with each other. If projects A and B were mutually exclusive, the firm could accept either Project A or Project B, but not both. A capital budgeting decision between two different stamping machines with different costs and output would be an example of choosing between two mutually exclusive projects.

Project Sequencing

Some projects must be undertaken in a certain order, or sequence, so that investing in a project today creates the opportunity to invest in other projects in the future. For example, if a project undertaken today is profitable, that may create the opportunity to invest in a second project a year from now. However, if the project undertaken today turns out to be unprofitable, the firm will not invest in the second project.

Unlimited Funds Versus Capital Rationing

If a firm has unlimited access to capital, the firm can undertake all projects with expected returns that exceed the cost of capital. Many firms have constraints on the amount of capital they can raise and must use *capital rationing*. If a firm's profitable project opportunities exceed the amount of funds available, the firm must ration, or prioritize, its capital expenditures with the goal of achieving the maximum increase in value for shareholders given its available capital.

LOS 44.d: Calculate and interpret the results using each of the following methods to evaluate a single capital project: net present value (NPV), internal rate of return (IRR), payback period, discounted payback period, and profitability index (PI).

Net Present Value (NPV)

We first examined the calculation of net present value (NPV) in Quantitative Methods. The NPV is the sum of the present values of all the expected incremental cash flows if a project is undertaken. The discount rate used is the firm's cost of capital, adjusted for the risk level of the project. For a normal project, with an initial cash outflow followed by a series of expected after-tax cash inflows, the NPV is the present value of the expected inflows minus the initial cost of the project.

$$NPV = CF_0 + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n} = \sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}$$

where:
CF_0 = the initial investment outlay (a negative cash flow)
CF_t = after-tax cash flow at time t
k = required rate of return for project

A positive NPV project is expected to increase shareholder wealth, a negative NPV project is expected to decrease shareholder wealth, and a zero NPV project has no expected effect on shareholder wealth.

For *independent* projects, the *NPV decision rule* is simply to accept any project with a positive NPV and to reject any project with a negative NPV.

Example: NPV analysis

Using the project cash flows presented in Table 1, compute the NPV of each project's cash flows and determine for each project whether it should be accepted or rejected. Assume that the cost of capital is 10%.

Table 1: Expected Net After-Tax Cash Flows

Year (t)	Project A	Project B
0	–$2,000	–$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

Answer:

$$NPV_A = -2,000 + \frac{1,000}{(1.1)^1} + \frac{800}{(1.1)^2} + \frac{600}{(1.1)^3} + \frac{200}{(1.1)^4} = \$157.64$$

$$NPV_B = -2,000 + \frac{200}{(1.1)^1} + \frac{600}{(1.1)^2} + \frac{800}{(1.1)^3} + \frac{1,200}{(1.1)^4} = \$98.36$$

Both Project A and Project B have positive NPVs, so both should be accepted.

You may calculate the NPV directly by using the cash flow (CF) keys on your calculator. The process is illustrated in Table 2 and Table 3 for Project A.

Table 2: Calculating NPV$_A$ With the TI Business Analyst II Plus

Key Strokes	Explanation	Display
[CF] [2nd] [CLR WORK]	Clear memory registers	CF0 = 0.00000
2,000 [+/−] [ENTER]	Initial cash outlay	CF0 = −2,000.00000
[↓] 1,000 [ENTER]	Period 1 cash flow	C01 = 1,000.00000
[↓]	Frequency of cash flow 1	F01 = 1.00000
[↓] 800 [ENTER]	Period 2 cash flow	C02 = 800.00000
[↓]	Frequency of cash flow 2	F02 = 1.00000
[↓] 600 [ENTER]	Period 3 cash flow	C03 = 600.00000
[↓]	Frequency of cash flow 3	F03 = 1.00000
[↓] 200 [ENTER]	Period 4 cash flow	C04 = 200.00000
[↓]	Frequency of cash flow 4	F04 = 1.00000
[NPV] 10 [ENTER]	10% discount rate	I = 10.00000
[↓] [CPT]	Calculate NPV	NPV = 157.63951

Table 3: Calculating NPV$_A$ With the HP12C

Key Strokes	Explanation	Display
[f]→[FIN] → [f] → [REG]	Clear memory registers	0.00000
[f] [5]	Display 5 decimals. You only need to do this once.	0.00000
2,000 [CHS] [g] [CF0]	Initial cash outlay	−2,000.00000
1,000 [g] [CFj]	Period 1 cash flow	1,000.00000
800 [g] [CFj]	Period 2 cash flow	800.00000
600 [g] [CFj]	Period 3 cash flow	600.00000
200 [g] [CFj]	Period 4 cash flow	200.00000
10 [i]	10% discount rate	10.00000
[f] [NPV]	Calculate NPV	157.63951

Internal Rate of Return (IRR)

For a normal project, the **internal rate of return** (IRR) is the discount rate that makes the present value of the expected incremental after-tax cash inflows just equal to the initial cost of the project. More generally, the IRR is the discount rate that makes the

present values of a project's estimated cash inflows equal to the present value of the project's estimated cash outflows. That is, IRR is the discount rate that makes the following relationship hold:

PV (inflows) = PV (outflows)

The IRR is also the discount rate for which the NPV of a project is equal to zero.

$$NPV = 0 = CF_0 + \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + ... + \frac{CF_n}{(1+IRR)^n} = \sum_{t=0}^{n} \frac{CF_t}{(1+IRR)^t}$$

To calculate the IRR, you may use the trial-and-error method. That is, just keep guessing IRRs until you get the right one, or you may use a financial calculator.

IRR decision rule: First, determine the required rate of return for a given project. This is usually the firm's cost of capital. Note that the required rate of return may be higher or lower than the firm's cost of capital to adjust for differences between project risk and the firm's average project risk.

If IRR > the required rate of return, accept the project.

If IRR < the required rate of return, reject the project.

Example: IRR

Continuing with the cash flows presented in Table 1 for projects A and B, compute the IRR for each project and determine whether to accept or reject each project under the assumptions that the projects are independent and that the required rate of return is 10%.

Answer:

Project A: $0 = -2,000 + \frac{1,000}{(1+IRR_A)^1} + \frac{800}{(1+IRR_A)^2} + \frac{600}{(1+IRR_A)^3} + \frac{200}{(1+IRR_A)^4}$

Project B: $0 = -2,000 + \frac{200}{(1+IRR_B)^1} + \frac{600}{(1+IRR_B)^2} + \frac{800}{(1+IRR_B)^3} + \frac{1,200}{(1+IRR_B)^4}$

The cash flows should be entered as in Table 2 and Table 3 (if you haven't changed them, they are still there from the calculation of NPV).

With the TI calculator, the IRR can be calculated with:

[IRR] [CPT] to get 14.4888(%) for Project A and 11.7906(%) for Project B.

With the HP12C, the IRR can be calculated with:

[f] [IRR]

Both projects should be accepted because their IRRs are greater than the 10% required rate of return.

Payback Period

The payback period (PBP) is the number of years it takes to recover the initial cost of an investment.

Example: Payback period

Calculate the payback periods for the two projects that have the cash flows presented in Table 1. Note the Year 0 cash flow represents the initial cost of each project.

Answer:

Note that the cumulative net cash flow (NCF) is just the running total of the cash flows at the end of each time period. Payback will occur when the cumulative NCF equals zero. To find the payback periods, construct Table 4.

Table 4: Cumulative Net Cash Flows

	Year (t)	0	1	2	3	4
Project A	Net cash flow	−2,000	1,000	800	600	200
	Cumulative NCF	−2,000	−1,000	−200	400	600
Project B	Net cash flow	−2,000	200	600	800	1,200
	Cumulative NCF	−2,000	−1,800	−1,200	−400	800

The payback period is determined from the cumulative net cash flow table as follows:

$$\text{payback period} = \text{full years until recovery} + \frac{\text{unrecovered cost at the beginning of last year}}{\text{cash flow during the last year}}$$

$$\text{payback period A} = 2 + \frac{200}{600} = 2.33 \text{ years}$$

$$\text{payback period B} = 3 + \frac{400}{1200} = 3.33 \text{ years}$$

Since the payback period is a measure of liquidity, for a firm with liquidity concerns, the shorter a project's payback period, the better. However, project decisions should not be made on the basis of their payback periods because of the method's drawbacks.

The main drawbacks of the payback period are that it does not take into account either the time value of money or cash flows beyond the payback period, which means terminal or salvage value wouldn't be considered. These drawbacks mean that the payback period is useless as a measure of profitability.

The main benefit of the payback period is that it is a good measure of project liquidity. Firms with limited access to additional liquidity often impose a maximum payback period and then use a measure of profitability, such as NPV or IRR, to evaluate projects that satisfy this maximum payback period constraint.

> *Professor's Note: If you have the Professional model of the TI calculator, you can easily calculate the payback period and the discounted payback period (which follows). Once NPV is displayed, use the down arrow to scroll through NFV (net future value), to PB (payback), and DPB (discounted payback). You must use the compute key when "PB=" is displayed. If the annual net cash flows are equal, the payback period is simply project cost divided by the annual cash flow.*

Discounted Payback Period

The **discounted payback period** uses the present values of the project's estimated cash flows. It is the number of years it takes a project to recover its initial investment in present value terms and, therefore, must be greater than the payback period without discounting.

Example: Discounted payback method

Compute the discounted payback period for projects A and B described in Table 5. Assume that the firm's cost of capital is 10% and the firm's maximum discounted payback period is four years.

Table 5: Cash Flows for Projects A and B

	Year (t)	0	1	2	3	4
Project A	Net Cash Flow	−2,000	1,000	800	600	200
	Discounted NCF	−2,000	910	661	451	137
	Cumulative DNCF	−2,000	−1,090	−429	22	159
Project B	Net Cash Flow	−2,000	200	600	800	1,200
	Discounted NCF	−2,000	182	496	601	820
	Cumulative DNCF	−2,000	−1,818	−1,322	−721	99

Answer:

$$\text{discounted payback A} = 2 + \frac{429}{451} = 2.95 \text{ years}$$

$$\text{discounted payback B} = 3 + \frac{721}{820} = 3.88 \text{ years}$$

The discounted payback period addresses one of the drawbacks of the payback period by discounting cash flows at the project's required rate of return. However, the discounted payback period still does not consider any cash flows beyond the payback period, which means that it is a poor measure of profitability. Again, its use is primarily as a measure of liquidity.

Profitability Index (PI)

The **profitability index** (PI) is the present value of a project's future cash flows divided by the initial cash outlay.

$$PI = \frac{\text{PV of future cash flows}}{CF_0} = 1 + \frac{NPV}{CF_0}$$

As you can see, the profitability index is closely related to the NPV. The PI is the ratio of the present value of future cash flows to the initial cash outlay, while the NPV is the difference between the present value of future cash flows and the initial cash outlay.

If the NPV of a project is positive, the PI will be greater than one. If the NPV is negative, the PI will be less than one. It follows that the *decision rule* for the PI is:

If PI > 1.0, accept the project.

If PI < 1.0, reject the project.

Example: Profitability index

Going back to our original example, calculate the PI for projects A and B. Note that Table 1 has been reproduced as Table 6.

Table 6: Expected Net After-Tax Cash Flows

Year (t)	Project A	Project B
0	–$2,000	–$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

Answer:

$$\text{PV future cash flows}_A = \frac{1,000}{(1.1)^1} + \frac{800}{(1.1)^2} + \frac{600}{(1.1)^3} + \frac{200}{(1.1)^4} = \$2,157.64$$

$$PI_A = \frac{\$2,157.64}{\$2,000} = 1.079$$

$$\text{PV future cash flows}_B = \frac{200}{(1.1)^1} + \frac{600}{(1.1)^2} + \frac{800}{(1.1)^3} + \frac{1,200}{(1.1)^4} = \$2,098.36$$

$$PI_B = \frac{\$2,098.36}{\$2,000} = 1.049$$

Decision: If projects A and B are independent, accept both projects since PI > 1 for both projects.

Professor's Note: The accept/reject decision rule here is exactly equivalent to both the NPV and IRR decision rules. That is, if PI > 1, then the NPV must be positive, and the IRR must be greater than the discount rate. Note also that once you have the NPV, you can just add back the initial outlay to get the PV of the cash inflows used here. Recall that the NPV of Project B is $98.36 with an initial cost of $2,000. PI is simply (2,000 + 98.36) / 2000.

LOS 44.e: Explain the NPV profile, compare and contrast the NPV and IRR methods when evaluating independent and mutually exclusive projects, and describe the problems associated with each of the evaluation methods.

A project's **NPV profile** is a graph that shows a project's NPV for different discount rates. The NPV profiles for the two projects described in the previous example are presented in Figure 1. The project NPVs are summarized in the table below the graph. The discount rates are on the x-axis of the NPV profile, and the corresponding NPVs are plotted on the y-axis.

Figure 1: NPV Profiles
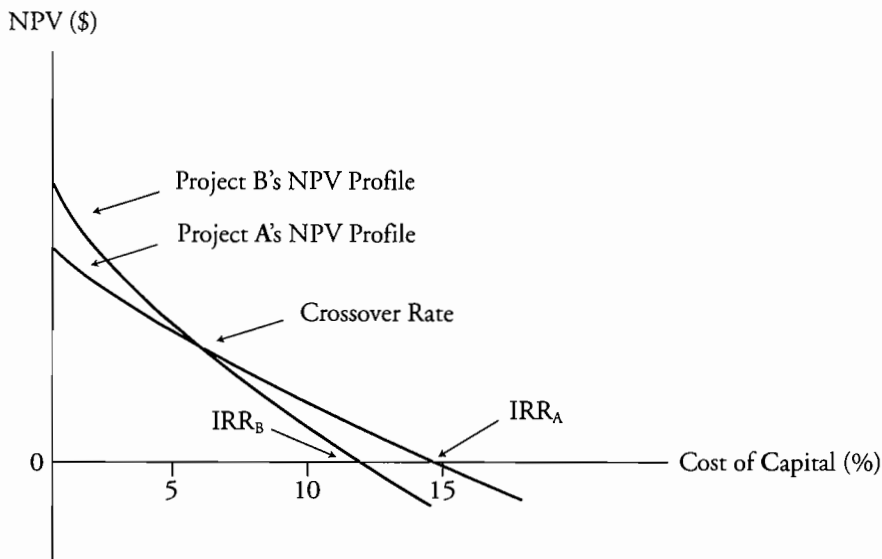
Discount Rate	NPV$_A$	NPV$_B$
0%	600.00	800.00
5%	360.84	413.00
10%	157.64	98.36
15%	(16.66)	(160.28)

Note that the projects' IRRs are the discount rates where the NPV profiles intersect the x-axis, since these are the discount rates for which NPV equals zero. Recall that the IRR is the discount rate that results in an NPV of zero.

Also notice in Figure 1 that the NPV profiles intersect. They intersect at the discount rate for which NPVs of the projects are equal, 7.2%. This rate at which the NPVs are equal is called the *crossover rate*. At discount rates below 7.2% (to the left of the intersection), Project B has the greater NPV, and at discount rates above 7.2%, Project A has a greater NPV. Clearly, the discount rate used in the analysis can determine which one of two mutually exclusive projects will be accepted.

The NPV profiles for projects A and B intersect because of a difference in the timing of the cash flows. Examining the cash flows for the projects (Table 1), we can see that the total cash inflows for Project B are greater ($2,800) than those of Project A

($2,600). Since they both have the same initial cost ($2,000) at a discount rate of zero, Project B has a greater NPV (2,800 – 2,000 = $800) than Project A (2,600 – 2000 = $600).

We can also see that the cash flows for Project B come later in the project's life. That's why the NPV of Project B falls faster than the NPV of Project A as the discount rate increases, and the NPVs are eventually equal at a discount rate of 7.2%. At discount rates above 7.2%, the fact that the total cash flows of Project B are greater in nominal dollars is overridden by the fact that Project B's cash flows come later in the project's life than those of Project A.

The Relative Advantages and Disadvantages of the NPV and IRR Methods

A **key advantage of NPV** is that it is a direct measure of the expected increase in the value of the firm. NPV is theoretically the best method. Its main weakness is that it does not include any consideration of the size of the project. For example, an NPV of $100 is great for a project costing $100 but not so great for a project costing $1 million.

A **key advantage of IRR** is that it measures profitability as a percentage, showing the return on each dollar invested. The IRR provides information on the margin of safety that the NPV does not. From the IRR, we can tell how much below the IRR (estimated return) the actual project return could fall, in percentage terms, before the project becomes uneconomic (has a negative NPV).

The *disadvantages* of the IRR method are (1) the possibility of producing rankings of mutually exclusive projects different from those from NPV analysis, and (2) the possibility that there are multiple IRRs or no IRR for a project.

Conflicting Project Rankings

Consider two projects with an initial investment of €1,000 and a required rate of return of 10%. Project X will generate cash inflows of €500 at the end of each of the next five years. Project Y will generate a single cash flow of €4,000 at the end of the fifth year.

Year	Project X	Project Y
0	–€1,000	–€1,000
1	500	0
2	500	0
3	500	0
4	500	0
5	500	4,000
NPV	€895	€1,484
IRR	41.0%	32.0%

Project X has a higher IRR, but Project Y has a higher NPV. Which is the better project? If Project X is selected, the firm will be worth €895 more because the PV of the expected cash flows is €895 more than the initial cost of the project. Project Y, however, is expected to increase the value of the firm by €1,484. Project Y is the better project. Because NPV measures the expected increase in wealth from undertaking a project, NPV is the only acceptable criterion when ranking projects.

Another reason, besides cash flow timing differences, that NPV and IRR may give conflicting project rankings is differences in project size. Consider two projects, one with an initial outlay of $100,000, and one with an initial outlay of $1 million. The smaller project may have a higher IRR, but the increase in firm value (NPV) may be small compared to the increase in firm value (NPV) of the larger project, even though its IRR is lower.

It is sometimes said that the NPV method implicitly assumes that project cash flows can be reinvested at the discount rate used to calculate NPV. This is a realistic assumption, since it is reasonable to assume that project cash flows could be used to reduce the firm's capital requirements. Any funds that are used to reduce the firm's capital requirements allow the firm to avoid the cost of capital on those funds. Just by reducing its equity capital and debt, the firm could "earn" its cost of capital on funds used to reduce its capital requirements. If we were to rank projects by their IRRs, we would be implicitly assuming that project cash flows could be reinvested at the project's IRR. This is unrealistic and, strictly speaking, if the firm could earn that rate on invested funds, that rate should be the one used to discount project cash flows.

The "Multiple IRR" and "No IRR" Problems

If a project has cash outflows during its life or at the end of its life in addition to its initial cash outflow, the project is said to have an unconventional cash flow pattern. Projects with such cash flows may have more than one IRR (there may be more than one discount rate that will produce an NPV equal to zero).

It is also possible to have a project where there is no discount rate that results in a zero NPV, that is, the project does not have an IRR. A project with no IRR may actually be a profitable project. The lack of an IRR results from the project having unconventional cash flows, where mathematically, no IRR exists. NPV does not have this problem and produces theoretically correct decisions for projects with unconventional cash flow patterns.

Neither of these problems can arise with the NPV method. If a project has non-normal cash flows, the NPV method will give the appropriate accept/reject decision.

LOS 44.f: Describe and account for the relative popularity of the various capital budgeting methods and explain the relation between NPV and company value and stock price.

Despite the superiority of NPV and IRR methods for evaluating projects, surveys of corporate financial managers show that a variety of methods are used. The surveys

show that the capital budgeting method used by a company varied according to four general criteria:

1. **Location.** European countries tended to use the payback period method as much or more than the IRR and NPV methods.

2. **Size of the company.** The larger the company, the more likely it was to use discounted cash flow techniques such as the NPV and IRR methods.

3. **Public vs. private.** Private companies used the payback period more often than public companies. Public companies tended to prefer discounted cash flow methods.

4. **Management education.** The higher the level of education (i.e., MBA), the more likely the company was to use discounted cash flow techniques, such as the NPV and IRR methods.

The Relationship Between NPV and Stock Price

Since the NPV method is a direct measure of the expected change in firm value from undertaking a capital project, it is also the criterion most related to stock prices. In theory, a positive NPV project should cause a proportionate increase in a company's stock price.

Example: Relationship Between NPV and Stock Price

Presstech is investing $500 million in new printing equipment. The present value of the future after-tax cash flows resulting from the equipment is $750 million. Presstech currently has 100 million shares outstanding, with a current market price of $45 per share. Assuming that this project is new information and is independent of other expectations about the company, calculate the effect of the new equipment on the value of the company and the effect on Presstech's stock price.

Answer:

NPV of the new printing equipment project = $750 million – $500 million
= $250 million.

Value of company prior to new equipment project = 100 million shares × $45 per share = $4.5 billion.

Value of company after new equipment project = $4.5 billion + $250 million
= $4.75 billion.

Price per share after new equipment project = $4.75 billion / 100 million shares = $47.50.

The stock price should increase from $45.00 per share to $47.50 per share as a result of the project.

In reality, the impact of a project on the company's stock price is more complicated than the example above. A company's stock price is a function of the present value of its expected future earnings stream. As a result, changes in the stock price will result more from changes in *expectations* about a project's profitability. If a company announces a project for which managers expect a positive NPV but analysts expect a lower level of profitability from the project than the company does, the stock price may actually drop on the announcement. In another example, a project announcement may be taken as a signal about other future capital projects, resulting in a stock price increase that is much greater than what the NPV of the announced project would justify.

KEY CONCEPTS

LOS 44.a

Capital budgeting is the process of evaluating capital projects, projects with cash flows over more than one year.

The four steps of the capital budgeting process are: (1) Generate investment ideas; (2) Analyze project ideas; (3) Create firm-wide capital budget; and (4) Monitor decisions and conduct a post-audit.

Categories of capital projects include: (1) Replacement projects for maintaining the business or for cost reduction; (2) Expansion projects; (3) New product or market development; (4) Mandatory projects to meet environmental or regulatory requirements; (5) Other projects, such as research and development or pet projects of senior management.

LOS 44.b

Capital budgeting decisions should be based on incremental after-tax cash flows, the expected differences in after-tax cash flows if a project is undertaken. Sunk (already incurred) costs are not considered, but externalities and cash opportunity costs must be included in project cash flows.

LOS 44.c

Acceptable independent projects can all be undertaken, while a firm must choose between or among mutually exclusive projects.

Project sequencing concerns the opportunities for future capital projects that may be created by undertaking a current project.

If a firm cannot undertake all profitable projects because of limited ability to raise capital, the firm should choose that group of fundable positive NPV projects with the highest total NPV.

LOS 44.d

NPV is the sum of the present values of a project's expected cash flows and represents the increase in firm value from undertaking a project. Positive NPV projects should be undertaken, but negative NPV projects are expected to decrease the value of the firm.

The IRR is the discount rate that equates the present values of the project's expected cash inflows and outflows and, thus, is the discount rate for which the NPV of a project is zero. A project for which the IRR is greater (less) than the discount rate will have an NPV that is positive (negative) and should be accepted (not be accepted).

The payback (discounted payback) period is the number of years required to recover the original cost of the project (original cost of the project in present value terms).

The profitability index is the ratio of the present value of a project's future cash flows to its initial cash outlay and is greater than one when a project's NPV is positive.

LOS 44.e

An NPV profile plots a project's NPV as a function of the discount rate, and it intersects the horizontal axis (NPV = 0) at its IRR. If two NPV profiles intersect at some discount rate, that is the crossover rate, and different projects are preferred at discount rates higher and lower than the crossover rate.

For projects with conventional cash flow patterns, the NPV and IRR methods produce the same accept/reject decision, but projects with unconventional cash flow patterns can produce multiple IRRs or no IRR.

Mutually exclusive projects can be ranked based on their NPVs, but rankings based on other methods will not necessarily maximize the value of the firm.

LOS 44.f

Small companies, private companies, and companies outside the United States are more likely to use techniques simpler than NPV, such as payback period.

The NPV method is a direct measure of the expected change in firm value from undertaking a project.

CONCEPT CHECKERS

1. Which of the following statements concerning the principles underlying the capital budgeting process is *most accurate*?
   A. Cash flows should be based on opportunity costs.
   B. Financing costs should be reflected in a project's incremental cash flows.
   C. The net income for a project is essential for making a correct capital budgeting decision.

2. Which of the following statements about the payback period method is *least accurate*? The payback period:
   A. provides a rough measure of a project's liquidity.
   B. considers all cash flows throughout the entire life of a project.
   C. is the number of years it takes to recover the original cost of the investment.

3. Which of the following statements about NPV and IRR is *least accurate*?
   A. The IRR is the discount rate that equates the present value of the cash inflows with the present value of outflows.
   B. For mutually exclusive projects, if the NPV method and the IRR method give conflicting rankings, the analyst should use the IRRs to select the project.
   C. The NPV method assumes that cash flows will be reinvested at the cost of capital, while IRR rankings implicitly assume that cash flows are reinvested at the IRR.

4. Which of the following statements is *least accurate*? The discounted payback period:
   A. frequently ignores terminal values.
   B. is generally shorter than the regular payback.
   C. is the time it takes for the present value of the project's cash inflows to equal the initial cost of the investment.

5. Which of the following statements about NPV and IRR is *least accurate*?
   A. The IRR can be positive even if the NPV is negative.
   B. When the IRR is equal to the cost of capital, the NPV will be zero.
   C. The NPV will be positive if the IRR is less than the cost of capital.

Use the following data to answer Questions 6 through 10.

A company is considering the purchase of a copier that costs $5,000. Assume a required rate of return of 10% and the following cash flow schedule:

- Year 1: $3,000.
- Year 2: $2,000.
- Year 3: $2,000.

6.   What is the project's payback period?
        A.   1.5 years.
        B.   2.0 years.
        C.   2.5 years.

7.   The project's discounted payback period is *closest* to:
        A.   1.4 years.
        B.   2.0 years.
        C.   2.4 years.

8.   What is the project's NPV?
        A.   –$309.
        B.   +$883.
        C.   +$1,523.

9.   The project's IRR is *closest* to:
        A.   10%.
        B.   15%.
        C.   20%.

10.   What is the project's profitability index (PI)?
        A.   0.72.
        B.   1.18.
        C.   1.72.

11.   An analyst has gathered the following information about a project:
        • Cost $10,000
        • Annual cash inflow $4,000
        • Life   4 years
        • Cost of capital   12%

        Which of the following statements about the project is *least accurate?*
        A.   The discounted payback period is 3.5 years.
        B.   The IRR of the project is 21.9%; accept the project.
        C.   The NPV of the project is +$2,149; accept the project.

Use the following data for Questions 12 and 13.

An analyst has gathered the following data about two projects, each with a 12% required rate of return.

	Project A	Project B
Initial cost	$15,000	$20,000
Life	5 years	4 years
Cash inflows	$5,000/year	$7,500/year

12. If the projects are independent, the company should:
    A. accept Project A and reject Project B.
    B. reject Project A and accept Project B.
    C. accept both projects.

13. If the projects are mutually exclusive, the company should:
    A. reject both projects.
    B. accept Project A and reject Project B.
    C. reject Project A and accept Project B.

14. The NPV profiles of two projects will intersect:
    A. at their internal rates of return.
    B. if they have different discount rates.
    C. at the discount rate that makes their net present values equal.

15. The post-audit is used to:
    A. improve cash flow forecasts and stimulate management to improve operations and bring results into line with forecasts.
    B. improve cash flow forecasts and eliminate potentially profitable but risky projects.
    C. stimulate management to improve operations, bring results into line with forecasts, and eliminate potentially profitable but risky projects.

16. Based on surveys of comparable firms, which of the following firms would be *most likely* to use NPV as its preferred method for evaluating capital projects?
    A. A small public industrial company located in France.
    B. A private company located in the United States.
    C. A large public company located in the United States.

17. Fullen Machinery is investing $400 million in new industrial equipment. The present value of the future after-tax cash flows resulting from the equipment is $700 million. Fullen currently has 200 million shares of common stock outstanding, with a current market price of $36 per share. Assuming that this project is new information and is independent of other expectations about the company, what is the theoretical effect of the new equipment on Fullen's stock price? The stock price will:
    A. decrease to $33.50.
    B. increase to $37.50.
    C. increase to $39.50.

ANSWERS – CONCEPT CHECKERS

1. **A** Cash flows are based on opportunity costs. Financing costs are recognized in the project's required rate of return. Accounting net income, which includes non-cash expenses, is irrelevant; incremental cash flows are essential for making correct capital budgeting decisions.

2. **B** The payback period ignores cash flows that go beyond the payback period.

3. **B** NPV should always be used if NPV and IRR give conflicting decisions.

4. **B** The discounted payback is longer than the regular payback because cash flows are discounted to their present value.

5. **C** If IRR is less than the cost of capital, the result will be a negative NPV.

6. **B** Cash flow (CF) after year 2 = –5,000 + 3,000 + 2,000 = 0. Cost of copier is paid back in the first two years.

7. **C** Year 1 discounted cash flow = 3,000 / 1.10 = 2,727; year 2 DCF = 2,000 / 1.10^2 = 1,653; year 3 DCF = 2,000 / 1.10^3 = 1,503. CF required after year 2 = –5,000 + 2,727 +1,653 = –\$620, 620 / year 3 DCF = 620 / 1,503 = 0.41, for a discounted payback of 2.4 years.

   Using a financial calculator:
   Year 1: I = 10%; FV = 3,000; N = 1; PMT = 0; CPT → PV = –2,727
   Year 2: N = 2; FV = 2,000; CPT → PV = –1,653
   Year 3: N = 3; CPT → PV = –1,503
   5,000 – (2,727 + 1,653) = 620, 620 / 1,503 = 0.413, so discounted payback = 2 + 0.4 = 2.4.

8. **B** NPV = CF_0 + (discounted cash flows years 0 to 3 calculated in Question 7) = –5,000 + (2,727 + 1,653 + 1,503) = –5,000 + 5,833 = \$883.

9. **C** From the information given, you know the NPV is positive, so the IRR must be greater than 10%. You only have two choices, 15% and 20%. Pick one and solve the NPV; if it's not close to zero, you guessed wrong—pick the other one. Alternatively, you can solve directly for the IRR as CF_0 = –5,000, CF_1 = 3,000, CF_2 = 2,000, CF_3 = 2,000. IRR = 20.64%.

10. **B** PI = PV of future cash flows / CF_0 (discounted cash flows years 0 to 3 calculated in Question 7). PI = (2,727 + 1,653 + 1,503) / 5,000 = 1.177.

11. **A** The discounted payback period of 3.15 is calculated as follows:

$$CF_0 = -10,000; \quad PVCF_1 = \frac{4,000}{1.12} = 3,571; \quad PVCF_2 = \frac{4,000}{1.12^2} = 3,189; \quad PVCF_3 = \frac{4,000}{1.12^3} = 2,847;$$

$$\text{and } PVCF_4 = \frac{4,000}{1.12^4} = 2,542. \text{ CF after year 3} = -10,000 + 3,571 + 3,189 + 2,847 = -393$$

$$\frac{393}{\text{year 4 DCF}} = \frac{393}{2,542} = 0.15, \text{ for a discounted payback period of 3.15 years.}$$

12. **C** Independent projects accept all with positive NPVs or IRRs greater than cost of capital. NPV computation is easy—treat cash flows as an annuity.

Project A: N = 5; I = 12; PMT = 5,000; FV = 0; CPT → PV = –18,024
NPV_A = 18,024 – 15,000 = $3,024

Project B: N = 4; I = 12; PMT = 7,500; FV = 0; CPT → PV = –22,780
NPV_B = 22,780 – 20,000 = $2,780

13. **B** Accept the project with the highest NPV.

14. **C** The crossover rate for the NPV profiles of two projects occurs at the discount rate that results in both projects having equal NPVs.

15. **A** A post-audit identifies what went right and what went wrong. It is used to improve forecasting and operations.

16. **C** According to survey results, large companies, public companies, U.S. companies, and companies managed by a corporate manager with an advanced degree, are more likely to use discounted cash flow techniques like NPV to evaluate capital projects.

17. **B** The NPV of the new equipment is $700 million – $400 million = $300 million. The value of this project is added to Fullen's current market value. On a per-share basis, the addition is worth $300 million / 200 million shares, for a net addition to the share price of $1.50. $36.00 + $1.50 = $37.50.

COST OF CAPITAL

EXAM FOCUS

The firm must decide how to raise the capital to fund its business or finance its growth, dividing it among common equity, debt, and preferred stock. The mix that produces the minimum overall cost of capital will maximize the value of the firm (share price). From this topic review, you must understand weighted average cost of capital and its calculation and be ready to calculate the costs of retained earnings, new common stock, preferred stock, and the after-tax cost of debt. Don't worry about choosing among the methods for calculating the cost of retained earnings; the information given in the question will make it clear which one to use. This is very testable material, and you must know all these methods and understand why the marginal cost of capital increases as greater amounts of capital are raised over a given period (usually taken to be a year).

LOS 45.a: Calculate and interpret the weighted average cost of capital (WACC) of a company.

LOS 45.b: Describe how taxes affect the cost of capital from different capital sources.

The capital budgeting process involves discounted cash flow analysis. To conduct such analysis, you must know the firm's proper discount rate. This topic review discusses how, as an analyst, you can determine the proper rate at which to discount the cash flows associated with a capital budgeting project. This discount rate is the firm's **weighted average cost of capital** (WACC) and is also referred to as the **marginal cost of capital** (MCC).

Basic definitions. On the right (liability) side of a firm's balance sheet, we have debt, preferred stock, and common equity. These are normally referred to as the *capital components* of the firm. Any increase in a firm's total assets will have to be financed through an increase in at least one of these capital accounts. The cost of each of these components is called the *component cost* of capital.

Throughout this review, we focus on the following capital components and their component costs:

k_d	The rate at which the firm can issue new debt. This is the yield to maturity on existing debt. This is also called the before-tax component cost of debt.
$k_d(1-t)$	The after-tax cost of debt. Here, t is the firm's marginal tax rate. The after-tax component cost of debt, $k_d(1-t)$, is used to calculate the WACC.
k_{ps}	The cost of preferred stock.

k_{ce} The cost of common equity. It is the required rate of return on common stock and is generally difficult to estimate.

In many countries, the interest paid on corporate debt is tax deductible. Since we are interested in the after-tax cost of capital, we adjust the cost of debt, k_d, for the firm's marginal tax rate, t. Since there is typically no tax deduction allowed for payments to common or preferred stockholders, there is no equivalent deduction to k_{ps} or k_{ce}.

How a company raises capital and how they budget or invest it are considered independently. Most companies have separate departments for the two tasks. The financing department is responsible for keeping costs low and using a balance of funding sources: common equity, preferred stock, and debt. Generally, it is necessary to raise each type of capital in large sums. The large sums may temporarily overweight the most recently issued capital, but in the long run, the firm will adhere to target weights. Because of these and other financing considerations, each investment decision must be made assuming a WACC, which includes each of the different sources of capital and is based on the long-run target weights. A company creates value by producing a return on assets that is higher than the required rate of return on the capital needed to fund those assets.

The WACC, as we have described it, is the cost of financing firm assets. We can view this cost as an opportunity cost. Consider how a company could reduce its costs if it found a way to produce its output using fewer assets, like less working capital. If we need less working capital, we can use the funds freed up to buy back our debt and equity securities in a mix that just matches our target capital structure. Our after-tax savings would be the WACC based on our target capital structure times the total value of the securities that are no longer outstanding.

For these reasons, any time we are considering a project that requires expenditures, comparing the return on those expenditures to the WACC is the appropriate way to determine whether undertaking that project will increase the value of the firm. This is the essence of the capital budgeting decision. Since a firm's WACC reflects the average risk of the projects that make up the firm, it is not appropriate for evaluating all new projects. It should be adjusted upward for projects with greater-than-average risk and downward for projects with less-than-average risk.

The weights in the calculation of a firm's WACC are the proportions of each source of capital in a firm's capital structure.

Calculating a Company's Weighted Average Cost of Capital

The WACC is given by:

$$\text{WACC} = (w_d)[k_d(1 - t)] + (w_{ps})(k_{ps}) + (w_{ce})(k_{ce})$$

where:
w_d = the percentage of debt in the capital structure
w_{ps} = the percentage of preferred stock in the capital structure
w_{ce} = the percentage of common stock in the capital structure

Example: Computing WACC

Suppose Dexter, Inc.'s target capital structure is as follows:

$$w_d = 0.45, \ w_{ps} = 0.05, \ \text{and} \ w_{ce} = 0.50$$

Its before-tax cost of debt is 8%, its cost of equity is 12%, its cost of preferred stock is 8.4%, and its marginal tax rate is 40%. Calculate Dexter's WACC.

Answer:

Dexter's WACC will be:

$$WACC = (w_d)(k_d)(1 - t) + (w_{ps})(k_{ps}) + (w_{ce})(k_{ce})$$

$$WACC = (0.45)(0.08)(0.6) + (0.05)(0.084) + (0.50)(0.12) = 0.0858 \cong 8.6\%$$

LOS 45.c: Describe alternative methods of calculating the weights used in the WACC, including the use of the company's target capital structure.

The weights in the calculation of WACC should be based on the firm's target capital structure; that is, the proportions (based on market values) of debt, preferred stock, and equity that the firm expects to achieve over time. In the absence of any explicit information about a firm's target capital structure from the firm itself, an analyst may simply use the firm's current capital structure (based on market values) as the best indication of its target capital structure. If there has been a noticeable trend in the firm's capital structure, the analyst may want to incorporate this trend into his estimate of the firm's target capital structure. For example, if a firm has been reducing its proportion of debt financing each year for two or three years, the analyst may wish to use a weight on debt that is lower than the firm's current weight on debt in constructing the firm's target capital structure.

Alternatively, an analyst may wish to use the industry average capital structure as the target capital structure for a firm under analysis.

Example: Determining target capital structure weights

The market values of a firm's capital are as follows:

- Debt outstanding: $8 million
- Preferred stock outstanding: $2 million
- Common stock outstanding: $10 million
- Total capital: $20 million

What is the firm's target capital structure based on its existing capital structure?

Answer:

debt 40%, $w_d = 0.40$

preferred stock 10%, $w_{ps} = 0.10$

common stock 50%, $w_{ce} = 0.50$

For the industry average approach, we would simply use the arithmetic average of the current market weights (for each capital source) from a sample of industry firms.

LOS 45.d: Explain how the marginal cost of capital and the investment opportunity schedule are used to determine the optimal capital budget.

A company increases its value and creates wealth for its shareholders by earning more on its investment in assets than is required by those who provide the capital for the firm. A firm's WACC may increase as larger amounts of capital are raised. Thus, its marginal cost of capital, the cost of raising additional capital, can increase as larger amounts are invested in new projects. This is illustrated by the upward-sloping **marginal cost of capital** curve in Figure 1. Given the expected returns (IRRs) on potential projects, we can order the expenditures on additional projects from highest to lowest IRR. This will allow us to construct a downward sloping **investment opportunity schedule**, such as that shown in Figure 1.

Figure 1: The Optimal Capital Budget
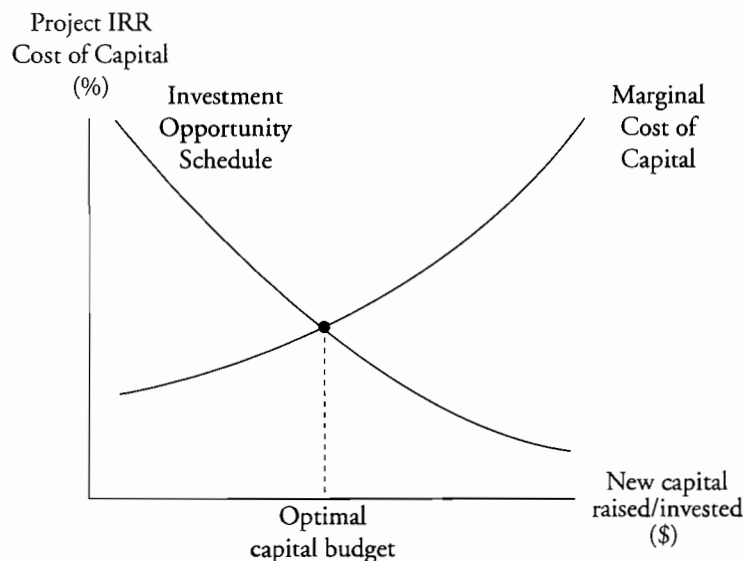
The intersection of the investment opportunity schedule with the marginal cost of capital curve identifies the amount of the **optimal capital budget**. The intuition here is that the firm should undertake all those projects with IRRs greater than the cost of funds, the same criterion developed in the capital budgeting topic review. This will maximize the value created. At the same time, no projects with IRRs less than the marginal cost of the additional capital required to fund them should be undertaken, as they will erode the value created by the firm.

LOS 45.e: Explain the marginal cost of capital's role in determining the net present value of a project.

One cautionary note regarding the simple logic behind Figure 1 is in order. All projects do not have the same risk. The WACC is the appropriate discount rate for projects that have approximately the same level of risk as the firm's existing projects. This is because the component costs of capital used to calculate the firm's WACC are based on the existing level of firm risk. To evaluate a project with greater than (the firm's) average risk, a discount rate greater than the firm's existing WACC should be used. Projects with below-average risk should be evaluated using a discount rate less than the firm's WACC.

An additional issue to consider when using a firm's WACC (marginal cost of capital) to evaluate a specific project is that there is an implicit assumption that the capital structure of the firm will remain at the target capital structure over the life of the project.

These complexities aside, we can still conclude that the NPVs of potential projects of firm-average risk should be calculated using the marginal cost of capital for the firm. Projects for which the present value of the after-tax cash inflows is greater than the present value of the after-tax cash outflows should be undertaken by the firm.

LOS 45.f: Calculate and interpret the cost of fixed rate debt capital using the yield-to-maturity approach and the debt-rating approach.

The **after-tax cost of debt**, $k_d(1 - t)$, is used in computing the WACC. It is the interest rate at which firms can issue new debt (k_d) net of the tax savings from the tax deductibility of interest, $k_d(t)$.

after-tax cost of debt = interest rate – tax savings = $k_d - k_d(t) = k_d(1 - t)$

after-tax cost of debt = $k_d(1 - t)$

Example: Cost of debt

Dexter, Inc., is planning to issue new debt at an interest rate of 8%. Dexter has a 40% marginal federal-plus-state tax rate. What is Dexter's cost of debt capital?

Answer:

$k_d(1 - t) = 8\%(1 - 0.4) = 4.8\%$

Professor's Note: It is important that you realize that the cost of debt is the market interest rate (YTM) on new (marginal) debt, not the coupon rate on the firm's existing debt. CFA Institute may provide you with both rates, and you need to select the current market rate.

If a market YTM is not available because the firm's debt is not publicly traded, the analyst may use the rating and maturity of the firm's existing debt to estimate the before-tax cost of debt. If, for example, the firm's debt carries a single-A rating and has an average maturity of 15 years, the analyst can use the yield curve for single-A rated debt to determine the current market rate for debt with a 15-year maturity.

If any characteristics of the firm's anticipated debt would affect the yield (e.g., covenants or seniority), the analyst should make the appropriate adjustment to his estimated before-tax cost of debt. For firms that primarily employ floating-rate debt, the analyst should estimate the longer-term cost of the firm's debt using the current yield curve (term structure) for debt of the appropriate rating category.

LOS 45.g: Calculate and interpret the cost of noncallable, nonconvertible preferred stock.

The cost of preferred stock (k_{ps}) is:

$$k_{ps} = D_{ps} / P$$

where:
D_{ps} = preferred dividends
P = market price of preferred

Example: Cost of preferred stock

Suppose Dexter, Inc. has preferred stock that pays an $8 dividend per share and sells for $100 per share. What is Dexter's cost of preferred stock?

Answer:

$$k_{ps} = D_{ps} / P$$

$$k_{ps} = \$8 / \$100 = 0.08 = 8\%$$

Note that the equation $k_{ps} = D_{ps} / P$ is just a rearrangement of the preferred stock valuation model $P = D_{ps} / k_{ps}$, where P is the market price.

LOS 45.h: Calculate and interpret the cost of equity capital using the capital asset pricing model approach, the dividend discount model approach, and the bond-yield-plus risk-premium approach.

The opportunity **cost of equity capital** (k_{ce}) is the required rate of return on the firm's common stock. The rationale here is that the firm could avoid part of the cost of common stock outstanding by using retained earnings to buy back shares of its own stock. The cost of (i.e., the required return on) common equity can be estimated using one of the following three approaches:

1. **The capital asset pricing model approach.**
   Step 1: Estimate the risk-free rate, RFR. The short-term Treasury bill (T-bill) rate is usually used, but some analysts feel the long-term Treasury rate should be used.
   Step 2: Estimate the stock's beta, β. This is the stock's risk measure.
   Step 3: Estimate the expected rate of return on the market, $E(R_{mkt})$.
   Step 4: Use the capital asset pricing model (CAPM) equation to estimate the required rate of return:

   $$k_{ce} = RFR + \beta[E(R_m) - RFR]$$

Example: Using CAPM to estimate k_{ce}

Suppose RFR = 6%, R_{mkt} = 11%, and Dexter has a beta of 1.1. Estimate Dexter's cost of equity.

Answer:

The required rate of return for Dexter's stock is:

$$k_{ce} = 6\% + 1.1(11\% - 6\%) = 11.5\%$$

Professor's Note: If you are unfamiliar with the Capital Asset Pricing Model, you can find more detail and the basic elements of its derivation in the Study Session titled Portfolio Management.

2. **The dividend discount model approach.** If dividends are expected to grow at a constant rate, g, then the current value of the stock is given by the dividend growth model:

$$P_0 = \frac{D_1}{k_{ce} - g}$$

where:
D_1 = next year's dividend
k_{ce} = the required rate of return on common equity
g = the firm's expected constant growth rate

Rearranging the terms, you can solve for k_{ce}:

$$k_{ce} = \frac{D_1}{P_0} + g$$

In order to use $k_{ce} = \dfrac{D_1}{P_0} + g$, you have to estimate the expected growth rate, g. This can be done by:

- Using the growth rate as projected by security analysts.
- Using the following equation to estimate a firm's sustainable growth rate:

    g = (retention rate)(return on equity) = (1 – payout rate)(ROE)

The difficulty with this model is estimating the firm's future growth rate.

Example: Estimating k_{ce} using the dividend discount model

Suppose Dexter's stock sells for $21, next year's dividend is expected to be $1, Dexter's expected ROE is 12%, and Dexter is expected to pay out 40% of its earnings. What is Dexter's cost of equity?

Answer:

g = (ROE)(retention rate)

g = (0.12)(1 – 0.4) = 0.072 = 7.2%

k_{ce} = (1 / 21) + 0.072 = 0.12 or 12%

3. **Bond yield plus risk premium approach.** Analysts often use an ad hoc approach to estimate the required rate of return. They add a risk premium (three to five percentage points) to the market yield on the firm's long-term debt.

    k_{ce} = bond yield + risk premium

Example: Estimating k_{ce} with bond yields plus a risk premium

Dexter's interest rate on long-term debt is 8%. Suppose the risk premium is estimated to be 5%. Estimate Dexter's cost of equity.

Answer:

Dexter's estimated cost of equity is:

$$k_{ce} = 8\% + 5\% = 13\%$$

Note that the three models gave us three different estimates of k_{ce}. The CAPM estimate was 11.5%, the dividend discount model estimate was 12%, and the bond yield plus risk premium estimate was 13%. Analysts must use their judgment to decide which is most appropriate.

LOS 45.i: Calculate and interpret the beta and cost of capital for a project.

A project's beta is a measure of its systematic or market risk. Just as we can use a firm's beta to estimate its required return on equity, we can use a project's beta to adjust for differences between a specific project's risk and the average risk of a firm's projects.

Since a specific project is not represented by a publicly traded security, we typically cannot estimate a project's beta directly. One process that can be used is based on the equity beta of a publicly traded firm that is engaged in a business similar to, and with risk similar to, the project under consideration. This is referred to as the **pure-play method** because we begin with the beta of a company or group of companies that are *purely* engaged in a business similar to that of the project and are therefore comparable to the project. Thus, using the beta of a conglomerate that is engaged in the same business as the project would be inappropriate because its beta depends on its many different lines of business.

The beta of a firm is a function not only of the business risks of its projects (lines of business) but also of its financial structure. For a given set of projects, the greater a firm's reliance on debt financing, the greater its equity beta. For this reason, we must adjust the pure-play beta from a comparable company (or group of companies) for the company's leverage (unlever it) and then adjust it (re-lever it) based on the financial structure of the company evaluating the project. We can then use this equity beta to calculate the cost of equity to be used in evaluating the project.

To get the *asset beta* for a publicly traded firm, we use the following formula:

$$\beta_{ASSET} = \beta_{EQUITY} \left[\frac{1}{1 + \left((1-t)\dfrac{D}{E} \right)} \right]$$

where: D/E is the *comparable company's* debt-to-equity ratio and *t* is its marginal tax rate.

To get the equity beta for the project, we use the *subject firm's* tax rate and debt-to-equity ratio:

$$\beta_{PROJECT} = \beta_{ASSET} \left[1 + \left((1-t)\dfrac{D}{E} \right) \right]$$

The following example illustrates this technique.

Example:

Acme Inc. is considering a project in the food distribution business. It has a D/E ratio of 2, a marginal tax rate of 40%, and its debt currently has a yield of 14%. Balfor, a publicly traded firm that operates only in the food distribution business, has a D/E ratio of 1.5, a marginal tax rate of 30%, and an equity beta of 0.9. The risk-free rate is 5% and the expected return on the market portfolio is 12%. Calculate Balfor's asset beta, the project's equity beta, and the appropriate WACC to use in evaluating the project.

Answer:

Balfor's asset beta:

$$\beta_{ASSET} = 0.9 \left[\frac{1}{1 + (1 - 0.3)(1.5)} \right] = 0.439$$

Equity beta for the project:

$$\beta_{PROJECT} = 0.439[1 + (1 - 0.4)(2)] = 0.966$$

Project cost of equity = 5% + 0.966(12% − 5%) = 11.762%

To get the weights of debt and equity, use the D / E ratio and give equity a value of 1. Here, D/E = 2, so if E = 1, D = 2. The weight for debt, D/(D + E), is 2/(2 + 1) = 2/3, and the weight for equity, E/(D + E), is 1/(2 + 1) = 1/3. The appropriate WACC for the project is therefore:

$$\frac{1}{3}(11.762\%) + \frac{2}{3}(14\%)(1 - 0.4) = 9.52\%$$

While the method is theoretically correct, there are several challenging issues involved in estimating the beta of the comparable (or any) company's equity:

- Beta is estimated using historical returns data. The estimate is sensitive to the length of time used and the frequency (daily, weekly, etc.) of the data.
- The estimate is affected by which index is chosen to represent the market return.
- Betas are believed to revert toward 1 over time, and the estimate may need to be adjusted for this tendency.
- Estimates of beta for small-capitalization firms may need to be adjusted upward to reflect risk inherent in small firms that is not captured by the usual estimation methods.

LOS 45.j: Explain the country equity risk premium in the estimation of the cost of equity for a company located in a developing market.

Using the CAPM to estimate the cost of equity is problematic in developing countries because beta does not adequately capture country risk. To reflect the increased risk associated with investing in a developing country, a **country risk premium** is added to the market risk premium when using the CAPM.

The general risk of the developing country is reflected in its **sovereign yield spread**. This is the difference in yields between the developing country's government bonds (denominated in the developed market's currency) and Treasury bonds of a similar maturity. To estimate an equity risk premium for the country, adjust the sovereign yield spread by the ratio of volatility between the country's equity market and its government bond market (for bonds denominated in the developed market's currency). A more volatile equity market increases the country risk premium, other things equal.

The revised CAPM equation is stated as:

$$k_{ce} = R_F + \beta\left[E(R_{MKT}) - R_F + CRP\right]$$

where:
CRP = country risk premium

The country risk premium can be calculated as:

$$CRP = \text{sovereign yield spread} \times \left(\frac{\text{Annualized standard deviation of equity index of developing country}}{\text{Annualized standard deviation of sovereign bond market in terms of the developed market currency}}\right)$$

where:
sovereign yield spread = difference between the yields of government bonds in the developing country and Treasury bonds of similar maturities

Example: Country risk premium

Robert Rodriguez, an analyst with Omni Corporation, is estimating a country risk premium to include in his estimate of the cost of equity for a project Omni is starting in Venezuela. Rodriguez has compiled the following information for his analysis:

- Venezuelan U.S. dollar-denominated 10-year government bond yield = 8.6%
- 10-year U.S. Treasury bond yield = 4.8%
- Annualized standard deviation of Venezuelan stock index = 32%
- Annualized standard deviation of Venezuelan U.S. dollar-denominated 10-year government bond = 22%
- Project beta = 1.25
- Expected market return = 10.4%
- Risk-free rate = 4.2%

Calculate the country risk premium and the cost of equity for Omni's Venezuelan project.

Answer:

Country risk premium:

$$\text{CRP} = (0.086 - 0.048)\left(\frac{0.32}{0.22}\right) = 0.038\left(\frac{0.32}{0.22}\right) = 0.0553, \text{ or } 5.53\%$$

Cost of equity:

$$\begin{aligned}
k_{ce} &= R_F + \beta\left[E(R_{MKT}) - R_F + \text{CRP}\right] \\
&= 0.042 + 1.25\left[0.104 - 0.042 + 0.0553\right] \\
&= 0.042 + 1.25\left[0.1173\right] \\
&= 0.1886, \text{ or } 18.86\%
\end{aligned}$$

LOS 45.k: Describe the marginal cost of capital schedule, explain why it may be upward-sloping with respect to additional capital, and calculate and interpret its break-points.

The **marginal cost of capital** (MCC) is the cost of the last new dollar of capital a firm raises. As a firm raises more and more capital, the costs of different sources of financing will increase. For example, as a firm raises additional debt, the cost of debt will rise to account for the additional financial risk. This will occur, for example, if bond covenants in the firm's existing senior debt agreement prohibit the firm from issuing additional debt with the same seniority as the existing debt. Therefore, the company will have to issue more expensive subordinated bonds at a higher cost of debt, which increases the marginal cost of capital.

Also, issuing new equity is more expensive than using retained earnings due to flotation costs (which are discussed in more detail in the next LOS). The bottom line is that raising additional capital results in an increase in the WACC.

The **marginal cost of capital schedule** shows the WACC for different amounts of financing. Typically, the MCC is shown as a graph. Since different sources of financing become more expensive as the firm raises more capital, the MCC schedule typically has an upward slope.

Break points occur any time the cost of one of the components of the company's WACC changes. A break point is calculated as:

$$\text{break point} = \frac{\text{amount of capital at which the component's cost of capital changes}}{\text{weight of the component in the capital structure}}$$

Example: Calculating break points

The Omni Corporation has a target capital structure of 60% equity and 40% debt. The schedule of financing costs for the Omni Corporation is shown in the figure below.

Schedule of Capital Costs for Omni

Amount of New Debt (in millions)	After-tax Cost of Debt	Amount of New Equity (in millions)	Cost of Equity
$0 to $99	4.2%	$0 to $199	6.5%
$100 to $199	4.6%	$200 to $399	8.0%
$200 to $299	5.0%	$400 to $599	9.5%

Calculate the break points for Omni Corporation, and graph the marginal cost of capital schedule.

Answer:

Omni will have a break point each time a component cost of capital changes, for a total of four break points.

$$\text{break point}_{\text{Debt} > \$100mm} = \frac{\$100 \text{ million}}{0.4} = \$250 \text{ million}$$

$$\text{break point}_{\text{Debt} > \$200mm} = \frac{\$200 \text{ million}}{0.4} = \$500 \text{ million}$$

$$\text{break point}_{\text{Equity} > \$200mm} = \frac{\$200 \text{ million}}{0.6} = \$333 \text{ million}$$

$$\text{break point}_{\text{Equity} > \$400mm} = \frac{\$400 \text{ million}}{0.6} = \$667 \text{ million}$$

The following figure shows Omni Corporation's WACC for the different break points.

WACC for Alternative Levels of Financing

Capital (in millions)	Equity (60%)	Cost of Equity	Debt (40%)	Cost of Debt	WACC
$50	$30	6.5%	$20	4.2%	5.58%
$250	$150	6.5%	$100	4.6%	5.74%
$333	$200	8.0%	$133	4.6%	6.64%
$500	$300	8.0%	$200	5.0%	6.80%
$667	$400	9.5%	$267	5.0%	7.70%

The following figure is a graph of the marginal cost of capital schedule given in the previous figure. Notice the upward slope of the line due to the increased financing costs as more financing is needed.

Marginal Cost of Capital Schedule for Omni Corporation
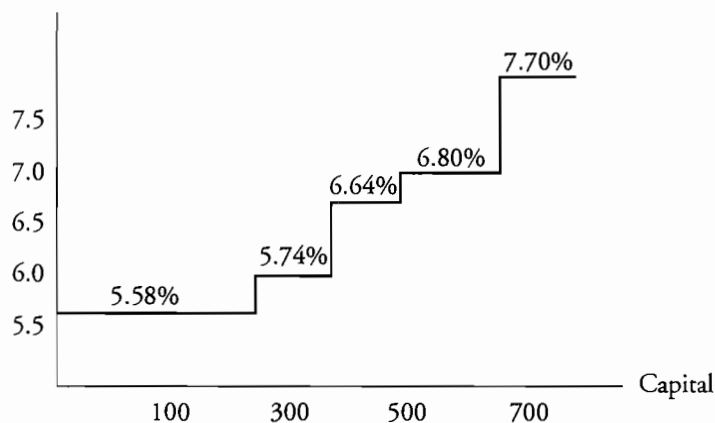
LOS 45.l: Explain and demonstrate the correct treatment of flotation costs.

Flotation costs are the fees charged by investment bankers when a company raises external equity capital. Flotation costs can be substantial and often amount to between 2% and 7% of the total amount of equity capital raised, depending on the type of offering.

Incorrect Treatment of Flotation Costs

Since the LOS asks for the "correct treatment of flotation costs," that implies that there is an incorrect treatment. Many financial textbooks incorporate flotation costs directly into the cost of capital by increasing the cost of external equity. For example, if a company has a dividend of $1.50 per share, a current price of $30 per share, and an expected growth rate of 6%, the cost of equity without flotation costs would be:

$$r_e = \left(\frac{\$1.50(1+0.06)}{\$30} \right) + 0.06 = 0.1130, \text{ or } 11.30\%$$

Professor's Note: Here we're using the constant growth model, rather than the CAPM, to estimate the cost of equity.

If we incorporate flotation costs of 4.5% directly into the cost of equity computation, the cost of equity increases:

$$r_e = \left[\frac{\$1.50(1+0.06)}{\$30(1-0.045)} \right] + 0.06 = 0.1155, \text{ or } 11.55\%$$

Correct Treatment of Flotation Costs

In the incorrect treatment we have just seen, flotation costs effectively increase the WACC by a fixed percentage and will be a factor for the duration of the project because future project cash flows are discounted at this higher WACC to determine project NPV. The problem with this approach is that flotation costs are not an ongoing expense for the firm. Flotation costs are a cash outflow that occurs at the initiation of a project and affect the project NPV by increasing the initial cash outflow. Therefore, *the correct way to account for flotation costs is to adjust the initial project cost.* An analyst should calculate the dollar amount of the flotation cost attributable to the project and increase the initial cash outflow for the project.

Example: Correctly accounting for flotation costs

Omni Corporation is considering a project that requires a $400,000 cash outlay and is expected to produce cash flows of $150,000 per year for the next four years. Omni's tax rate is 35%, and the before-tax cost of debt is 6.5%. The current share price for Omni's stock is $36 per share, and the expected dividend next year is $2 per share. Omni's expected growth rate is 5%. Assume that Omni finances the project with 50% debt and 50% equity capital, and that flotation costs for equity are 4.5%. The appropriate discount rate for the project is the WACC.

Calculate the NPV of the project using the correct treatment of flotation costs, and discuss how the result of this method differs from the result obtained from the incorrect treatment of flotation costs.

Answer:

after-tax cost of debt $= 6.5\% \ (1 - 0.35) = 4.23\%$

cost of equity $= \left(\dfrac{\$2}{\$36}\right) + 0.05 = 0.1055$, or 10.55%

$\text{WACC} = 0.50(0.0423) + 0.50(0.1055) = 7.39\%$

Since the project is financed with 50% equity, the amount of equity capital raised is $0.50 \times \$400,000 = \$200,000$.

Flotation costs are 4.5%, which equates to a dollar cost of $\$200,000 \times 0.045 = \$9,000$.

$$\text{NPV} = -\$400,000 - \$9,000 + \frac{\$150,000}{1.0739} + \frac{\$150,000}{(1.0739)^2} + \frac{\$150,000}{(1.0739)^3} + \frac{\$150,000}{(1.0739)^4}$$

$$= \$94,640$$

For comparison, if we would have adjusted the cost of equity for flotation costs, the cost of equity would have increased to $10.82\% \left(= \dfrac{\$2.00}{\$36(1 - 0.045)} + 0.05\right)$, which

would have increased the WACC to 7.53%. Using this method, the NPV of the project would have been:

$$\text{NPV} = -\$400,000 + \frac{\$150,000}{1.0753} + \frac{\$150,000}{(1.0753)^2} + \frac{\$150,000}{(1.0753)^3} + \frac{\$150,000}{(1.0753)^4} = \$102,061$$

The two methods result in significantly different estimates for the project NPV. Adjusting the initial outflow for the dollar amount of the flotation costs is the correct approach because it provides the most accurate assessment of the project's value once all costs are considered.

KEY CONCEPTS

LOS 45.a

$$\text{WACC} = (w_d)(k_d)(1-t) + (w_{ps})(k_{ps}) + (w_{ce})(k_{ce})$$

The weighted average cost of capital, or WACC, is calculated using weights based on the market values of each component of a firm's capital structure and is the correct discount rate to use to discount the cash flows of projects with risk equal to the average risk of a firm's projects.

LOS 45.b

Interest expense on a firm's debt is tax-deductible, so the pre-tax cost of debt must be reduced by the firm's marginal tax rate to get an after-tax cost of debt capital.

after-tax cost of debt = k_d (1 – firm's marginal tax rate)

The pre-tax and after-tax capital costs are equal for both preferred stock and common equity because dividends paid by the firm are not tax-deductible.

LOS 45.c

WACC should be calculated based on a firm's target capital structure weights.

If information on a firm's target capital structure is not available, an analyst can use the firm's current capital structure, based on market values, or the average capital structure in the firm's industry as estimates of the target capital structure.

LOS 45.d

A firm's marginal cost of capital (WACC at each level of capital investment) increases as it needs to raise larger amounts of capital. This is shown by an upward-sloping marginal cost of capital curve.

An investment opportunity schedule shows the IRRs of (in decreasing order), and the initial investment amounts for, a firm's potential projects.

The intersection of a firm's investment opportunity schedule with its marginal cost of capital curve indicates the optimal amount of capital expenditure, the amount of investment required to undertake all positive NPV projects.

LOS 45.e

The marginal cost of capital (the WACC for additional units of capital) should be used as the discount rate when calculating project NPVs for capital budgeting decisions.

Adjustments to the cost of capital are necessary when a project differs in risk from the average risk of a firm's existing projects. The discount rate should be adjusted upward for higher-risk projects and downward for lower-risk projects.

LOS 45.f

The before-tax cost of fixed-rate debt capital, k_d, is the rate at which the firm can issue new debt.

- The yield-to-maturity approach assumes the before-tax cost of debt capital is the YTM on the firm's existing publicly traded debt.
- If a market YTM is not available, the analyst can use the debt rating approach, estimating the before-tax cost of debt capital based on market yields for debt with the same rating and average maturity as the firm's existing debt.

LOS 45.g

The cost (and yield) of noncallable, nonconvertible preferred stock is simply the annual dividend divided by the market price of preferred shares.

LOS 45.h

The cost of equity capital, k_{ce}, is the required rate of return on the firm's common stock.

There are three approaches to estimating k_{ce}:

- CAPM approach: $k_{ce} = RFR + \beta[E(R_{mkt}) - RFR]$.
- Dividend discount model approach: $k_{ce} = (D_1/P_0) + g$.
- Bond yield plus risk premium approach: add a risk premium of 3% to 5% to the market yield on the firm's long-term debt.

LOS 45.i

When a project's risk differs from that of the firm's average project, we can use the beta of a company or group of companies that are exclusively in the same business as the project to calculate the project's required return. This *pure-play method* involves the following steps:

1. Estimate the beta for a comparable company or companies.

2. Unlever the beta to get the asset beta using the marginal tax rate and debt-to-equity ratio for the comparable company:

$$\beta_{ASSET} = \beta_{EQUITY} \left\{ \frac{1}{1 + \left[(1-t)\dfrac{D}{E} \right]} \right\}$$

3. Re-lever the beta using the marginal tax rate and debt-to-equity ratio for the firm considering the project:

$$\beta_{PROJECT} = \beta_{ASSET} \left\{ 1 + \left[(1-t)\dfrac{D}{E} \right] \right\}$$

4. Use the CAPM to estimate the required return on equity to use when evaluating the project.

5. Calculate the WACC for the firm using the project's required return on equity.

LOS 45.j

A country risk premium should be added to the market risk premium in the CAPM to reflect the added risk associated with investing in a developing market.

The country risk premium for a developing country can be estimated as the spread between the developing country's sovereign debt (denominated in a developed country's currency) and the developed country's sovereign debt (e.g., U.S. T-bills), multiplied by the ratio of the volatility of the developing country's equity market to the volatility of the market for its developed-country-denominated sovereign debt.

LOS 45.k

The marginal cost of capital schedule shows the WACC for successively greater amounts of new capital investment for a period, such as the coming year.

The MCC schedule is typically upward-sloping because raising greater amounts of capital increases the cost of equity and debt financing. Break points (increases) in the marginal cost of capital schedule occur at amounts of total capital raised equal to the amount of each source of capital at which the component cost of capital increases, divided by the target weight for that source of capital.

LOS 45.l

The correct method to account for flotation costs of raising new equity capital is to increase a project's initial cash outflow by the flotation cost attributable to the project when calculating the project's NPV.

CONCEPT CHECKERS

1. A company has $5 million in debt outstanding with a coupon rate of 12%. Currently the yield to maturity (YTM) on these bonds is 14%. If the firm's tax rate is 40%, what is the company's after-tax cost of debt?
    A. 5.6%.
    B. 8.4%.
    C. 14.0%.

2. The cost of preferred stock is equal to:
    A. the preferred stock dividend divided by its par value.
    B. [(1 – tax rate) times the preferred stock dividend] divided by price.
    C. the preferred stock dividend divided by its market price.

3. A company's $100, 8% preferred is currently selling for $85. What is the company's cost of preferred equity?
    A. 8.0%.
    B. 9.4%.
    C. 10.8%.

4. The expected dividend is $2.50 for a share of stock priced at $25. What is the cost of equity if the long-term growth in dividends is projected to be 8%?
    A. 15%.
    B. 16%.
    C. 18%.

5. An analyst gathered the following data about a company:

Capital structure	Required rate of return
30% debt	10% for debt
20% preferred stock	11% for preferred stock
50% common stock	18% for common stock

    Assuming a 40% tax rate, what after-tax rate of return must the company earn on its investments?
    A. 13.0%.
    B. 14.2%.
    C. 18.0%.

6. A company is planning a $50 million expansion. The expansion is to be financed by selling $20 million in new debt and $30 million in new common stock. The before-tax required return on debt is 9% and 14% for equity. If the company is in the 40% tax bracket, the company's marginal cost of capital is *closest* to:
    A. 7.2%.
    B. 10.6%.
    C. 12.0%.

Use the following data to answer Questions 7 through 10.

- The company has a target capital structure of 40% debt and 60% equity.
- Bonds with face value of $1,000 pay a 10% coupon (semiannual), mature in 20 years, and sell for $849.54 with a yield to maturity of 12%.
- The company stock beta is 1.2.
- Risk-free rate is 10%, and market risk premium is 5%.
- The company is a constant-growth firm that just paid a dividend of $2, sells for $27 per share, and has a growth rate of 8%.
- The company's marginal tax rate is 40%.

7. The company's after-tax cost of debt is:
    A. 7.2%.
    B. 8.0%.
    C. 9.1%.

8. The company's cost of equity using the capital asset pricing model (CAPM) approach is:
    A. 16.0%.
    B. 16.6%.
    C. 16.9%.

9. The company's cost of equity using the dividend discount model is:
    A. 15.4%.
    B. 16.0%.
    C. 16.6%.

10. The company's weighted average cost of capital (using the cost of equity from CAPM) is *closest* to:
    A. 12.5%.
    B. 13.0%.
    C. 13.5%.

11. What happens to a company's weighted average cost of capital (WACC) if the firm's corporate tax rate increases and if the Federal Reserve causes an increase in the risk-free rate, respectively? (Consider the events independently, and assume a beta of less than one.) WACC will:

	Tax rate increase	Increase in risk-free rate
A.	Decrease	Increase
B.	Decrease	Decrease
C.	Increase	Increase

12.   Given the following information on a company's capital structure, what is the company's weighted average cost of capital? The marginal tax rate is 40%.

Type of capital	Percent of capital structure	Before-tax component cost
Bonds	40%	7.5%
Preferred stock	5%	11%
Common stock	55%	15%

A.   10.0%.
B.   10.6%.
C.   11.8%.

13.   Derek Ramsey is an analyst with Bullseye Corporation, a major U.S.-based discount retailer. Bullseye is considering opening new stores in Brazil and wants to estimate its cost of equity capital for this investment. Ramsey has found that:
   •   The yield on a Brazilian government 10-year U.S. dollar-denominated bond is 7.2%.
   •   A 10-year U.S. Treasury bond has a yield of 4.9%.
   •   The annualized standard deviation of the Sao Paulo Bovespa stock index in the most recent year is 24%.
   •   The annualized standard deviation of Brazil's U.S. dollar-denominated 10-year government bond over the last year was 18%.
   •   The appropriate beta to use for the project is 1.3.
   •   The market risk premium is 6%.
   •   The risk-free interest rate is 4.5%.

Which of the following choices is *closest* to the appropriate country risk premium for Brazil and the cost of equity that Ramsey should use in his analysis?

Country risk premium for Brazil	Cost of equity for project
A. 2.5%	15.6%
B. 2.5%	16.3%
C. 3.1%	16.3%

14.   Manigault Industries currently has assets on its balance sheet of $200 million that are financed with 70% equity and 30% debt. The executive management team at Manigault is considering a major expansion that would require raising additional capital. Rosannna Stallworth, the CFO of Manigault, has put together the following schedule for the costs of debt and equity:

Amount of New Debt (in millions)	After-tax Cost of Debt	Amount of New Equity (in millions)	Cost of Equity
$0 to $49	4.0%	$0 to $99	7.0%
$50 to $99	4.2%	$100 to $199	8.0%
$100 to $149	4.5%	$200 to $299	9.0%

In a presentation to Manigault's Board of Directors, Stallworth makes the following statements:

Statement 1: If we maintain our target capital structure of 70% equity and 30% debt, the break point at which our cost of equity will increase to 8.0% is $185 million in new capital.

Statement 2: If we want to finance total assets of $450 million, our marginal cost of capital will increase to 7.56%.

Are Stallworth's Statements 1 and 2 *most likely* correct or incorrect?

	Statement 1	Statement 2
A.	Correct	Correct
B.	Incorrect	Correct
C.	Incorrect	Incorrect

15.   Black Pearl Yachts is considering a project that requires a $180,000 cash outlay and is expected to produce cash flows of $50,000 per year for the next five years. Black Pearl's tax rate is 25%, and the before-tax cost of debt is 8%. The current share price for Black Pearl's stock is $56 and the expected dividend next year is $2.80 per share. Black Pearl's expected growth rate is 5%. Assume that Black Pearl finances the project with 60% equity and 40% debt, and the flotation cost for equity is 4.0%. The appropriate discount rate is the weighted average cost of capital (WACC). Which of the following choices is *closest* to the dollar amount of the flotation costs and the NPV for the project, assuming that flotation costs are accounted for properly?

	Dollar amount of flotation costs	NPV of project
A.	$4,320	$17,548
B.	$4,320	$13,228
C.	$7,200	$17,548

16.   Jay Company has a debt-to-equity ratio of 2.0. Jay is evaluating the cost of equity for a project in the same line of business as Cass Company and will use the pure-play method with Cass as the comparable firm. Cass has a beta of 1.2 and a debt-to-equity ratio of 1.6. The project beta *most likely*:
A.   will be less than Jay Company's beta.
B.   will be greater than Jay Company's beta.
C.   could be greater than or less than Jay Company's beta.

ANSWERS – CONCEPT CHECKERS

1. **B** $k_d(1 - t) = (0.14)(1 - 0.4) = 8.4\%$

2. **C** Cost of preferred stock $= k_{ps} = D_{ps} / P$

3. **B** $k_{ps} = D_{ps} / P_{ps}$, $D_{ps} = \$100 \times 8\% = \$8$, $k_{ps} = 8 / 85 = 9.4\%$

4. **C** Using the dividend yield plus growth rate approach: $k_{ce} = (D_1 / P_0) + g = (2.50 / 25.00) + 8\% = 18\%$.

5. **A** $\text{WACC} = (w_d)(k_d)(1 - t) + (w_{ps})(k_{ps}) + (w_{ce})(k_{ce}) = (0.3)(0.1)(1 - 0.4) + (0.2)(0.11) + (0.5)(0.18) = 13\%$

6. **B** $w_d = 20 / (20 + 30) = 0.4$, $w_{ce} = 30 / (20 + 30) = 0.6$

   $\text{WACC} = (w_d)(k_d)(1 - t) + (w_{ce})(k_{ce}) = (0.4)(9)(1 - 0.4) + (0.6)(14) = 10.56\% = \text{MCC}$

7. **A** $k_d(1 - t) = 12(1 - 0.4) = 7.2\%$

8. **A** Using the CAPM formula, $k_{ce} = \text{RFR} + \beta[E(R_{mkt}) - \text{RFR}] = 10 + 1.2(5) = 16\%$.

9. **B** $D_1 = D_0 (1 + g) = 2(1.08) = 2.16$; $k_{ce} = (D_1 / P_0) + g = (2.16 / 27) + 0.08 = 16\%$

10. **A** $\text{WACC} = (w_d)(k_d)(1 - t) + (w_{ce})(k_{ce}) = (0.4)(7.2) + (0.6)(16) = 12.48\%$

11. **A** An increase in the corporate tax rate will reduce the after-tax cost of debt, causing the WACC to fall. More specifically, since the after-tax cost of debt $= (k_d)(1 - t)$, the term $(1 - t)$ decreases, decreasing the after-tax cost of debt. If the risk-free rate were to increase, the costs of debt and equity would both increase, thus causing the firm's cost of capital to increase.

12. **B** $\text{WACC} = (w_d)(k_d)(1 - t) + (w_{ps})(k_{ps}) + (w_{ce})(k_{ce}) = (0.4)(7.5)(1 - 0.4) + (0.05)(11) + (0.55)(15) = 10.6\%$

13. **C** $\text{CRP} = \text{sovereign yield spread} \left(\dfrac{\text{Annualized standard deviation of equity index of developing country}}{\text{Annualized standard deviation of sovereign bond market in terms of the developed market currency}} \right)$

    $= (0.072 - 0.049)\left(\dfrac{0.24}{0.18}\right) = 0.031$, or 3.1%

    $k = R_F + \beta[E(R_{MKT}) - R_F + \text{CRP}]$
    $= 0.045 + 1.3[0.06 + 0.031]$
    $= 0.163$, or 16.3%

14. **C** Statement 1 is incorrect. The break point at which the cost of equity changes to 8.0% is:

$$\text{Break point} = \frac{\text{amount of capital at which the component's cost of capital changes}}{\text{weight of the component in the WACC}}$$

$$= \frac{\$100 \text{ million}}{0.70} = \$142.86 \text{ million}$$

Statement 2 is also incorrect. If Manigault wants to finance $450 million of total assets, that means that the firm will need to raise $450 – $200 = $250 million in additional capital. Using the target capital structure of 70% equity, 30% debt, the firm will need to raise 0.70 × $250 = $175 million in new equity and 0.30 × $250 = $75 in new debt. Looking at the capital schedule, the cost associated with $75 million in new debt is 4.2%, and the cost associated with $175 million in new equity is 8.0%. The marginal cost of capital at that point will be (0.3 × 4.2%) + (0.7 × 8.0%) = 6.86%.

15. **B** Since the project is financed with 60% equity, the amount of equity capital raised is 0.60 × $180,000 = $108,000.

Flotation costs are 4.0%, which equates to a dollar cost of $108,000 × 0.04 = $4,320.

After-tax cost of debt = 8.0% (1 – 0.25) = 6.0%

$$\text{Cost of equity} = \left(\frac{\$2.80}{\$56.00}\right) + 0.05 = 0.10, \text{ or } 10.0\%$$

WACC = 0.60(0.10) + 0.40(0.06) = 8.4%

NPV =

$$-\$180,000 - \$4,320 + \frac{\$50,000}{1.084} + \frac{\$50,000}{(1.084)^2} + \frac{\$50,000}{(1.084)^3} + \frac{\$50,000}{(1.084)^4} + \frac{\$50,000}{(1.084)^5} = \$13,228$$

16. **C** The project beta calculated using the pure-play method is not necessarily related in a predictable way to the beta of the firm that is performing the project.

The following is a review of the Corporate Finance principles designed to address the learning outcome statements set forth by CFA Institute®. This topic is also covered in:

WORKING CAPITAL MANAGEMENT

EXAM FOCUS

Firm liquidity is an important concern for an analyst. How a firm manages its working capital, its short-term financing policy, and its sources of short-term financing for liquidity needs are therefore important concerns for the analyst. A good portion of this topic review repeats material on ratios and yield calculations from previous readings and introduces types of debt securities that will also be covered in the topic reviews for fixed income investments.

New concepts introduced here are the management of current assets and liabilities, types of short-term bank financing, and the receivables aging schedule. Understand well why the management of inventory, receivables, and payables is important to a firm's overall profitability and value. The general guidelines for establishing and evaluating a firm's short-term investment policies and for evaluating short-term funding strategy and policy should be sufficient here. Focus on the overall objectives and how they can be met.

LOS 46.a: Describe primary and secondary sources of liquidity and factors that influence a company's liquidity position.

A company's **primary sources of liquidity** are the sources of cash it uses in its normal day-to-day operations. The company's *cash balances* result from selling goods and services, collecting receivables, and generating cash from other sources such as short-term investments. Typical sources of *short-term funding* include trade credit from vendors and lines of credit from banks. Effective *cash flow management* of a firm's collections and payments can also be a source of liquidity for a company.

Secondary sources of liquidity include liquidating short-term or long-lived assets, negotiating debt agreements (i.e., renegotiating), or filing for bankruptcy and reorganizing the company. While using its primary sources of liquidity is unlikely to change the company's normal operations, resorting to secondary sources of liquidity such as these can change the company's financial structure and operations significantly, and may indicate that its financial position is deteriorating.

Factors That Influence a Company's Liquidity Position

In general, a company's liquidity position improves if it can get cash to flow in more quickly and flow out more slowly. Factors that weaken a company's liquidity position are called *drags and pulls* on liquidity.

Drags on liquidity delay or reduce cash inflows, or increase borrowing costs. Examples include uncollected receivables and bad debts, obsolete inventory (takes longer to sell

and can require sharp price discounts), and tight short-term credit due to economic conditions.

Pulls on liquidity accelerate cash outflows. Examples include paying vendors sooner than is optimal and changes in credit terms that require repayment of outstanding balances.

LOS 46.b: Compare a company's liquidity measures with those of peer companies.

Some companies tend to have chronically weak liquidity positions, often due to specific factors that affect the company or its industry. These companies typically need to borrow against their long-lived assets to acquire working capital.

Liquidity ratios are employed by analysts to determine the firm's ability to pay its short-term liabilities.

- The *current ratio* is the best-known measure of liquidity:

$$\text{current ratio} = \frac{\text{current assets}}{\text{current liabilities}}$$

The higher the current ratio, the more likely it is that the company will be able to pay its short-term bills. A current ratio of less than one means that the company has negative working capital and is probably facing a liquidity crisis. Working capital equals current assets minus current liabilities.

- The *quick ratio* or *acid-test ratio* is a more stringent measure of liquidity because it does not include inventories and other assets that might not be very liquid:

$$\text{quick ratio} = \frac{\text{cash + short-term marketable securities + receivables}}{\text{current liabilities}}$$

The higher the quick ratio, the more likely it is that the company will be able to pay its short-term bills.

The current and quick ratios differ only in the assumed liquidity of the current assets that the analyst projects will be used to pay off current liabilities.

- A measure of accounts receivable liquidity is the *receivables turnover:*

$$\text{receivables turnover} = \frac{\text{credit sales}}{\text{average receivables}}$$

It is considered desirable to have a receivables turnover figure close to the industry norm.

> *Professor's Note: This formula for the receivables turnover ratio uses credit sales in the numerator, rather than total sales as shown in the earlier topic review on ratio analysis. While an analyst within a company will know what proportion of sales are credit or cash sales, an external analyst will likely not have this information, but may be able to estimate it based on standard industry practice.*

Professor's Note: In most cases when a ratio compares a balance sheet account (such as receivables) with an income or cash flow item (such as sales), the balance sheet item will be the average of the account instead of simply the end-of-year balance. Averages are calculated by adding the beginning-of-year account value and the end-of-year account value, then dividing the sum by two.

- The inverse of the receivables turnover times 365 is the *number of days of receivables* (also called the *average collection period* or *average days' sales outstanding*), which is the average number of days it takes for the company's customers to pay their bills:

$$\text{number of days of receivables} = \frac{365}{\text{receivables turnover}} = \frac{\text{average receivables}}{\text{average day's credit sales}}$$

It is considered desirable to have a collection period (and receivables turnover) close to the industry norm. The firm's credit terms are another important benchmark used to interpret this ratio. A collection period that is too high might mean that customers are too slow in paying their bills, which means too much capital is tied up in assets. A collection period that is too low might indicate that the firm's credit policy is too rigorous, which might be hampering sales.

- A measure of a firm's efficiency with respect to its processing and inventory management is the *inventory turnover*:

$$\text{inventory turnover} = \frac{\text{cost of goods sold}}{\text{average inventory}}$$

Professor's Note: Pay careful attention to the numerator in the turnover ratios. For inventory turnover, be sure to use cost of goods sold, not sales.

- The inverse of the inventory turnover times 365 is the *average inventory processing period* or *number of days of inventory*:

$$\text{number of days of inventory} = \frac{365}{\text{inventory turnover}} = \frac{\text{average inventory}}{\text{average day's COGS}}$$

As is the case with accounts receivable, it is considered desirable to have an inventory processing period (and inventory turnover) close to the industry norm. A processing period that is too high might mean that too much capital is tied up in inventory and could mean that the inventory is obsolete. A processing period that is too low might indicate that the firm has inadequate stock on hand, which could hurt sales.

- A measure of the use of trade credit by the firm is the *payables turnover ratio*:

$$\text{payables turnover ratio} = \frac{\text{purchases}}{\text{average trade payables}}$$

- The inverse of the payables turnover ratio multiplied by 365 is the *payables payment period* or *number of days of payables*, which is the average amount of time it takes the company to pay its bills:

$$\text{number of days of payables} = \frac{365}{\text{payables turnover ratio}} = \frac{\text{average payables}}{\text{average day's purchases}}$$

LOS 46.c: Evaluate overall working capital effectiveness of a company, using the operating and cash conversion cycles, and compare its effectiveness with other peer companies.

- The **operating cycle**, the average number of days that it takes to turn raw materials into cash proceeds from sales, is:

    operating cycle = days of inventory + days of receivables

- The *cash conversion cycle* or *net operating cycle* is the length of time it takes to turn the firm's cash investment in inventory back into cash, in the form of collections from the sales of that inventory. The cash conversion cycle is computed from the average receivables collection period, average inventory processing period, and the payables payment period.

$$\begin{matrix}\text{cash} \\ \text{conversion} \\ \text{cycle}\end{matrix} = \begin{pmatrix}\text{average days} \\ \text{of receivables}\end{pmatrix} + \begin{pmatrix}\text{average days} \\ \text{of inventory}\end{pmatrix} - \begin{pmatrix}\text{average days} \\ \text{of payables}\end{pmatrix}$$

High cash conversion cycles are considered undesirable. A conversion cycle that is too high implies that the company has an excessive amount of investment in working capital.

LOS 46.d: Identify and evaluate the necessary tools to use in managing a company's net daily cash position.

The purpose of managing a firm's daily cash position is to make sure there is sufficient cash (target balance), but to avoid keeping excess cash balances because of the interest foregone by not investing the cash in short-term securities to earn interest. These short-term securities include:

- U.S. Treasury bills.
- Short-term federal agency securities.
- Bank certificates of deposit.
- Banker's acceptances.
- Time deposits.
- Repurchase agreements.
- Commercial paper.
- Money market mutual funds.
- Adjustable-rate preferred stock.

Adjustable-rate preferred stock has a dividend rate that is reset quarterly to current market yields and offers corporate holders a tax advantage because a percentage of the dividends received are exempt from federal tax. The other securities listed are all described in more detail in the readings on fixed income securities.

Firms also use short-term borrowings, typically from banks or from issuing commercial paper, to manage their daily cash positions.

LOS 46.e: Compute and interpret comparable yields on various securities, compare portfolio returns against a standard benchmark, and evaluate a company's short-term investment policy guidelines.

We covered the yield calculations for short-term discount securities in the "Discounted Cash Flow Applications" reading in Quantitative Methods.

The percentage discount from face value is:

$$\% \text{ discount} = \left(\frac{\text{face value} - \text{price}}{\text{face value}} \right)$$

The discount-basis yield (bank discount yield or BDY) is:

$$\text{discount-basis yield} = \left(\frac{\text{face value} - \text{price}}{\text{face value}} \right) \left(\frac{360}{\text{days}} \right) = \% \text{ discount} \times \left(\frac{360}{\text{days}} \right)$$

The money market yield is:

$$\text{money market yield} = \left(\frac{\text{face value} - \text{price}}{\text{price}} \right) \left(\frac{360}{\text{days}} \right) = \text{holding period yield} \times \left(\frac{360}{\text{days}} \right)$$

where "days" is days to maturity and "price" is the purchase price of the security.

The bond equivalent yield measure for short-term discount securities is calculated as:

$$\text{bond equivalent yield} = \left(\frac{\text{face value} - \text{price}}{\text{price}} \right) \left(\frac{365}{\text{days to maturity}} \right)$$

$$= \text{holding period yield} \times \left(\frac{365}{\text{days}} \right)$$

Professor's Note: In Quantitative Methods, the bond equivalent yield was defined differently as two times the effective semiannual yield.

Returns on the firm's short-term securities investments should be stated as bond equivalent yields. The return on the portfolio should be expressed as a weighted average of these yields.

CASH MANAGEMENT INVESTMENT POLICY

Typically, the objective of cash management is to earn a market return without taking on much risk, either liquidity risk or default risk. Firms invest cash that may be needed in the short term in securities of relatively high credit quality and relatively short maturities to minimize these risks.

It is advisable to have a written investment policy statement. An investment policy statement typically begins with a statement of the purpose and objective of the investment portfolio, some general guidelines about the strategy to be employed to achieve those objectives, and the types of securities that will be used. The investment policy statement will also include specific information on who is allowed to purchase securities, who is responsible for complying with company guidelines, and what steps will be taken if the investment guidelines are not followed. Finally, the investment policy statement will include limitations on the specific types of securities permitted for investment of short-term funds, limitations on the credit ratings of portfolio securities, and limitations on the proportions of the total short-term securities portfolio that can be invested in the various types of permitted securities.

An investment policy statement should be evaluated on how well the policy can be expected to satisfy the goals and purpose of short-term investments, generating yield without taking on excessive credit or liquidity risk. The policy should not be overly restrictive in the context of meeting the goals of safety and liquidity.

LOS 46.f: Assess the performance of a company's accounts receivable, inventory management, and accounts payable functions against historical figures and comparable peer company values.

The management of accounts receivable begins with calculating the average days of receivables and comparing this ratio to the firm's historical performance or to the average ratios for a group of comparable companies. More detail about the accounts receivable performance can be gained by using an **aging schedule** such as that presented in Figure 1.

Figure 1: Receivables Aging ($ 000's)

Days Outstanding	March	April	May
< 31 days	200	212	195
31–60 days	150	165	140
61–90 days	100	90	92
> 90 days	50	70	66

In March, $200,000 of accounts receivable were current—that is, had been outstanding less than 31 days. $50,000 of the receivables at the end of March had been outstanding for more than 90 days.

Presenting this data as percentages of total outstanding receivables can facilitate analysis of how the aging schedule for receivables is changing over time. An example is presented in Figure 2.

Figure 2: Receivables Aging (% of totals)

Days Outstanding	March	April	May
< 31 days	40%	39%	40%
31–60 days	30%	31%	28%
61–90 days	20%	17%	19%
> 90 days	10%	13%	13%

Another useful metric for monitoring the accounts receivable performance is the *weighted average collection period*, which indicates the average days outstanding per dollar of receivables. As illustrated in Figure 3, the weights are the percentage of total receivables in each category, and these are multiplied by the average days to collect accounts within each aging category.

Figure 3: Weighted Average Collection Period – March

Days Outstanding	Average Collection Days	% Weight	Days × Weight
< 31 days	22	40%	8.8
31–60 days	44	30%	13.2
61–90 days	74	20%	14.8
> 90 days	135	10%	13.5
Weighted Average Collection Period			50.3 days

The information necessary to compare a firm's aging schedule and weighted average collection period to other firms is not available. However, analysis of the historical trends and significant changes in a firm's aging schedule and weighted average collection days can give a clearer picture of what is driving changes in the simpler metric of average days of receivables. The company must always evaluate the trade-off between stricter credit terms (and borrower creditworthiness) and the ability to make sales. Terms that are too strict will lead to less-than-optimal sales. Terms that are too lenient will increase sales at the cost of longer average days of receivables, which must be funded at some cost, and will increase bad accounts, directly affecting profitability.

Inventory Management

Inventory management involves a trade-off as well. Inventory levels that are too low will result in lost sales due to stock-outs, while inventory that is too large will have carrying costs because the firm's capital is tied up in inventory. Reducing inventory will free up cash that can be invested in interest-bearing securities or used to reduce debt or equity funding. Increasing average days inventory or a decreasing inventory turnover ratio can both indicate that inventory is too large. A large inventory can lead to greater losses from obsolete items and can also indicate that obsolete items that no longer sell well are included in inventory.

Comparing average days of inventory and inventory turnover ratios between industries, or even between two firms that have different business strategies, can be misleading. The grocery business typically has high inventory turnover, while an art gallery's inventory turnover will typically be low. An auto parts firm that stocks hard-to-find parts for antique cars will likely have a low inventory turnover (and charge premium prices) compared to a chain auto parts store that does most of its business in standard items like oil filters, brake parts, and antifreeze. In any business, inventory management is an important component of effective overall financial management.

Accounts Payable Management

Just as a company must manage its receivables because they require working capital (and therefore have a funding cost), payables must be managed well because they represent a source of working capital to the firm. If the firm pays its payables prior to their due dates, cash is used unnecessarily and interest on it is sacrificed. If a firm pays its payables late, it can damage relationships with suppliers and lead to more restrictive credit terms or even the requirement that purchases be made for cash. Late payment can also result in interest charges that are high compared to other sources of short-term financing.

Typical terms on payables (trade credit) contain a discount available to those who pay quickly as well as a due date. Terms of "2/10 net 60" mean that if the invoice is paid within 10 days, the company gets a 2% discount on the invoiced amount and that if the company does not take advantage of the discount, the net amount is due 60 days from the date of the invoice.

The cost to the company of not taking the discount for early payment can be evaluated as an annualized rate.

$$\text{cost of trade credit} = \left(1 + \frac{\% \text{ discount}}{1 - \% \text{ discount}}\right)^{\frac{365}{\text{days past discount}}} - 1$$

where:
days past discount = the number of days after the end of the discount period

Professor's Note: You should recognize this from Quantitative Methods as the formula for converting a short-term rate to an effective annual rate. [% discount / (1 – % discount)] is the holding period return to the firm of taking advantage of a discount, in the same way that the holding period return on a pure discount security is [discount / (face – discount)].

Trade credit can be a source of liquidity for a company. However, when the cost of trade credit is greater than the company's cost of short-term liquidity from other sources, the company is better off paying the invoice within (ideally at the end of) the discount period.

Example: Cost of trade credit

Calculate and interpret the annualized cost of trade credit for invoice terms of 2/10 net 60, when the invoice is paid on the 40th, 50th, or 60th day.

Answer:

The discount is 2%. The annualized cost of not taking the discount can be calculated when the invoice is paid on:

$$\text{Day 40:} \quad \left(1 + \frac{0.02}{1 - 0.02}\right)^{\frac{365}{40-10}} - 1 = 27.9\%$$

$$\text{Day 50:} \quad \left(1 + \frac{0.02}{1 - 0.02}\right)^{\frac{365}{50-10}} - 1 = 20.2\%$$

$$\text{Day 60:} \quad \left(1 + \frac{0.02}{1 - 0.02}\right)^{\frac{365}{60-10}} - 1 = 15.9\%$$

The annualized cost of trade credit decreases as the payment period increases. If the company does not take the 2% discount within the first 10 days, it should wait until the due date (day 60) to pay the invoice.

Our primary quantitative measure of payables management is average days of payables outstanding, which can also be calculated as:

$$\text{number of days of payables} = \frac{\text{accounts payable}}{\text{average day's purchases}}$$

where:

$$\text{average day's purchases} = \frac{\text{annual purchases}}{365}$$

A company with a short payables period (high payables turnover) may simply be taking advantage of discounts for paying early because it has good low-cost funds available to finance its working capital needs. A company with a long payables period may be such an important buyer that it can effectively utilize accounts payable as a source of short-term funding with relatively little cost (because suppliers will put up with it). Monitoring the changes in days' payables outstanding over time for a single firm will, however, aid the analyst. An extension of days' payables may serve as an early warning of deteriorating short-term liquidity.

LOS 46.g: Evaluate the choices of short-term funding available to a company and recommend a financing method.

There are several sources of short-term funding available to a company, from both bank and non-bank sources. We list the most important of these here.

Sources of Short-Term Funding from Banks

Lines of credit are used primarily by large, financially sound companies.

- *Uncommitted line of credit.* A bank extends an offer of credit for a certain amount but may refuse to lend if circumstances change.
- *Committed (regular) line of credit.* A bank extends an offer of credit that it "commits to" for some period of time. The fact that the bank has committed to extend credit in amounts up to the credit line makes this a more reliable source of short-term funding than an uncommitted line of credit. Banks charge a fee for making such a commitment. Loans under the agreement are typically for periods of less than a year and interest charges are stated in terms of a short-term reference rate, such as LIBOR or the U.S. prime rate, plus a margin to compensate for the credit risk of the loan. Outside the United States, similar arrangements are referred to as *overdraft lines of credit.*
- A *revolving line of credit* is an even more reliable source of short-term financing than a committed line of credit. Revolving lines of credit are typically for longer terms than a committed line of credit, sometimes as long as years. Along with committed lines of credit, revolving credit lines can be verified and can be listed on a firm's financial statements in the footnotes as a source of liquidity.

Companies with weaker credit may have to pledge assets as collateral for bank borrowings. Fixed assets, inventory, and accounts receivable may all serve as collateral for loans. Short-term financing is typically collateralized by receivables or inventory and longer-term loans are secured with a claim to fixed (longer-term) assets. The bank may also have a *blanket lien* which gives it a claim to all current and future firm assets as collateral in case the primary collateral is insufficient and the borrowing firm defaults. When a firm assigns its receivables to the bank making a loan, the company still services the receivables and remains responsible for any receivables that are not paid.

Banker's acceptances are used by firms that export goods. A banker's acceptance is a guarantee from the bank of the firm that has ordered the goods stating that a payment will be made upon receipt of the goods. The exporting company can then sell this acceptance at a discount in order to generate immediate funds.

Factoring refers to the actual sale of receivables at a discount from their face values. The size of the discount will depend on how long it is until the receivables are due, the creditworthiness of the firm's credit customers, and the firm's collection history on its receivables. The "factor" (the buyer of the receivables) takes on the responsibility for collecting receivables and the credit risk of the receivables portfolio.

Non-Bank Sources of Short-Term Funding

Smaller firms and firms with poor credit may use nonbank *finance companies* for short-term funding. The cost of such funding is higher than other sources and is used by firms for which normal bank sources of short-term funding are not available.

Large, creditworthy companies can issue short-term debt securities called **commercial paper**. Whether the firm sells the paper directly to investors (direct placement) or sells it through dealers (dealer-placed paper), the interest costs are typically slightly less than the rate they could get from a bank.

In managing its short-term financing, a firm should focus on the objectives of having sufficient sources of funding for current as well as future foreseeable cash needs, and should seek the most cost-effective rates available given its needs, assets, and creditworthiness. The firm should have the ability to prepay short-term borrowings when cash flow permits and have the flexibility to structure its short-term financing so that the debt matures without peaks and can be matched to expected cash flows. For large borrowers it is important that the firm has alternative sources of short-term funding and even alternative lenders for a particular type of financing. It is often worth having slightly higher overall short-term funding costs in order to have flexibility and redundant sources of financing.

KEY CONCEPTS

LOS 46.a

Primary sources of liquidity are the sources of cash a company uses in its normal operations. If its primary sources are inadequate, a company can use secondary sources of liquidity such as asset sales, debt negotiation, and bankruptcy reorganization.

A company's liquidity position depends on the effectiveness of its cash flow management and is influenced by drags on its cash inflows (e.g., uncollected receivables, obsolete inventory) and pulls on its cash outflows (e.g., early payments to vendors, reductions in credit limits).

LOS 46.b

Measures of a company's short-term liquidity include:
- Current ratio = current assets / current liabilities.
- Quick ratio = (cash + marketable securities + receivables) / current liabilities.

Measures of how well a company is managing its working capital include:
- Receivables turnover = credit sales / average receivables.
- Number of days of receivables = 365 / receivables turnover.
- Inventory turnover = cost of goods sold / average inventory.
- Number of days of inventory = 365 / inventory turnover.
- Payables turnover = purchases / average trade payables.
- Number of days of payables = 365 / payables turnover.

LOS 46.c

The operating cycle and the cash conversion cycle are summary measures of the effectiveness of a company's working capital management.
- Operating cycle = days of inventory + days of receivables.
- Cash conversion cycle = days of inventory + days of receivables – days of payables.

Operating and cash conversion cycles that are high relative to a company's peers suggest the company has too much cash tied up in working capital.

LOS 46.d

Managing a firm's cash position can involve both investing in short-term securities when cash balances are higher than necessary and short-term borrowing when cash balances are lower than needed.

Short-term securities available for investing excess cash include Treasury bills, short-term agency securities, bank CDs, bankers' acceptances, time deposits, repurchase agreements, commercial paper, money market mutual funds, and adjustable-rate preferred stock.

LOS 46.e

Commonly used annualized yields for short-term pure discount securities are based on the days to maturity (days) of the securities and include:

- Discount-basis yields = % discount from face value × (360/days).
- Money market yields = HPY × (360/days).
- Bond-equivalent yields = HPY × (365/days).

The overall objective of short-term cash management is to earn a reasonable return while taking on only very limited credit and liquidity risk. Returns on the firm's short-term securities investments should be stated as bond equivalent yields. The return on the portfolio should be expressed as a weighted average of these yields.

An investment policy statement should include the objectives of the cash management program, details of who is authorized to purchase securities, authorization for the purchase of specific types of securities, limitations on portfolio proportions of each type, and procedures in the event that guidelines are violated.

LOS 46.f

A firm's inventory, receivables, and payables management can be evaluated by comparing days of inventory, days of receivables, and days of payables for the firm over time, and by comparing them to industry averages or averages for a group of peer companies.

A receivables aging schedule and a schedule of weighted average days of receivables can each provide additional detail for evaluating receivables management.

LOS 46.g

There are many choices for short-term borrowing. The firm should keep costs down while also allowing for future flexibility and alternative sources.

The choice of short-term funding sources depends on a firm's size and creditworthiness. Sources available, in order of decreasing firm creditworthiness and increasing cost, include:

- Commercial paper
- Bank lines of credit
- Collateralized borrowing
- Nonbank financing
- Factoring

CONCEPT CHECKERS

1. Firm A and Firm B have the same quick ratio but Firm A has a greater current ratio than Firm B. Compared to Firm B, it is *most likely* that Firm A has:
   A. greater inventory.
   B. greater payables.
   C. a higher receivables turnover ratio.

2. An increase in Rowley Corp's cash conversion cycle and a decrease in Rowley's operating cycle could result from:

	Cash conversion cycle ↑	Operating cycle ↓
A.	Decreased receivables turnover	Increased payables turnover
B.	Decreased receivables turnover	Decrease in days of inventory
C.	Increased inventory turnover	Increased payables turnover

3. An example of a primary source of liquidity is:
   A. liquidating assets.
   B. negotiating debt contracts.
   C. short-term investment portfolios.

4. Boyle Inc. just purchased a banker's acceptance for $25,400. It will mature in 80 days for $26,500. The discount-basis yield and the bond equivalent yield for this security are *closest* to:

	Discount-basis	Bond equivalent
A.	18.7%	18.7%
B.	18.7%	19.8%
C.	4.2%	19.8%

5. Blodnick Corp. has found that its weighted average collection period has increased from 45 days last year to 55 days this year, and its average days of receivables this year is 13 compared to 22 last year. It is *most likely* that:
   A. Blodnick has relaxed its credit standards this year.
   B. Blodnick's credit customers are paying more slowly this year.
   C. credit sales are a greater part of Blodnick's business this year.

6. Chapmin Corp. is a large domestic services firm with a good credit rating. The source of short-term financing it would *most likely* use is:
   A. factoring of receivables.
   B. issuing commercial paper.
   C. issuing banker's acceptances.

ANSWERS – CONCEPT CHECKERS

1. **A**   Inventory is in the numerator of the current ratio but not in the quick ratio. Greater inventory for Firm A is consistent with a greater current ratio for Firm A.

2. **B**   A decrease in receivables turnover would increase days of receivables and increase the cash conversion cycle. A decrease in days of inventory would decrease the operating cycle.

3. **C**   Primary sources of liquidity include ready cash balances, short-term funds (e.g., short-term investment portfolios), and cash flow management. Secondary sources of liquidity include negotiating debt contracts, liquidating assets, and filing for bankruptcy protection and reorganization.

4. **B**   The actual discount on the acceptance is (26,500 – 25,400)/26,500 = 4.151%. The annualized discount, or discount-basis yield, is 4.151(360/80) = 18.68%.

   The holding period yield is (26,500 – 25,400)/25,400 = 4.331%. The bond equivalent yield is 4.331(365/80) = 19.76%.

5. **B**   Outstanding accounts are paying more slowly since the average collection period is up. Blodnick has less credit sales outstanding since days of receivables are down, so credit sales are a *smaller* part of Blodnick's business. Relaxed credit standards would tend to *increase* average days of receivables.

6. **B**   Large firms with good credit have access to the commercial paper market and can get lower financing costs with commercial paper than they can with bank borrowing. Banker's acceptances are used by companies involved in international trade. Factoring of receivables is a higher-cost source of funds and is used more by smaller firms that do not have particularly strong credit.

FINANCIAL STATEMENT ANALYSIS

EXAM FOCUS

This review demonstrates the basic methodology for deriving pro forma financial statements for a company based on a forecast of next period sales. While there are innumerable assumptions and forecasts that can be used in preparing pro forma financial statements, we illustrate the basic methodology under a set of fairly straightforward assumptions.

LOS 47: Demonstrate the use of pro forma income and balance sheet statements.

Pro forma is from the Latin and means "as a matter of form." **Pro forma balance** sheets and **pro forma income statements** here refer to forward-looking financial statements that are constructed based on specific assumptions about future business conditions and firm performance.

> *Professor's Note: Don't confuse these with the "pro forma financial statements" or "pro forma net income" that firms refer to in releasing their financial results. The use of "pro forma" in that context refers to results that are not calculated in accordance with GAAP, supposedly to give a better picture of actual results but often to put firm performance in the best possible light (i.e., put a positive "spin" on their financial results).*

Constructing a pro forma income statement and balance sheet begins with making an assumption about which variable is the overall "driver" of income and balance sheet items. One common assumption is that changes in sales drive any changes in income statement and balance sheet items. For example, if sales are projected to increase by 10%, then we could forecast that cost of goods sold, fixed assets, total assets, debt, and interest expense (among other items) all increase by 10%. Another way to say the same thing is that if costs of goods sold was 70% of revenues last period, it will also be 70% of revenues this period. For a 10% increase in sales, 70% of sales will also increase by 10%, so the two assumptions amount to the same thing. More complex relationships can be incorporated in the assumptions underlying the pro forma financial statements as the analyst feels is warranted. Other items, such as the tax rate, may be assumed to be constant over the forecast period.

The steps involved in constructing sales-driven pro forma financial statements can be listed as:

1. Estimate the relation between changes in sales and the changes in sales-driven income statement and balance sheet items.

2. Estimate the future tax rate, interest rates on debt, lease payments, etc.

3. Forecast sales for the period of interest.

4. Estimate fixed operating costs and fixed financial costs.

5. Integrate these estimates into pro forma financial statements for the period of interest.

CONSTRUCTING PRO FORMA FINANCIAL STATEMENTS

Below are an income statement and balance sheet for Viktor Corp. for the year 20X0. Each shows selected items as a percentage of sales.

Figure 1: Viktor Financial Statements for 20X0

Viktor Income Statement 20X0

($ thousands)		
Sales	23,405.0	100% of sales
Cost of goods sold	9,876.9	42.2% of sales
SG&A	6,857.7	29.3% of sales
Interest expense	1,008.0	7% of LT debt
Nonoperating income	93.6	0.4% of sales
Earnings before tax	5,756.0	
Income tax	1,807.4	at 31.4%
Net income	3,948.6	
Dividends	1,184.6	30% payout
Retained earnings	2,764.1	

Viktor Balance Sheet 20X0

($ thousands)		
Current assets	9,362.0	40% of sales
Net PPE	25,745.5	110% of sales
Total assets	35,107.5	
Current liabilities	3,978.9	17.0% of sales
Long-term debt	14,400.0	
Common stock	3,000.0	
Retained earnings	13,728.7	
Total liabilities + equity	35,107.5	

One way to construct pro forma financial statements for the next period would be to estimate sales for the next period and maintain the same percentage of sales for cost of goods sold, SG&A, nonoperating income, current assets, net PPE, and current liabilities. While this would be a somewhat simplistic method of developing financial projections, it will serve as a starting point from which we can then add more realistic assumptions for the change in individual items from period to period. We will initially assume that long-term debt and common stock remain the same (i.e., no issuance or retirement of debt or common stock) and that the effective tax rate remains constant.

Estimating Sales

To construct pro forma financial statements under this approach, the first step is to estimate next-period sales. One way to estimate next period's sales is to calculate the average compound growth rate of sales over a 5- or 10-year period and use that rate of increase for next period's sales. More complex forecasting methods can be employed as well. One example would be to use regression analysis to estimate the relation between GDP growth and growth in firm sales so that economists' estimates of GDP growth can be used to forecast the change in sales. Economic cycles, seasonality of sales, and specific events such as new product introductions, changes in regulation, and introduction and acceptance of competing products can also be incorporated into more complex sales forecasting models. These methods can also be applied to a company's sales in a (business) segment-by-segment analysis, and the forecast sales for each segment can be aggregated into a total revenue forecast.

For the moment, let's assume that we have generated a forecast of a 5% increase in sales for next year. Using the above assumptions, we can generate the pro forma income statement and balance sheet for Viktor Corp. shown in Figure 2. We have estimated the effective tax rate for the year 20X1 to be the same as for the prior year. If tax laws change or our analysis of Viktor's expected future effective tax rate indicates a change next period, we can improve our financial statement forecast by integrating the projected effective tax rate for the next period into our pro forma statements.

Figure 2: Viktor Corp. Sales-Driven Pro Forma Financial Statements

Viktor Income Statement 20X0 and 20X1 Estimate

($ thousands)	Actual 20X0	Est. 20X1	
Sales	23,405.0	24,575.3	100% of sales
Cost of goods sold	9,876.9	10,370.8	42.2% of sales
SG&A	6,857.7	7,200.5	29.3% of sales
Interest expense	1,008.0	1,008.0	7% of LT debt
Nonoperating income	93.6	98.3	0.4% of sales
Earnings before tax	5,756.0	6,094.2	
Income tax (31.4%)	1,807.4	1,913.6	
Net income	3,948.6	4,180.7	
Dividends at 30% of NI	1,184.6	1,254.2	
Retained earnings	2,764.1	2,926.5	

Viktor Balance Sheet 20X0 and 20X1 Estimate

($ thousands)	Actual 20X0	Est. 20X1	
Current assets	9,362.0	9,830.1	40% of sales
Net PPE	25,745.5	27,032.8	110% of sales
Total assets	35,107.5	36,862.9	
Current liabilities	3,978.9	4,177.8	17.0% of sales
Long-term debt	14,400.0	14,400.0	no change
Common stock	3,000.0	3,000.0	no change
Retained earnings	13,728.7	16,655.1	from Inc. Stmt.
Total liabilities + equity	35,107.5	38,232.9	

Figure 2 presents the estimated values for selected income statement and balance sheet items based on 5% estimated growth in sales and no change in long-term debt, common stock, or the effective tax rate. One part of the process of developing pro forma financial statements is to reconcile the income statement and balance sheet forecasts. Note that in Figure 2 the forecast net income for the year 20X1 is $4.181 million, but the increase in retained earnings (balance sheet) is only $2.927 million. If the firm paid out the difference as dividends, then these two entries are consistent. However, what if we expect Viktor Corp. to pay out only 30% of net income as dividends? In this case we have an excess of net income over the projected increase in asset accounts plus dividend payments. This excess is shown in Figure 3 as a surplus.

Figure 3: Calculation of Viktor's Surplus

Viktor Income Statement 20X0 and 20X1 Estimate

($ thousands)	Actual 20X0	Est. 20X1	
Sales	23,405.0	24,575.3	100% of sales
Cost of goods sold	9,876.9	10,370.8	42.2% of sales
SG&A	6,857.7	7,200.5	29.3% of sales
Interest expense	1,008.0	1,008.0	7% of LT debt
Nonoperating income	93.6	98.3	0.4% of sales
Earnings before tax	5,756.0	6,094.2	
Income tax	1,807.4	1,913.6	at 31.4%
Net income	3,948.6	4,180.7	
Dividends	1,184.6	1,254.2	30% payout
Retained earnings	2,764.1	2,926.5	

Viktor Balance Sheet 20X0 and 20X1 Estimate

($ thousands)	Actual 20X0	Est. 20X1	
Current assets	9,362.0	9,830.1	40% of sales
Net PPE	25,745.5	27,032.8	110% of sales
Total assets	35,107.5	36,862.9	
Current liabilities	3,978.9	4,177.8	17.0% of sales
Long-term debt	14,400.0	14,400.0	no change
Common stock	3,000.0	3,000.0	no change
Retained earnings	13,728.7	16,655.1	from Inc. Stmt.
Total liabilities + equity	35,107.5	38,232.9	
Total assets		36,862.9	
Surplus		1,370.0	

The surplus in Figure 3 is the difference between the projected growth in assets and the projected growth in liabilities and stockholders' equity. One possible assumption is that this surplus might simply be used to pay down debt. Assuming that this is the case and that interest costs remain at 7% of long-term debt, we can show how paying down debt will affect the pro forma statements. With less debt, the interest cost is lower and net income and dividends will be higher. Figure 4 presents our next iteration of the pro forma financial statements with the surplus from the statements in Figure 3 used to reduce long-term debt, with interest costs reduced as a consequence.

Figure 4: Viktor Corp. Pro Forma Financial Statements with Surplus Used to Reduce Debt

Viktor Income Statement 20X0 and 20X1 Estimate

($ thousands)	Actual 20X0	Est. 20X1	
Sales	23,405.0	24,575.3	100% of sales
Cost of goods sold	9,876.9	10,370.8	42.2% of sales
SG&A	6,857.7	7,200.5	29.3% of sales
Interest expense	1,008.0	912.1	7% of LT debt
Nonoperating income	93.6	98.3	0.4% of sales
Earnings before tax	5,756.0	6,190.1	
Income tax (31.4%)	1,807.4	1,943.7	
Net income	3,948.6	4,246.4	
Dividends	1,184.6	1,274.0	30% payout
Retained earnings	2,764.1	2,972.5	

Viktor Balance Sheet 20X0 and 20X1 Estimate

($ thousands)	Actual 20X0	Est. 20X1	
Current assets	9,362.0	9,830.1	40% of sales
Net PPE	25,745.5	27,032.8	110% of sales
Total assets	35,107.5	36,862.9	
Current liabilities	3,978.9	4,177.8	17% of sales
Long-term debt	14,400.0	13,030.0	
Common stock	3,000.0	3,000.0	
Retained earnings	13,728.7	16,701.2	
Total liabilities + equity	35,107.5	36,908.9	
Total assets		36,862.9	
Surplus		46.1	

The surplus in the Figure 4 pro forma statements is reduced to $46,100. Successive iterations that further decrease long-term debt by the amount of the successive surpluses (further reducing interest expense) will eventually result in a surplus of zero and agreement between the pro forma income statement and balance sheet.

We have considered one possible assumption here, that the financial surplus in the first iteration of our pro forma financial statements is used entirely to reduce long-term debt. Other assumptions may be used in the same fashion, however. We could assume that the capital structure is maintained so that the surplus is used to proportionally reduce both common stock and long-term debt. If there are plans for large capital expenditures, we would increase PPE by that amount and make further assumptions about how the remainder is used (e.g., reducing debt or a stock repurchase).

KEY CONCEPTS

LOS 47

Pro forma financial statements can be constructed by forecasting sales growth for the next period and assuming that some financial statement items, such as COGS, current assets, current liabilities, and fixed assets, all increase at the same rate as sales.

Next period sales can be forecast using a simple trend analysis, average historical growth, regression analysis, or by using specific assumptions about such factors as the success of new product introductions, competitors' actions, and business conditions in the firm's industry.

By making further assumptions about interest expense, capital structure changes, fixed-asset expenditures, dividend payments, and the tax rate, successive iterations of the pro forma financial statements can bring about consistency between the pro forma income statement and the pro forma balance sheet.

CONCEPT CHECKERS

1. Typically, the first step in developing pro forma financial statements for a firm is to:
    A. forecast revenue growth.
    B. establish the firm's tax and interest burdens.
    C. forecast next period's net income and dividend payout.

2. A financial surplus in the first iteration of a firm's pro forma financial statements is *most likely* the result of:
    A. changes in the dividend payout ratio.
    B. assumptions about financial leverage.
    C. an increase in retained earnings greater than the increase in assets.

ANSWERS – CONCEPT CHECKERS

1. A   Typically, the process of developing pro forma financial statements begins with an estimate of sales revenue for the next period.

2. C   A positive surplus in the first iteration of a firm's pro forma financial statements results when the pro forma balance sheet value of total assets is less than the pro forma balance sheet value of liabilities and shareholders' equity, which reflects retained earnings from the period. Further assumptions about the use of retained earnings are required to reconcile the pro forma income statement and balance sheet.

THE CORPORATE GOVERNANCE OF LISTED COMPANIES: A MANUAL FOR INVESTORS

Study Session 11

EXAM FOCUS

Due to the collapses of some major corporations and associated investor losses, corporate governance has become a hot topic in the investment community. The prominence of the issue has likely been a factor in the decision to include this topic in the curriculum. Corporate governance encompasses the internal controls that outline how a firm is managed. The material here is not particularly challenging. You need to understand the specific issues that are covered under the heading of "corporate governance" and which practices are considered good. You should know the characteristics of an independent and effective board of directors. Much of the rest of the material has to do with shareholder interests and whether a firm's actions and procedures promote the interests of shareholders.

LOS 48.a: Define and describe corporate governance.

Corporate governance is the set of internal controls, processes, and procedures by which firms are managed. It defines the appropriate rights, roles, and responsibilities of management, the board of directors, and shareholders within an organization. It is the firm's checks and balances. Good corporate governance practices seek to ensure that:

- The board of directors protects shareholder interests.
- The firm acts lawfully and ethically in dealings with shareholders.
- The rights of shareholders are protected and shareholders have a voice in governance.
- The board acts independently from management.
- Proper procedures and controls cover management's day-to-day operations.
- The firm's financial, operating, and governance activities are reported to shareholders in a fair, accurate, and timely manner.

LOS 48.b: Discuss and critique characteristics and practices related to board and committee independence, experience, compensation, external consultants, and frequency of elections, and determine whether they are supportive of shareowner protection.

The duty of the board is to act in the shareholders' long-term interests. An effective board needs to have the independence, experience, and resources necessary to perform

this duty. To properly protect their long-term interests as shareholders, investors should consider whether:

- A majority of the board of directors is comprised of independent members (not management).
- The board meets regularly outside the presence of management.
- The chairman of the board is also the CEO or a former CEO of the firm. This may impair the ability and willingness of independent board members to express opinions contrary to those of management.
- Independent board members have a primary or leading board member in cases where the chairman is not independent.
- Board members are closely aligned with a firm supplier, customer, share-option plan, or pension adviser. Can board members recuse themselves on any potential areas of conflict?

A non-independent board is more likely to make decisions that unfairly or improperly benefit management and those who have influence over management. These also may harm shareholders' long-term interests.

There is often a need for specific, specialized, independent advice on various firm issues and risks, including compensation, mergers and acquisitions, legal, regulatory, and financial matters, and issues relating to the firm's reputation. A truly independent board will have the ability to hire external consultants without management approval. This enables the board to receive specialized advice on technical issues and provides the board with independent advice that is not influenced by management interests.

Frequency of Board Elections

Anything that prevents shareholders from being able to approve or reject board members annually limits shareowners' ability to change the board's composition if board members fail to represent shareowners' interests fairly.

While reviewing firm policy regarding election of the board, investors should consider:

- Whether there are annual elections or staggered multiple-year terms (a **classified board**). A classified board may serve another purpose—to act as a takeover defense.
- Whether the board filled a vacant position for a remaining term without shareholder approval.
- Whether shareholders can remove a board member.
- Whether the board is the proper size for the specific facts and circumstances of the firm.

LOS 48.c: Describe board independence and explain the importance of independent board members in corporate governance.

A board can be considered independent if its decisions are not controlled or biased by the management of the firm. To be independent, a board member must not have any material relationship with:

- The firm and its subsidiaries, including former employees, executives, and their families.

- Individuals or groups, such as a shareholder(s) with a controlling interest, which can influence the firm's management.
- Executive management and their families.
- The firm's advisers, auditors, and their families.
- Any entity which has a cross directorship with the firm.

An independent board member must work to protect shareholders' long-term interests. Board members need to have not only independence, but experience and resources. The board of directors must have autonomy to operate independently from management.

If board members are not independent, they may be more likely to make decisions that benefit either management or those who have influence over management, thus harming shareholders' long-term interests.

To make sure board members act independently, the firm should have policies in place to discourage board members from receiving consulting fees for work done on the firm's behalf or receiving finders' fees for bringing mergers, acquisitions, and sales to management's attention. Further, procedures should limit board members' and associates' ability to receive compensation beyond the scope of their board responsibilities.

The firm should disclose all material related-party transactions or commercial relationships it has with board members or nominees. The same goes for any property that is leased, loaned, or otherwise provided to the firm by board members or executive officers. Receiving personal benefits from the firm can create conflicts of interest.

LOS 48.d: Identify factors that indicate a board and its members possess the experience required to govern the company for the benefit of its shareowners.

Board members without the requisite skills and experience are more likely to defer to management when making decisions. This can be a threat to shareholder interests.

When evaluating the qualifications of board members, consider whether board members:

- Can make informed decisions about the firm's future.
- Can act with care and competence as a result of their experience with:
  - Technologies, products, and services which the firm offers.
  - Financial operations and accounting and auditing topics.
  - Legal issues.
  - Strategies and planning.
  - Business risks the firm faces.
- Have made any public statements indicating their ethical stances.
- Have had any legal or regulatory problems as a result of working for or serving on the firm's board or the board of another firm.
- Have other board experience.
- Regularly attend meetings.
- Are committed to shareholders. Do they have significant stock positions? Have they eliminated any conflicts of interest?
- Have necessary experience and qualifications.
- Have served on the board for more than ten years. While this adds experience, these board members may be too closely allied with management.

Investors should also consider how many board and committee meetings are held, and the attendance record of the meetings; whether the board and its committees conduct self-assessments; and whether the board provides adequate training for its members.

LOS 48.e: Explain the provisions that should be included in a strong corporate code of ethics and the implications of a weak code of ethics with regard to related-party transactions and personal use of company assets.

A code of ethics for a firm sets the standard for basic principles of integrity, trust, and honesty. It gives the staff behavioral standards and addresses conflicts of interest. Ethical breaches can lead to big problems for firms, resulting in sanctions, fines, management turnover, and unwanted negative publicity. Having an ethical code can be a mitigating factor with regulators if a breach occurs.

With respect to board members and persons related to board members, it is important to discourage consultancy contracts, finder's fees for identifying merger or acquisition targets, and other compensation from the company as this can compromise the independence of board members from management. With respect to other corporate personnel and their friends and relations, it is important to discourage related-party transactions as well so that shareholders can be confident that company transactions are to their benefit rather than to the benefit of company insiders. The same holds true for personal use of company assets by board members as well as company management and their families. Personal use of company assets should be discouraged to preserve and promote board member independence and to ensure that company assets are used exclusively to generate value for the company and its shareholders.

In the United States and many other countries, investors can get information about either of these practices in the annual report (under related-party transactions), the annual corporate governance report, or in proxy statements. In the case of newly public companies, the prospectus will disclose any stock sales to insiders and related persons that have been recently made at prices less than the offering price, since such transactions will tend to dilute shareholder interests.

When analyzing ethics codes, these are items to be considered:

- Make sure the board of directors receives relevant corporate information in a timely manner.
- Ethics codes should be in compliance with the corporate governance laws of the location country and with the governance requirements set forth by the local stock exchange. Firms should disclose whether they adhered to their own ethical code, including any reasons for failure.
- The ethical code should prohibit advantages to the firm's insiders that are not offered to shareowners.
- A person should be designated to be responsible for corporate governance.
- If selected management personnel receive waivers from the ethics code, reasons should be given.
- If any provisions of the ethics code were waived recently, the firm should explain why.
- The firm's ethics code should be audited and improved periodically.

In evaluating management, investors should:

- Verify that the firm has committed to an ethical framework and adopted a code of ethics.
- See if the firm permits board members or management to use firm assets for personal reasons.
- Analyze executive compensation to assess whether it is commensurate with responsibilities and performance.
- Look into the size, purpose, means of financing, and duration of any share-repurchase programs.

LOS 48.f: State the key areas of responsibility for which board committees are typically created and explain the criteria for assessing whether each committee is able to adequately represent shareowner interests.

Audit Committee

This committee ensures that the financial information provided to shareholders is complete, accurate, reliable, relevant, and timely. Investors must determine whether:

- Proper accounting and auditing procedures have been followed.
- The external auditor is free from management influence.
- Any conflicts between the external auditor and the firm are resolved in a manner that favors the shareholder.
- Independent auditors have authority over the audit of all the company's affiliates and divisions.
- All board members serving on the audit committee are independent.
- Committee members are financial experts.
- The shareholders vote on the approval of the board's selection of the external auditor.
- The audit committee has authority to approve or reject any proposed non-audit engagements with the external audit firm.
- The firm has provisions and procedures that specify to whom the internal auditor reports. Internal auditors must have no restrictions on their contact with the audit committee.
- There have been any discussions between the audit committee and the external auditor resulting in a change in financial reports due to questionable interpretation of accounting rules, fraud, and the like.
- The audit committee controls the audit budget.

Remuneration/Compensation Committee

Investors should be sure a committee of independent board members sets executive compensation, commensurate with responsibilities and performance. The committee can further these goals by making sure all committee members are independent, and by linking compensation to long-term firm performance and profitability.

Investors, when analyzing this committee, should determine whether:

- Executive compensation is appropriate.
- The firm has provided loans or the use of company property to board members.

- Committee members attend regularly.
- Policies and procedures for this committee are in place.
- The firm has provided details to shareholders regarding compensation in public documents.
- Terms and conditions of options granted are reasonable.
- Any obligations regarding share-based compensation are met through issuance of new shares.
- The firm and the board are required to receive shareholder approval for any share-based remuneration plans, since these plans can create potential dilution issues.
- Senior executives from other firms have cross-directorship links with the firm or committee members. Watch for situations where individuals may benefit directly from reciprocal decisions on board compensation.

Nominations Committee

The nominations committee handles recruiting of new (independent) board members. It is responsible for:

- Recruiting qualified board members.
- Regularly reviewing performance, independence, skills, and experience of existing board members.
- Creating nomination procedures and policies.
- Preparing an executive management succession plan.

Candidates proposed by this committee will affect whether or not the board works for the benefit of shareholders. Performance assessment of board members should be fair and appropriate. Investors should review company reports over several years to see if this committee has properly recruited board members who have fairly protected shareholder interests. Investors should also review:

- Criteria for selecting new board members.
- Composition, background, and expertise of present board members. How do proposed new members complement the existing board?
- The process for finding new members (i.e., input from outside the firm versus management suggestions).
- Attendance records.
- Succession plans for executive management (if such plans exist).
- The committee's report, including any actions, decisions, and discussion.

Other Board Committees

Additional committees can provide more insight into goals and strategies of the firm. These committees are more likely to fall outside typical corporate governance codes, so they are more likely to be comprised of members of executive management. Be wary of this—independence is once again critical to maintain shareowners' best interests.

LOS 48.g: Evaluate, from a shareowner's perspective, company policies related to voting rules, shareowner sponsored proposals, common stock classes, and takeover defenses.

The ability to vote proxies is a fundamental shareholder right. If the firm makes it difficult to vote proxies, it limits the ability of shareholders to express their views and affect the firm's future direction.

Investors should consider whether the firm:

- Limits the ability to vote shares by requiring attendance at the annual meeting.
- Groups its meetings to be held the same day as other companies in the same region and also requires attendance to cast votes.
- Allows proxy voting by some remote mechanism.
- Is allowed under its governance code to use **share blocking**, a mechanism that prevents investors who wish to vote their shares from trading their shares during a period prior to the annual meeting.

Confidential Voting

Investors should determine if shareholders are able to cast confidential votes. This can encourage unbiased voting. In looking at this issue, investors should consider whether:

- The firm uses a third party to tabulate votes.
- The third party or the firm retains voting records.
- The tabulation is subject to audit.
- Shareholders are entitled to vote only if present.

Cumulative Voting

Shareholders may be able to cast the cumulative number of votes allotted to their shares for one or a limited number of board nominees. Be cautious in the event the firm has a considerable minority shareholder group, such as a founding family, that can serve its own interests through cumulative voting.

Information on possible cumulative voting rights will be contained in the articles of organization and by-laws, the prospectus, or Form 8-A, which must be filed with the Securities and Exchange Commission in the United States.

Voting for Other Corporate Changes

Changes to corporate structure or policies can change the relationship between shareholders and the firm. Watch for changes to:

- Articles of organization.
- By-laws.
- Governance structures.
- Voting rights and procedures.
- Poison pill provisions (these are impediments to an acquisition of the firm).
- Provisions for change-in-control.

Regarding issues requiring shareholder approval, consider whether shareholders:

- Must approve corporate change proposals with supermajority votes.
- Will be able to vote on the sale of the firm, or part of it, to a third-party buyer.
- Will be able to vote on major executive compensation issues.
- Will be able to approve any anti-takeover measures.
- Will be able to periodically reconsider and re-vote on rules that require supermajority voting to revise any governance documents.
- Have the ability to vote for changes in articles of organization, by-laws, governance structures, and voting rights and procedures.
- Have the ability to use their relatively small ownership interest to force a vote on a special interest issue.

Investors should also be able to review issues such as:

- Share buy-back programs that may be used to fund share-based compensation grants.
- Amendments or other changes to a firm's charter and by-laws.
- Issuance of new capital stock.

Shareowner-Sponsored Board Nominations

Investors need to determine whether the firm's shareholders have the power to put forth an independent board nominee. Having such flexibility is positive for investors as it allows them to address their concerns and protect their interests through direct board representation. Additional items to consider:

- Under what circumstances can a shareholder nominate a board member?
- Can shareowners vote to remove a board member?
- How does the firm handle contested board elections?

The proxy statement is a good source document for information about these issues in the United States. In many jurisdictions, articles of organization and corporate by-laws are other good sources of information on shareholder rights.

Shareowner-Sponsored Resolutions

The right to propose initiatives for consideration at the annual meeting is an important shareholder method to send a message to management.

Investors should look at whether:

- The firm requires a simple majority or a supermajority vote to pass a resolution.
- Shareholders can hold a special meeting to vote on a special initiative.
- Shareholder-proposed initiatives will benefit all shareholders rather than just a small group.

Advisory or Binding Shareowner Proposals

Investors should find out if the board and management are required to actually implement any shareholder-approved proposals. Investors should determine whether:

- The firm has implemented or ignored such proposals in the past.

- The firm requires a supermajority of votes to approve changes to its by-laws and articles of organization.
- Any regulatory agencies have pressured firms to act on the terms of any approved shareholder initiatives.

Different Classes of Common Equity

Different classes of common equity within a firm may separate the voting rights of those shares from their economic value.

Firms with dual classes of common equity could encourage prospective acquirers to only deal directly with shareholders with the supermajority rights. Firms that separate voting rights from economic rights have historically had more trouble raising equity capital for fixed investment and product development than firms that combine those rights.

When looking at a firm's ownership structure, examine whether:

- Safeguards in the by-laws and articles of organization protect shareholders who have inferior voting rights.
- The firm was recently privatized by a government entity and the selling entity retained voting rights. This may prevent shareholders from receiving full value for their shares.
- Any super-voting rights kept by certain classes of shareholders impair the firm's ability to raise equity capital. If a firm has to turn to debt financing, the increase in leverage can harm the firm.

Information on these issues can be found in the proxy, web site, prospectus, or notes to the financial statements.

Shareowner Legal Rights

Examine whether the investor has the legal right under the corporate governance code and other legal statutes of the jurisdiction in which the firm is headquartered to seek legal redress or regulatory action to enforce and protect shareholder rights.

Investors should determine whether:

- Legal statutes allow shareholders to take legal actions to enforce ownership rights.
- The local market regulator, in similar situations, has taken action to enforce shareholder rights.
- Shareholders are allowed to take legal or regulatory action against the firm's management or board in the case of fraud.
- Shareholders have "dissenters' rights," which require the firm to repurchase their shares at fair market value in the event of a problem.

Takeover Defenses

Takeover defenses are provisions that are designed to make a company less attractive to a hostile bidder. Examples of takeover defenses include golden parachutes (rich severance packages for top managers who lose their jobs as a result of a takeover), poison pills (provisions that grant rights to existing shareholders in the event a certain percentage

of a company's shares are acquired), and greenmail (use of corporate funds to buy back the shares of a hostile acquirer at a premium to their market value). All of these defenses may be used to counter a hostile bid, and their probable effect is to decrease share value.

When reviewing the firm's takeover defenses, investors should:

- Ask whether the firm requires shareholder approval to implement such takeover measures.
- Ask whether the firm has received any acquisition interest in the past.
- Consider that the firm may use its cash to "pay off" a hostile bidder. Shareholders should take steps to discourage this activity.
- Consider whether any change of control issues would invoke the interest of a national or local government and, as a result, pressure the seller to change the terms of the acquisition or merger.

KEY CONCEPTS

LOS 48.a
Corporate governance is the set of internal controls, processes, and procedures by which firms are managed. Good corporate governance practices ensure that the board of directors is independent of management and that the firm and its managers act lawfully, ethically, and in the interests of shareholders.

LOS 48.b
A majority of board and committee members should be independent (not management), and the board should meet regularly without management present.

Board members should have the experience and knowledge necessary to advise management and review its activities.

The board should have the resources it needs to act independently, including the ability to hire outside consultants without approval from management.

LOS 48.c
A board can be considered independent if its decisions are not controlled or biased by the management of the firm.

An independent board member must work to protect the long-term interests of shareholders.

LOS 48.d
Board members should have the skills and experience required to make informed decisions about the firm's future.

A qualified board member should have experience with:
• The products or services the firm produces.
• Financial operations, accounting, and auditing.
• Legal issues.
• Strategies and planning.
• The firm's business and financial risks.

Members who serve on the board for a long time (more than ten years) may become too closely aligned with management to be considered independent.

LOS 48.e

A firm's code of ethics sets the standard for basic principles of integrity, trust, and honesty. Having a code of ethics can be a mitigating factor with regulators if a breach occurs.

A strong code of ethics should:
- Comply with corporate governance standards of the company's home country and stock exchange.
- Prohibit the company from giving advantages to company insiders that are not available to shareholders.
- Discourage payments to board members of consultancy fees or finder's fees for acquisition targets.
- Designate a person responsible for corporate governance.

A company with a weak code of ethics may allow practices such as transactions with parties related to management, or personal use of company assets by management or board members. Such practices benefit company insiders rather than shareholders.

LOS 48.f

The audit committee is responsible for providing financial information to shareholders. The audit committee should:
- Follow proper accounting and auditing procedures.
- Appoint an external auditor that is free from management influence.
- Resolve conflicts between the auditor and management in a way that favors shareholders.
- Approve or reject any non-audit engagements with the external auditor.
- Have no restrictions on its communications with the firm's internal auditors.
- Control the audit budget.

The compensation (remuneration) committee sets the compensation for the firm's executives. The compensation committee should:
- Determine whether executives' compensation is appropriate and linked to the firm's long-term profitability.
- Provide shareholders with details about executive compensation in public documents.
- Require the firm and the board to seek shareholder approval for any share-based compensation plans.

The nominations committee is responsible for recruiting new, qualified, independent board members. The nominations committee should:
- Review the performance, independence, and skills of existing board members.
- Create nomination procedures and policies.
- Prepare a succession plan for senior management.

LOS 48.g

Consider whether company policies make it difficult to vote proxies and whether a significant minority shareholder group can serve their own interests through cumulative voting. Confidential voting and remote proxy voting promote the interests of shareholders.

Investors should determine whether a firm permits shareholders to nominate board members and propose initiatives to be discussed at the annual meeting, and whether the firm regards shareholder proposals as binding or advisory.

Corporate structure changes can alter the relationship between shareholders and the firm. Different classes of equity may separate the voting rights of shares from their economic value.

Takeover defenses are provisions that make a company less attractive to a hostile bidder or more difficult to acquire. They are generally not in shareholders' interests.

CONCEPT CHECKERS

1. Which of the following board characteristics would *least likely* be an indication of high quality corporate governance?
    A. Board members have staggered terms.
    B. The board can hire independent consultants.
    C. The board has a separate committee to set executive pay.

2. Which of the following board members would *most likely* be considered to be well chosen based on the principles of good corporate governance?
    A. A board member of Company B who is also the CEO of Company B.
    B. A board member of Company B who is a partner in an accounting firm that competes with the firm's auditor.
    C. A board member of Company A who is president of Company B, when the CFO of company A sits on Company B's board.

3. Which of the following is *least likely* to enable a corporate board to exercise its duty by acting in the long-term interest of shareholders?
    A. The board meets regularly outside the presence of management.
    B. A majority of the board members are independent of firm management.
    C. The board has representatives from key suppliers and important customers.

4. Which of the following would *most likely* be considered a negative factor in assessing the suitability of a board member? The board member:
    A. has served for ten years.
    B. has served on other boards.
    C. is a former CEO of another firm.

5. Which of the following would *least likely* be an indication of poor corporate governance?
    A. A board member leases office space to the company in a building he owns.
    B. There are board members who do not have previous experience in the industry in which the firm operates.
    C. A board member has a consulting contract with the firm to provide strategic vision for the technology research and development effort.

6. Which of the following would *most likely* be considered a poor corporate practice in terms of promoting shareholder interests?
    A. The firm can use "share blocking."
    B. The firm uses a third party to tabulate shareholder votes.
    C. Voting for board members does not allow cumulative voting by shareholders of all votes allotted to their shares.

7.   Two analysts are discussing shareholder defenses against hostile takeovers. Alice states, "It is positive for shareholders that the board has shown a willingness to buy back shares from holders who may be in a position to effect a hostile takeover of the firm at less than its long-term value to shareholders." Bradley states, "Firms that are likely takeover targets should offer valuable exit packages in the event of a hostile takeover because they are necessary to recruit highly talented top executives, such as the CEO." From the perspective of good corporate governance, are these statements correct?
A. Both statements are correct.
B. Neither statement is correct.
C. Only one of the statements is correct.

ANSWERS – CONCEPT CHECKERS

1. **A** Staggered terms make it more difficult for shareholders to change the board of directors. Annual elections of all members make the board more responsive to shareholder wishes.

2. **B** A board member who is a partner in an unrelated accounting firm would be considered independent, has no particular relation to firm management, and could be a valuable addition to the board.

3. **C** Board members should not be closely aligned with a firm's suppliers or customers since they may act in the interest of suppliers and customers rather than in the interest of shareholders.

4. **A** While experience may be a good thing, a board member with long tenure may be too closely aligned with management to be considered an independent member.

5. **B** Lack of previous experience in the firm's industry is not necessarily a negative and can be consistent with an independent board member who acts in shareholders' long-term interests. Examples might be board members with specialized knowledge of finance, marketing, management, accounting, or auditing. The other answers indicate possible conflicts of interest.

6. **A** Share blocking prevents shareholders from trading their shares over a period prior to the annual meeting and is considered a restriction on the ability of shareholders to express their opinions and act in their own interests. Cumulative voting can allow a minority group, such as a founding family, to serve its own interests. Third party tabulation of shareowner votes is considered a good corporate governance practice.

7. **B** Defenses against hostile takeovers such as greenmail (Alice) or golden parachutes (Bradley) tend to protect entrenched or poorly performing managements and typically decrease share values. Shareholders as a group always have the choice not to sell when a takeover offer is not in their long-term interests.

10 questions: 15 minutes

1.
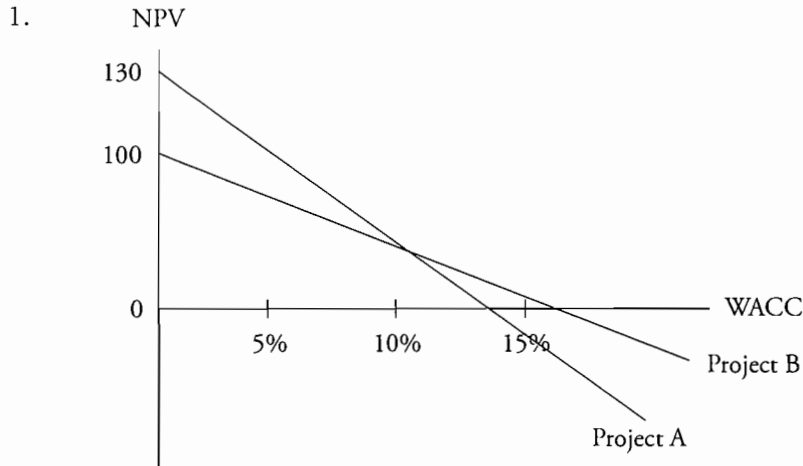
Based on the NPV profiles for two potential capital projects of the same risk class shown in the figure above, which of the following statements is *least likely* correct?
A. The IRR of Project A is less than that of Project B.
B. If the projects are independent and the cost of capital is 15%, both projects should be accepted.
C. At some discount rate less than 15% the expected increase in firm value from undertaking Project A is exactly the same as the expected increase from Project B.

2. Which of the following would *most likely* lead to an increase in a typical firm's capital investment for the current period?
A. A need to increase inventory.
B. An increase in the firm's expected marginal tax rate.
C. A decrease in the market value of the firm's debt.

3. With respect to takeover defenses and remote proxy voting, shareholder interests are typically:

	Takeover defense	Remote proxy voting
A.	Not served	Served
B.	Not served	Not served
C.	Served	Served

4. A company's operations analyst is evaluating a plant expansion project that is likely to be financed in part by issuing new common equity. Flotation costs are expected to be 4% of the amount of new equity capital raised. The *most appropriate* way for the analyst to treat the flotation costs is to:
    A. ignore them, since flotation costs for common equity are likely to be nonmaterial.
    B. estimate the cost of equity capital based on a share price 4% less than the current price.
    C. determine the flotation cost attributable to this project and treat it as part of the project's initial cash outflow.

5. A board of directors is *most likely* to act in the long-term interest of shareholders if:
    A. all board members are elected annually.
    B. most board members are selected from outside the company's industry.
    C. there are board members who represent the company's key supplier and largest customer.

6. The manufacturer of Pow Detergent has developed New Improved Pow with Dirteaters and is considering adding it to its product line. New Improved Pow would sell at a premium price compared to Pow. In order to manufacture New Improved Pow, the firm will need to build a new facility and purchase new equipment. Which of the following is *least likely* included when calculating the appropriate cash flows for analysis of whether to add New Improved Pow to its product line?
    A. Expected depreciation on the new facility and equipment for tax purposes.
    B. Costs of a marketing survey performed last month to decide whether to introduce New Improved Pow.
    C. Reduced sales of Pow that result from the introduction of New Improved Pow.

7. Acme Corp. has reported the following financial ratios for the past two years:

Year	Net Profit Margin	Financial Leverage	Total Asset Turnover
20X0	14%	1.3	1.1
20X1	13%	1.8	0.9

Based only on these results, an analyst would *most correctly* conclude that the results in year 20X1 compared to those in year 20X0 indicate that Acme's ROE has:
    A. declined, in part due to lower profitability.
    B. increased because the company has used more debt financing.
    C. increased because of the improvement in asset utilization.

8. The use of secondary sources of liquidity would *most likely* be considered:
   A. a normal part of daily business for a company.
   B. a signal that a company's financial position is deteriorating.
   C. a lower-cost source of short-term financing compared to primary sources of liquidity.

9. An analyst is constructing pro forma financial statements for Liden Plastics Corp. that are based on an expected 8% increase in sales next year. His first iteration results in a financial surplus of $2.2 million. Which of the following assumptions would result in no financial surplus or deficiency in the next iteration of the pro forma statements?
   A. The surplus will be used to decrease Liden's outstanding long-term debt.
   B. Liden will use the surplus to repurchase its common stock.
   C. The surplus will be used to repurchase Liden's common shares and retire long-term debt in amounts that preserve Liden's existing capital structure.

10. A firm is evaluating two mutually exclusive projects of the same risk class, Project A and Project B. Both have the same initial cash outlay and both have positive NPVs. Which of the following is a sufficient reason to choose Project A over Project B?
   A. Project B has a lower profitability index than Project A.
   B. Project A has both a shorter payback period and a shorter discounted payback period compared to Project B.
   C. Project B has a lower accounting rate of return than Project A.

SELF-TEST ANSWERS: CORPORATE FINANCE

1. **B** At a discount rate of 15%, Project A has a negative NPV and should not be accepted. The crossover point (where $NPV_A = NPV_B$) shows that the discount rate where the expected increases in firm value from both projects are equal is between 10% and 15%. The IRR of each project is the discount rate for which NPV = 0.

2. **B** Since a typical firm has both equity and debt financing, an increase in the firm's tax rate will decrease the after-tax cost of debt and consequently decrease the firm's WACC, which can change a project's NPV from negative to positive. A decrease in the market value of the firm's debt will increase the market yield on the debt, which will increase the after-tax cost of debt and the firm's WACC. Increases in inventory increase current assets and working capital needs, not capital investment.

3. **A** Takeover defenses act as an impediment to hostile takeover by an outside entity and typically serve the interests of entrenched management and decrease share values. Remote proxy voting allows shareholders to vote their shares from a remote location and does not require them to attend the annual shareholder meeting in person. Shareholder interests are served when it is easier to vote proxies.

4. **C** The correct treatment of flotation costs is to treat them as a cash outflow at the project's initiation. Methods that adjust the cost of equity capital (and therefore the WACC) for flotation costs are incorrect because the cost of capital is an ongoing expense, whereas flotation costs are actually a one-time expense. Flotation costs for common equity are typically large enough that they must be considered in computing a project's NPV.

5. **A** Annual elections of all board members (as compared to longer terms) make a board more likely to represent shareholders' long-term interests because it is easier for shareholders to nominate and elect new members. Board members who do not have direct experience in the company's industry might lack the specific knowledge they need to give proper oversight to management's decisions, and therefore tend to defer to management. Board members who are aligned with the company's customers and suppliers might have interests that conflict with shareholders' interests.

6. **B** Costs that are incurred prior to the decision of whether or not to pursue a project are sunk costs and should not be used in the NPV calculation. Only cash flows that result from the decision to actually do the project should be considered in the analysis. Taxes must be deducted so the project's cash flows can be analyzed on an after-tax basis. Since depreciation is tax deductible, expected depreciation will affect annual taxes and after-tax cash flows. Cannibalization of sales of an existing product is an externality that should be included in the estimation of incremental project cash flows.

7. **B** ROE was (14%)(1.3)(1.1) = 20% in 20X0 and (13%)(1.8)(0.9) = 21% in 20X1. Both the decrease in profitability and the decrease in total asset turnover in 20X1 will tend to decrease ROE. The only reason ROE increased in 20X1 is that more debt was used in the capital structure, increasing the financial leverage ratio.

8. **B** Secondary sources of liquidity include negotiating debt contracts, liquidating assets, and filing for bankruptcy protection and reorganization. The use of these sources of funds is typically a signal that a company's financial position is deteriorating. The liquidity provided by these sources usually comes at a substantially higher cost than liquidity provided by primary sources.

9. **B**   Using the entire surplus to repurchase common shares would not affect net income, so the financial surplus in the second iteration would be zero. Assuming that part of the surplus is used to retire debt will decrease interest expense on the pro forma income statement and increase net income, resulting in a positive surplus in the amount of the after-tax interest savings from the assumed debt retirement.

10. **A**   The correct method of choosing between two mutually exclusive projects is to choose the one with the higher NPV. The profitability index is calculated as the present value of the future cash flows divided by the initial outlay for the project. Since both projects have the same initial cash outlay, the one with the higher profitability index has both higher present value of future cash flows and the higher NPV. Ranking projects on their payback periods or their accounting rates of return can lead to incorrect ranking.

THE ASSET ALLOCATION DECISION

Study Session 12

EXAM FOCUS

There is nothing difficult here, but the material is important because it is likely to be tested and it is the foundation for the portfolio construction material at Level 2 and especially Level 3. You should be ready to explain the what and why of an investment policy statement and know the objectives (risk and return) and the constraints: liquidity, legal, time horizon, tax treatment, and unique circumstances. Know the four common return objectives, why the objectives part of the investment policy statement should include risk objectives, and (in broad strokes) the factors that influence risk tolerance.

LOS 49.a: Describe the steps in the portfolio management process and explain the reasons for a policy statement.

There are four general steps in the **portfolio management process**:

1. *Write a policy statement* that specifies the investor's goals and constraints and itemize the risks the investor is willing to take to meet these goals.

2. *Develop an investment strategy* designed to satisfy the investor's policy statement based on an analysis of the current and projected financial and economic conditions.

3. *Implement the plan* by constructing the portfolio and allocating the investor's assets across countries, asset classes, and securities based on current and forecast economic conditions.

4. *Monitor and update* the investor's needs and market conditions. Rebalance the investor's portfolio as needed. Rebalancing refers to shifting assets when the account allocations to different asset classes deviate significantly from the strategic asset allocation specified.

The **policy statement** is the framework that provides structure to the investment process. It forces investors to understand their own needs and constraints and to articulate them within the construct of realistic goals. The policy statement helps investors understand the risks and costs of investing and guides the actions of the portfolio manager. In essence, the purpose of the policy statement is to impose investment discipline on the client and the portfolio manager.

Performance cannot be judged without an objective standard. The policy statement should state the standards by which the portfolio's performance will be judged and specify the benchmark that represents the investor's risk preferences. The portfolio performance should be measured relative to the stated benchmark and not simply by the portfolio's raw returns.

LOS 49.b: Explain why investment objectives should be expressed in terms of risk and return and list the factors that may affect an investor's risk tolerance.

Investment objectives must be stated in terms of both risk and return.

Return objectives may be stated in absolute terms (dollar amounts) or as a pre-tax or after-tax percentage return. Return considerations also cover capital preservation, capital appreciation, current income needs, and total returns.

Specifying investment goals in terms of just return may expose an investor to inappropriate, high-risk investment strategies. Also, return-only objectives can lead to unacceptable behavior on the part of investment managers, such as excessive trading to generate commissions (churning).

Risk tolerance is a function of the investor's psychological makeup and personal factors such as age, family situation, existing wealth, insurance coverage, current cash reserves, and income. For example, younger investors are generally considered to be better able to tolerate investment risk because they can increase savings over their remaining working lives if they incur losses. Investors with relatively high incomes or high net worth have the capacity to withstand losses and thus tend to be more risk tolerant. Families might be more willing to accept investment risk when their children are younger and investment goals such as paying for college or otherwise helping them get a start in life are further in the future.

Recommendations for asset allocations vary among investment firms and advisors, but some examples will illustrate the basics. Consider a 25-year old person who is employed and has no spouse or children and owns her own home. If her primary investment goal is early retirement, her tolerance for risk may be relatively high because of her long investment horizon and lack of shorter-term needs to use investment funds for living expenses. Once she has set aside enough stable liquid investments for an unexpected job loss, the remainder of her portfolio might be allocated almost entirely to equities. On the other hand, an individual in the same situation, but who is saving for a down payment on a home, might well allocate all savings to cash or very short-term low-risk debt securities.

For an investor who is approaching retirement, is moderately risk averse personally, and will depend primarily on investment income in retirement, a conservative asset allocation, such as 30% cash, 50% bonds, and 20% equities, may be the most appropriate.

LOS 49.c: Describe the return objectives of capital preservation, capital appreciation, current income, and total return.

Capital preservation is the objective of earning a return on an investment that is at least equal to the inflation rate with little or no chance of loss. The concern here is the maintenance of purchasing power. To achieve this objective, the nominal rate of return must at least equal the inflation rate. This is an appropriate goal when the funds will be needed in the near future.

Capital appreciation is the objective of earning a nominal return that exceeds the rate of inflation over some period of time. Achieving this goal means that the purchasing power of the initial investment increases over time, usually through capital gains. This is an appropriate goal when the need for the funds is further in the future, such as for retirement.

Current income is the objective when the primary purpose of an account is to produce income as opposed to capital appreciation. The current income objective is usually appropriate when an investor wants or needs to supplement other sources of income to meet living expenses or some other planned spending need, as in retirement.

Total return is the objective of having a portfolio grow in value to meet a future need through both capital gains and the reinvestment of current income. The total return objective is riskier than the income objective but less risky than the capital appreciation objective. This would be an appropriate objective for an investor with a longer-term investment horizon but only moderate risk tolerance.

LOS 49.d: Describe the investment constraints of liquidity, time horizon, tax concerns, legal and regulatory factors, and unique needs and preferences.

Liquidity refers to the ability to quickly convert investments into cash at a price close to their fair market value. Liquidity, from the investor's view, is the potential need for ready cash. This may necessitate selling assets at unfavorable terms if adequate liquidity is not provided in the portfolio.

Time horizon (investment horizon) refers to the time between making an investment and needing the funds. There is a relationship between an investor's time horizon, liquidity needs, and ability to handle risk. Since losses are harder to overcome in a short time frame, lower-risk investments are usually more appropriate for investors with shorter time horizons.

Tax concerns play an important role in investment planning because after-tax returns are what investors should be concerned with. The tax codes in the United States, as in most other countries, are complex. For instance, in the United States, interest and dividends were, until recently, taxed at the investor's marginal tax rate, while capital gains were taxed at another rate. Taxes on unrealized capital gains can be deferred indefinitely, and estate taxes must be considered. Other tax-related issues include the following:

- There is a trade-off between taxes and diversification needs. The decision to sell some stock to diversify one's portfolio by reinvesting the proceeds in other assets must be balanced against the resulting tax liability.
- Some sources of income are tax exempt at the federal and state levels. For example, high-income individuals are motivated to invest in municipal bonds because the interest income is tax free.
- The investor must also consider tax-deferred investment opportunities such as IRAs, 401(k) and 403(b) plans, and various life insurance contracts.
- Young investors will want to put as much as possible into tax-deferred plans. The only drawback is the loss of liquidity.

- For older retirees, the need for tax-deferred investments may decrease. Also, taxable income may now offer higher after-tax returns than tax-exempt income. If a retirement account contains a lot of an old employer's stock, diversification becomes more important than taxes.

Legal and regulatory factors are more of a concern to institutional investors than individuals, but the investment strategies of both may be restricted due to these constraints. One example of a legal and regulatory constraint that affects many individual investors is the penalty for early withdrawals from tax-deferred retirement accounts. For trust accounts, an important legal constraint is the "prudent investor rule," which requires trustees to make investment decisions in a portfolio context rather than evaluating each investment in isolation.

Unique needs and preferences are constraints that investors may have that address special needs or place special restrictions on investment strategies for personal or socially conscious reasons. This is a catch-all constraint category for those "special" circumstances that don't fit neatly into one of the other constraint areas.

LOS 49.e: Describe the importance of asset allocation, in terms of the percentage of a portfolio's return that can be explained by the target asset allocation, and explain how political and economic factors result in differing asset allocations by investors in various countries.

Several studies support the idea that approximately 90% of the variation in a single portfolio's returns over time can be explained by its target asset allocations, and about 40% of the variation in returns across funds can be explained by their target asset allocations. The clear implication of this result is that differences in returns among asset classes are much more important than differences in security selection in determining overall portfolio returns. For actively managed funds, actual portfolio returns are slightly less than those that would have been achieved if the manager strictly maintained the target asset allocation. This illustrates the real difficulty of improving returns by varying from target allocations (market timing) or by selecting undervalued securities in very efficiently priced markets.

Average asset allocations across countries differ for reasons related to demographics, social factors, legal constraints, and taxation. Countries with younger populations tend to have greater average allocations to equities. Some countries have legal restrictions on the percentage of equities that various institutions can hold. The existence of a strong government pension program in Germany tends to decrease the equity holdings of workers and private pension plans since less growth is needed for retirement funding needs. The German society also has an historical aversion to financial risk, and equity ownership is not typical for its citizens. Differences in historical inflation rates are correlated with differences in equity allocations across countries as well. Countries with higher historical inflation rates tend to have greater investor allocations to equities.

KEY CONCEPTS

LOS 49.a
The portfolio management process has four steps:
- Writing a policy statement.
- Developing an investment strategy.
- Implementing the plan by constructing the portfolio and allocating the assets.
- Monitoring performance, updating client information and capital markets expectations, and rebalancing the portfolio.

An investment policy statement provides investment discipline by requiring investors to articulate their needs, goals, and risk tolerance, ensuring that goals are realistic, and providing an objective measure of portfolio manager performance.

LOS 49.b
Investment objectives should be expressed in terms of both risk and return so that meeting the return objective does not expose the investor to more risk than is appropriate.

Risk tolerance depends on an investor's psychological characteristics as well as financial factors such as family obligations, wealth, income, age, and insurance coverage.

LOS 49.c
Common return objectives are:
- Capital preservation—minimizing the risk of loss in real terms.
- Capital appreciation—managing real growth in the portfolio to meet some future need.
- Current income—meeting specified spending needs.
- Total return—growing a portfolio through both capital appreciation and reinvested income.

LOS 49.d
Investment constraints include:
- Liquidity—for cash spending needs (anticipated or unexpected).
- Time horizon—when funds will be needed.
- Tax—the tax treatments of various accounts, and the investor's marginal tax bracket.
- Legal—restrictions on investments in retirement, personal, and trust accounts.
- Unique needs—constraints because of investor preferences or other factors not already considered (e.g. socially conscious investing).

LOS 49.e
Target allocations among different asset classes can explain approximately 40% of the variation in portfolio returns across funds, and approximately 90% of the variation in returns for a single fund over time.

Differences in average asset allocations across countries exist due to differences in social factors, demographics, legal constraints, tax laws, and historical inflation rates.

CONCEPT CHECKERS

1. Which of the following is *least likely* an example of a portfolio constraint?
    A. Tax concerns.
    B. Liquidity needs.
    C. Total return requirement of 15%.

2. Which of the following statements about investment policy statements is *most likely* correct?
    A. For some investors, specifying an investment goal in terms of return alone is appropriate.
    B. An investment policy statement should have objectives and constraints.
    C. Risk is an important investment policy constraint.

3. The approximate percentage of the variation in a portfolio's returns that can be explained by differences in target portfolio asset allocations is *closest* to:
    A. 10%.
    B. 50%.
    C. 90%.

4. The return objective of an investor who is relatively risk averse yet has a long time horizon and little need for liquidity would *most likely* be described as:
    A. total return.
    B. capital appreciation.
    C. capital preservation.

5. In determining the appropriate asset allocation for a client's investment account, the manager should:
    A. consider only the investor's risk tolerance.
    B. rely on forecasts of future economic conditions.
    C. consider the investor's risk tolerance and future needs, but not market conditions.

ANSWERS – CONCEPT CHECKERS

1. **C** Return objectives are part of a policy statement's objectives, not constraints.

2. **B** The policy statement should specify objectives and constraints. Return should always be considered with risk. Setting a risk tolerance is an investment policy objective, not a constraint.

3. **C** Studies suggest that approximately 90% of the variation in a portfolio's returns can be explained by target asset allocation choices.

4. **A** A total return strategy is appropriate for an investor with a longer-term investment horizon who is relatively risk averse. The inclusion of a significant allocation to income producing securities such as bonds and high-dividend stocks makes this a less risky strategy than that for an objective of capital appreciation.

5. **B** An advisor's forecasts of the expected returns and expected volatilities (risk) of different asset classes are an important part of determining an appropriate asset allocation.

AN INTRODUCTION TO PORTFOLIO MANAGEMENT

EXAM FOCUS

This topic review looks at Markowitz portfolio theory and optimal portfolio choice. The major result is the development of the efficient frontier. Understanding the relationship between portfolio risk and correlation is the key to understanding modern portfolio theory. Be able to discuss diversification, correlation, indifference curves, expected return, and the efficient frontier. A sound grasp of the portfolio theory presented here is essential to an understanding of the capital market theory covered in our next topic review. Additionally, portfolio theory is the heart of much of the portfolio management material essential for the Level 3 exam.

LOS 50.a: Define risk aversion and discuss evidence that suggests that individuals are generally risk averse.

Risk aversion refers to the fact that individuals prefer less risk to more risk. Risk-averse investors:

- Prefer lower to higher risk for a given level of expected returns.
- Will only accept a riskier investment if they are compensated in the form of greater expected return.

In Figure 1, we examine the concept of risk aversion using indifference curves.

Figure 1: Risk Aversion
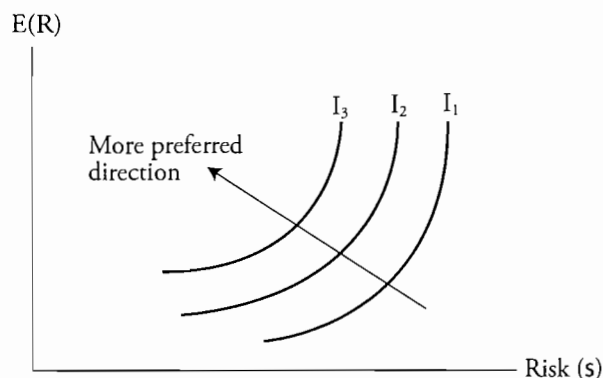
The curved lines, I_1, I_2, and I_3, represent *indifference curves* because all investments (combinations of risk and expected return) that lie along each curve are equally preferred. Because we have a "good" (expected return) and a "bad" (risk), a higher or more preferred indifference curve lies in the northwest direction (more expected return and less risk). Focusing on indifference curve I_1, a risk-averse investor whose

preferences are represented by these curves will be equally happy with, or indifferent among, any risk/return combinations on this curve. Notice that as risk increases, a risk-averse investor demands an increasingly higher rate of return as compensation. While an investor would be equally happy with any point on I_1, she prefers all risk/return combinations on I_2 to any combination on I_1. In reality, there are an infinite number of indifference curves, and the indifference curves for any given investor can never cross.

The fact that most individuals buy some sort of insurance, whether auto, health, or homeowners, indicates that they are generally risk averse. Interestingly, however, an individual may exhibit risk-averse tendencies in one area and not in others. For example, many people buy auto insurance to protect against the costs associated with auto accidents but will not buy health insurance or will buy lottery tickets or participate in other forms of gambling.

LOS 50.b: List the assumptions about investor behavior underlying the Markowitz model.

In the investment framework he developed, Nobel laureate Dr. Harry Markowitz made the following **assumptions about investor behavior:**

- *Returns distribution.* Investors look at each investment opportunity as a probability distribution of expected returns over a given investment horizon.
- *Utility maximization.* Investors maximize their expected utility over a given investment horizon, and their indifference curves exhibit diminishing marginal utility of wealth (i.e., they are convex).
- *Risk is variability.* Investors measure risk as the variance (standard deviation) of expected returns.
- *Risk/return.* Investors make all investment decisions by considering only the risk and return of an investment opportunity. This means that their utility (indifference) curves are a function of the expected return (mean) and the variance of the returns distribution they envision for each investment.
- *Risk aversion.* Given two investments with equal expected returns, investors prefer the one with the lower risk. Likewise, given two investments with equal risk, investors prefer the one with the greater expected return.

> *Professor's Note: Make sure you understand each of the Markowitz assumptions—it will make asset pricing models easier to grasp.*

LOS 50.c: Compute and interpret the expected return, variance, and standard deviation for an individual investment and the expected return and standard deviation for a portfolio.

Expected Return for an Individual Security

The *expected rate of return* from *expectational data* (probability model) for a single risky asset can be calculated as:

$$E(R) = \sum_{i=1}^{n} P_i R_i = P_1 R_1 + P_2 R_2 + ... + P_n R_n \text{ (using expectational returns)}$$

where:

P_i = probability that state i will occur

R_i = asset return if the economy is in state i

Example: Calculating expected return for an individual security

The first three columns of the following figure contain the probability of outcomes (states of the world) and the returns for a security in each state of the world. Calculate the expected return on the security.

Answer:

The computation of expected return is illustrated in the fourth column of the following figure.

Computing Expected Return

State of the World	Probability (P_i)	Return (R_i)	Expected Return ($P_i R_i$)
Expansion	0.25	5.0%	(0.25)(5.0) = 1.25%
Normal	0.50	15.0%	(0.50)(15.0) = 7.50%
Recession	0.25	25.0%	(0.25)(25.0) = 6.25%

$$E(R) = \sum_{i=1}^{3} P_i R_i = 15.00\%$$

Variance (Standard Deviation) of Returns for an Individual Security

In finance, the variance and standard deviation of returns are common measures of investment risk. Both of these related measures determine the variability of a distribution of returns about its mean or expected value.

The **variance and standard deviation of rates of return** from a probability model for an individual investment are calculated as:

$$\text{variance} = \sigma^2 = \sum_{i=1}^{n} P_i \left[R_i - E(R) \right]^2$$

$$\text{standard deviation} = \sigma = \sqrt{\sigma^2}$$

where:
R_i = return in state of the world i
P_i = probability of state i occurring
$E(R)$ = expected return

Example: Calculating variance (standard deviation) for an individual security

The returns expectations from the previous example are reproduced in the first three columns of the following figure. Using this expectational data, calculate the variance and standard deviation of returns. Recall that the expected return is 15%.

Answer:

Based on the computations illustrated in the following figure, the variance and standard deviation are 0.0050 and 7.07%, respectively.

Variance and Standard Deviation Computation

State i	Probability P_i	Return R_i	Expected Return $E(R)$	$[R_i - E(R)]^2$	$P_i[(R_i) - E(R)]^2$
Expansion	0.25	0.05	0.15	0.01	(0.25)(0.01) = 0.0025
Normal	0.50	0.15	0.15	0.00	(0.50)(0.00) = 0.0000
Recession	0.25	0.25	0.15	0.01	(0.25)(0.01) = 0.0025

$$\text{Variance} = \sum P_i[(R_i) - E(R)]^2 = 0.0025 + 0.0000 + 0.0025 = 0.0050$$

$$\text{Standard deviation} = (0.0050)^{1/2} = 0.0707 = 7.07\%$$

Expected Return for a Portfolio of Risky Assets

The expected return on a portfolio of assets is simply the weighted average of the returns on the individual assets, using their portfolio weights. Thus, for a two-asset portfolio, the expected return is:

$$E(R_p) = w_1 E(R_1) + w_2 E(R_2)$$

where:
$E(R_1)$ = expected return on Asset 1
$E(R_2)$ = expected return on Asset 2
w_1 = percentage of the total portfolio value invested in Asset 1
w_2 = percentage of the total portfolio value invested in Asset 2

Example: Calculating expected returns for a portfolio

An investor holds the following portfolio which is invested in three stocks: Able, Baker, and Chuck.

Security	Number of Shares	Share Price	Expected Return
Able	15,000	€20	8%
Baker	10,000	€30	10%
Chuck	40,000	€10	12%

Calculate the expected return on this portfolio.

Answer:

The market values of the securities holdings are:

Able = 15,000 × 20 = €300,000

Baker = 10,000 × 30 = €300,000

Chuck = 40,000 × 10 = €400,000

For a total portfolio value of €1,000,000.

The portfolio market-value weights for each security are:

Able = 300,000 / 1,000,000 = 30%

Baker = 300,000 / 1,000,000 = 30%

Chuck = 400,000 / 1,000,000 = 40%

The expected return for the portfolio is:

$$0.30\,(0.08) + 0.30\,(0.10) + 0.40\,(0.12) = 0.102 = 10.2\%$$

In a previous reading in Quantitative Methods, we were introduced to the formula for calculating the variance (standard deviation) of returns for a portfolio of risky assets, which depends on the portfolio weights, the variance of the risky asset returns, and the covariance or correlation between the returns on pairs of risky assets. We will review this calculation, but first we review the concepts of covariance and the correlation coefficient.

LOS 50.d: Compute and interpret the covariance of rates of return and show how it is related to the correlation coefficient.

Covariance measures the extent to which two variables move together over time. A positive covariance means that the variables (e.g., rates of return on two stocks) tend to move together. Negative covariance means that the two variables tend to move in

opposite directions. A covariance of zero means there is no linear relationship between the two variables. To put it another way, if the covariance of returns between two assets is zero, knowing the return for the next period on one of the assets tells you nothing about the return of the other asset for the period.

In one of the readings in Quantitative Methods, we calculated the covariance between two assets from a probability model as follows:

$$Cov_{1,2} = \sum_{i=1}^{n} \left\{ P_i \left[R_{i,1} - E(R_1) \right] \left[R_{i,2} - E(R_2) \right] \right\}$$

where:
$R_{i,1}$ = return on Asset 1 in state i
$R_{i,2}$ = return on Asset 2 in state i
P_i = probability of state i occurring
$E(R_1)$ = expected return on Asset 1
$E(R_2)$ = expected return on Asset 2

Here we will focus on the calculation of the covariance between two asset returns using **historical** data. The calculation of the sample covariance is based on the following formula:

$$Cov_{1,2} = \frac{\sum_{t=1}^{n} \left\{ \left[R_{t,1} - \bar{R}_1 \right] \left[R_{t,2} - \bar{R}_2 \right] \right\}}{n-1}$$

where:
$R_{t,1}$ = return on Asset 1 in period t
$R_{t,2}$ = return on Asset 2 in period t
$\bar{R}_1$ = mean return on Asset 1
$\bar{R}_2$ = mean return on Asset 2
n = number of returns

Example: Calculating covariance with historical data

Calculate the covariance for the returns of Stock 1 and Stock 2 given the six years of historical returns presented in the first three columns of the following figure.

Answer:

The covariance calculation is demonstrated in the right side of the figure.

Calculating Covariance From Historical Returns

Year	Stock 1 Return	Stock 2 Return	$(R_t - \bar{R}_1)$	$(R_t - \bar{R}_2)$	$(R_t - \bar{R}_1)(R_t - \bar{R}_2)$
2004	+0.10	+0.20	+0.05	+0.10	+0.005
2005	−0.15	−0.20	−0.20	−0.30	+0.060
2006	+0.20	−0.10	+0.15	−0.20	−0.030
2007	+0.25	+0.30	+0.20	+0.20	+0.040
2008	−0.30	−0.20	−0.35	−0.30	+0.105
2009	+0.20	+0.60	+0.15	+0.50	+0.075

$$\bar{R}_1 = 0.05 \quad \bar{R}_2 = 0.10$$

$$\Sigma = 0.255$$
$$Cov = 0.255 / 5 = 0.0510$$

Correlation. The magnitude of the covariance depends on the magnitude of the individual stocks' standard deviations and the relationship between their co-movements. The covariance is an absolute measure and is measured in return units squared.

Covariance can be standardized by dividing by the product of the standard deviations of the two securities being compared. This standardized measure of co-movement is called *correlation* and is computed as:

$$\rho_{1,2} = \frac{Cov_{1,2}}{\sigma_1\sigma_2}$$
$$\text{or } Cov_{1,2} = \rho_{1,2}\sigma_1\sigma_2$$

The term $\rho_{1,2}$ is called the *correlation coefficient* between the returns of securities 1 and 2. The correlation coefficient has no units. It is a pure measure of the co-movement of the two stocks' returns and is bounded by −1 and +1.

How should you interpret the correlation coefficient?

- A correlation coefficient of +1 means that returns always change proportionally in the same direction. They are perfectly positively correlated.
- A correlation coefficient of −1 means that returns always move proportionally in the opposite directions. They are perfectly negatively correlated.
- A correlation coefficient of zero means that there is no linear relationship between the two stocks' returns. They are uncorrelated. One way to interpret a correlation (or covariance) of zero is that, in any period, knowing the actual value of one variable tells you nothing about the other.

Example: Computing correlation

The covariance between the returns on the two stocks in the previous example is 0.0510 and the standard deviations of returns for stocks 1 and 2 were 0.2236 and 0.3225, respectively. Calculate and interpret the correlation between the two assets.

Answer:

$$\rho_{1,2} = \frac{0.0510}{0.2236 \times 0.3225} = 0.7072$$

The returns from the two stocks are positively correlated, meaning they tend to move in the same direction at the same time. Although the correlation is positive and high, the correlation is not perfectly positive because the correlation coefficient is less than one.

Example: Computing covariance

The correlation between the returns on two stocks is 0.56. Their standard deviations of returns are 0.1544 and 0.0892, respectively. Calculate and interpret the covariance between the two assets.

Answer:

$$Cov_{1,2} = 0.56 \times 0.1544 \times 0.0892 = 0.0077$$

The covariance between the returns shows that the two securities' returns tend to move together. However, the strength of this tendency cannot be measured using the covariance—we must rely on the correlation to provide us with an indication of the relative strength of the relationship.

LOS 50.e: List the components of the portfolio standard deviation formula.

Earlier in this review, we showed that the expected return for a portfolio of risky assets is the weighted average of the expected returns of the individual assets in the portfolio. This is not the case for the variance and standard deviation of a portfolio of risky assets. The variance and, by association, the standard deviation of a portfolio of two assets are *not* simple weighted averages of the asset variances (standard deviations). Portfolio variance (standard deviation) is not only a function of the variance (standard deviation) of the returns of the individual assets in the portfolio. It is also a function of the correlation (covariance) among the returns of the assets in the portfolio.

The general formula for the standard deviation for a portfolio of n risky assets is as follows:

$$\sigma_P = \sqrt{\sigma_P^2} = \sqrt{\sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i=1}^{n}\sum_{\substack{j=1 \\ i \neq j}}^{n} w_i w_j \text{Cov}_{i,j}}$$

where :

σ_p^2 = portfolio variance
w_i = the market weight of asset i
σ_i^2 = variance of returns for asset i
$\text{Cov}_{i,j}$ = the covariance between the returns of assets i and j

For a portfolio of two risky assets this is equivalent to:

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \rho_{1,2}} \text{ or } \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \text{Cov}_{1,2}}$$

For a portfolio of three risky assets, the expanded form is:

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + w_3^2 \sigma_3^2 + 2 w_1 w_2 \text{Cov}_{1,2} + 2 w_1 w_3 \text{Cov}_{1,3} + 2 w_2 w_3 \text{Cov}_{2,3}}$$

Note that in the first formula for a two-asset portfolio we have substituted $\sigma_1 \sigma_2 \rho_{1,2}$ for $\text{Cov}_{1,2}$ (using the definition of $\rho_{1,2}$) because the formula is often written this way as well to emphasize the role of correlation in portfolio risk.

The first part of the formula is intuitive—the risk of a portfolio of risky assets depends on the risk of the assets in the portfolio and how much of each asset is in the portfolio (the σ and w terms). The second part of the formula is there because the risk (standard deviation) of a portfolio of risky assets also depends on how the returns on the assets move in relation to each other (the covariance or correlation of their returns).

Note that if the asset returns are *negatively correlated*, the final term in the formula for a two-asset portfolio is negative and reduces the portfolio standard deviation. If the correlation is zero, the final term is zero, and the portfolio standard deviation is greater than when the correlation is negative. If the correlation is positive, the final term is positive, and portfolio standard deviation is greater still. The maximum portfolio standard deviation for a portfolio of two assets with given portfolio weights will result when the correlation coefficient is +1 (perfect positive correlation). When assets are perfectly positively correlated, there is no diversification benefit.

This is the key point of the Markowitz analysis and the point of this LOS. *The risk of a portfolio of risky assets depends on the asset weights and the standard deviations of the assets' returns, and crucially on the correlation (covariance) of the asset returns.*

Other things equal, the higher (lower) the correlation between asset returns, the higher (lower) the portfolio standard deviation.

PORTFOLIO RISK AND RETURN FOR A TWO-ASSET PORTFOLIO

Before we move on to the next LOS, let's take a minute to show graphically the risk-return combinations from varying the proportions of two risky assets and then to show how the graph of these combinations is affected by changes in the correlation coefficient for the returns on the two assets.

Figure 2 provides the risk and return characteristics for two stocks, Sparklin' and Caffeine Plus. Figure 3 shows the calculation of portfolio risk and expected return for portfolios with different proportions of each stock (calculated from the formula in the previous LOS).

Figure 2: Risk/Return Characteristics for Two Individual Assets

	Caffeine Plus	Sparklin'
Expected return (%)	11%	25%
Standard deviation (%)	15%	20%
Correlation	0.3	

Figure 3: Possible Combinations of Caffeine Plus and Sparklin'

$W_{Caffeine\ Plus}$	100%	80%	60%	40%	20%	0%
$W_{Sparklin'}$	0%	20%	40%	60%	80%	100%
$E(R_p)$	11.0%	13.8%	16.6%	19.4%	22.2%	25.0%
σ_p	15.0%	13.7%	13.7%	14.9%	17.1%	20.0%

The plot in Figure 4 represents all possible expected return and standard deviation combinations attainable by investing in varying amounts of Caffeine Plus and Sparklin'. We'll call it the *risk-return tradeoff curve*.

Figure 4: Risk-Return Tradeoff Curve
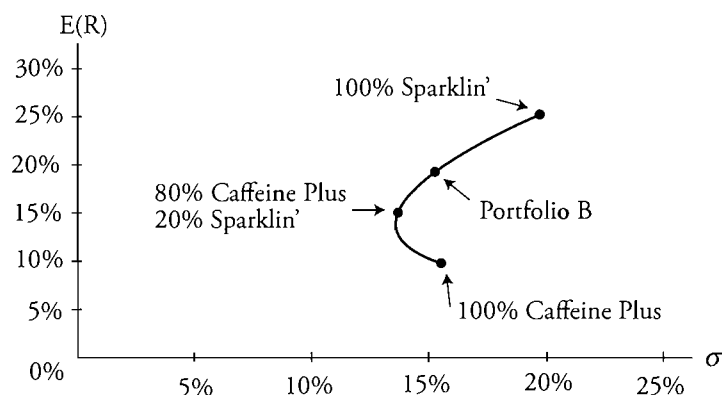
If you have all your investment in Caffeine Plus, your "portfolio" will have an expected return and standard deviation equal to that of Caffeine Plus, and you will be at one end of the curve (at the point labeled "100% Caffeine Plus"). As you increase your investment in Sparklin' to 20% and decrease your investment in Caffeine Plus to 80%, you will move up the risk-return tradeoff curve to the point where the expected return is 13.8% with a standard deviation of 13.7% (labeled "80% Caffeine Plus/20% Sparklin"). Moving along the curve (and changing the expected return and standard deviation of the portfolio) is a matter of changing your portfolio allocation between the two stocks.

We can create portfolios with the *same* risk level (i.e., same standard deviation) and *higher* expected returns by diversifying our investment portfolio across many stocks. We can even benefit by adding just Sparklin' to a portfolio of only Caffeine Plus stock. We can create a combination of Caffeine Plus and Sparklin' (Portfolio B) that has the same standard deviation but a higher expected return. Risk-averse investors would always prefer that combination to Caffeine Plus by itself.

Let's take an analytical look at how diversification reduces risk by using the portfolio combinations in Figure 4. As indicated, the end points of this curve represent the risk/ return combination from a 100% investment in either Sparklin' or Caffeine Plus. Notice that as Sparklin' is added to Caffeine Plus, the frontier "bulges" up and to the left (i.e., northwesterly, if you think of the plot as a map and up as north). This bulge is what creates the diversification benefits because portfolios with between 100% and 80% allocations to Caffeine Plus have both less risk and greater expected return than a portfolio of Caffeine Plus only.

The Special Role of Correlation

As the correlation between the two assets decreases, the benefits of diversification increase. That's because, as the correlation decreases, there is less of a tendency for stock returns to move together. The separate movements of each stock serve to reduce the volatility of the portfolio to a level that is less than that of its individual components.

Figure 5 illustrates the effects of correlation levels on diversification benefits. We've created the risk-return trade-off line for four different levels of correlation between the returns on the two stocks. Notice that the amount of bulge in the risk-return trade-off line is a function of the correlation between the two assets: the lower the correlation (closer to −1), the greater the bulge; the larger the correlation (closer to +1), the smaller is the bulge.

Figure 5: Effects of Correlation on Diversification Benefits
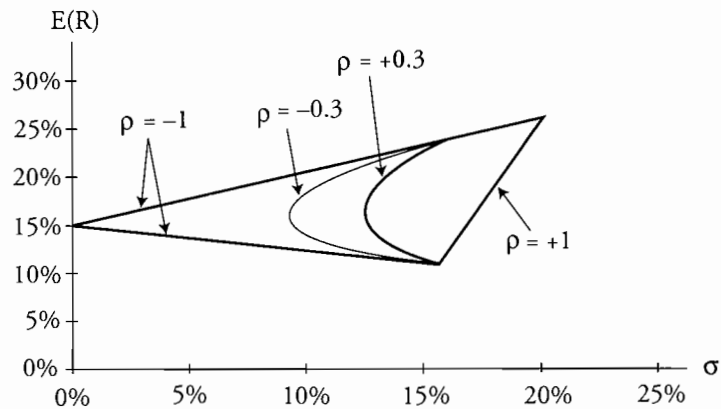
What does all this tell us? *The lower the correlation between the returns of the stocks in the portfolio, all else equal, the greater the diversification benefits.* This principle also applies to portfolios with many stocks, as we'll see next.

LOS 50.f: Describe the efficient frontier and explain the implications for incremental returns as an investor assumes more risk.

The calculations required to generate what we called the risk-return trade-off curve for a two-asset portfolio are not too difficult to do with a spreadsheet. However, the statistical input requirements to apply Markowitz portfolio theory in a large portfolio are significant. Specifically, we must estimate:

- The expected return for each asset available for investment.
- The standard deviation for each asset.
- The correlations between every pair of assets.

This need for correlations can be particularly onerous. For example, if the universe of potential securities includes 100 different stocks, then there are 4,950 pairwise correlation coefficients that must be estimated.

However, with enough computer power, we can generate the set of efficient portfolios from among all the possible combinations of all the assets available for investment. A portfolio is considered to be *efficient* if no other portfolio offers a higher expected return with the same (or lower) risk or if no other portfolio offers lower risk with the same (or higher) return. The concept of efficient portfolios is a key concept in portfolio theory (and capital market theory, discussed in the next topic review).

The **efficient frontier** represents the set of portfolios that will give you the highest return at each level of risk (or, alternatively, the lowest risk for each level of return). The efficient frontier is portrayed graphically in Figure 6.

Figure 6: Markowitz Efficient Frontier
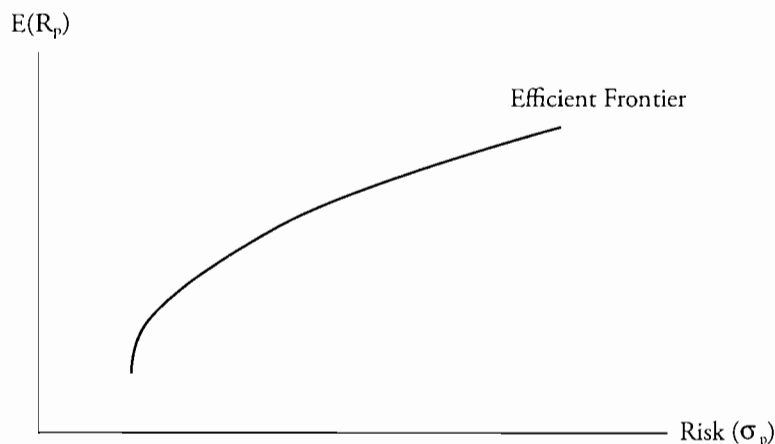
LOS 50.g: Explain the concept of an optimal portfolio and show how each investor may have a different optimal portfolio.

We can combine the concepts of the efficient frontier and indifference curve analysis to describe how a risk averse investor selects his optimal portfolio. Steep indifference curves for Investor A in Figure 7 (I_1 and I_2) indicate greater risk aversion than Investor B, who has relatively flat indifference curves (I_1' and I_2'). The *optimal portfolio* for each investor is at the point where the investor's (highest) indifference curve is tangent to the efficient frontier. The optimal portfolio is the portfolio that is the most preferred of the possible portfolios (i.e., the one that lies on the highest indifference curve).

Investor A, the more risk-averse investor, has Portfolio X as his most preferred portfolio, while Investor B, the less risk-averse investor, has Portfolio Y as his most preferred portfolio. Investor B will expect more return than Investor A but is also willing to assume more risk than Investor A to get a higher expected return. The bottom line here is simple—the less risk-averse investor will have a most-preferred portfolio that is riskier, compared to the more risk-averse investor.

Figure 7: Locating the Optimal Portfolio
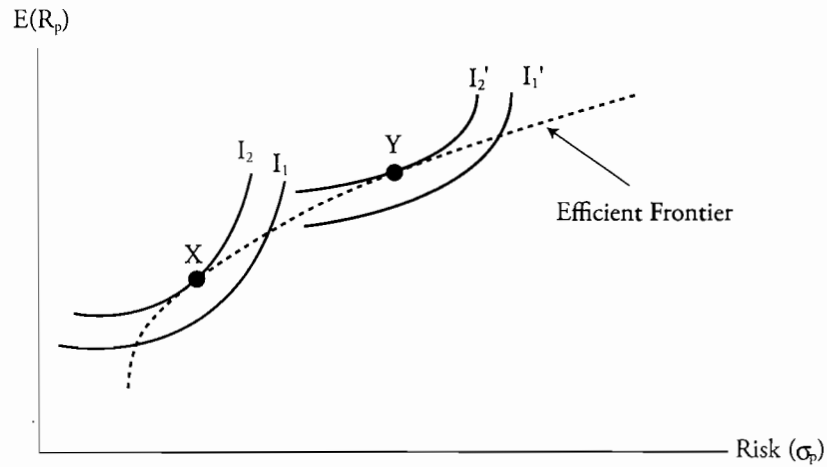
Professor's Note: The steeper the slope at the point of tangency, the greater the level of risk aversion because it takes more additional return to compensate for each additional unit of risk. If you think this was a lot of work to show that a less risk-averse investor chooses a riskier portfolio, you may be right, but we will use this analysis shortly to extend the model.

KEY CONCEPTS

LOS 50.a

A risk-averse investor prefers less risk (returns variability) to more risk, but will take on additional risk if additional expected return offers sufficient compensation.

The fact that most people buy insurance is evidence that individuals are generally risk-averse.

LOS 50.b

The assumptions that underlie Markowitz portfolio theory are:
- Investors view every investment in terms of the probability distribution of returns.
- Investors maximize expected utility over a single time horizon, and their indifference curves exhibit diminishing marginal utility of wealth.
- Investors measure risk as the expected variance (standard deviation) of returns.
- Investors make all investment decisions only on the basis of risk and return.
- Investors are risk averse.

LOS 50.c

The expected rate of return from a probability model of returns for a single risky asset is the sum of the probabilities times the expected return for each outcome:

$$E(R) = \sum_{i=1}^{n} P_i R_i$$

The expected return for a portfolio is the weighted average of the expected returns on the individual assets, using their weights in the portfolio:

$$E(R_P) = \sum_{i=1}^{n} w_i E(R_i)$$

The variance and standard deviation of rates of return from a probability model of returns for an individual investment are calculated as:

$$\sigma^2 = \sum_{i=1}^{n} \left\{ [R_i - E(R)]^2 \times P_i \right\}; \ \sigma = \sqrt{\sigma^2}$$

The standard deviation for a portfolio of n assets is:

$$\sigma_P = \sqrt{\sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j Cov_{i,j}} \ \text{ for } i \neq j$$

LOS 50.d

The sample covariance of returns for two assets based on their historical returns is:

$$Cov_{1,2} = \frac{\sum_{t=1}^{n} \left\{ \left[R_{t,1} - \bar{R}_1 \right]\left[R_{t,2} - \bar{R}_2 \right] \right\}}{n-1}$$

The correlation coefficient, $\rho_{1,2}$, is calculated as:

$$\rho_{1,2} = \frac{Cov_{1,2}}{\sigma_1 \times \sigma_2} \quad \text{and} \quad Cov_{1,2} = \rho_{1,2}\sigma_1\sigma_2$$

LOS 50.e

The standard deviation of a portfolio of two risky assets is a function of the correlation between the returns of the two assets, the portfolio weights, and the standard deviations of the asset returns. It is calculated as:

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_1\sigma_2\rho_{1,2}} \quad \text{or} \quad \sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2Cov_{1,2}}$$

Other things equal, the lower the correlation, the lower the risk of the portfolio and the greater the risk reduction from diversification.

LOS 50.f

The efficient frontier represents the set of portfolios with the highest expected return for each level of risk and shows the trade-offs available in the market between returns and standard deviations of well diversified (efficient) portfolios.

LOS 50.g

The optimal portfolio for a specific investor can be represented as the point where the investor's (highest attainable) indifference curve is tangent to the efficient frontier. Where on the efficient frontier each investor's optimal portfolio lies depends on that investor's degree of risk aversion (indicated by the slope of the tangent indifference curve).

CONCEPT CHECKERS

Use the following data to answer Questions 1 through 3.

An investment has a 50% chance of a 20% return, a 25% chance of a 10% return, and a 25% chance of a −10% return.

1.   What is the investment's expected return?
      A. 5.0%.
      B. 10.0%.
      C. 12.5%.

2.   What is the investment's variance of returns?
      A. 0.005.
      B. 0.015.
      C. 0.150.

3.   What is the investment's standard deviation of returns?
      A. 1.225%.
      B. 2.250%.
      C. 12.250%.

4.   Which of the following statements about covariance and correlation is *least likely* correct?
      A. A zero covariance implies there is no linear relationship between the returns on two assets.
      B. If two assets have perfect negative correlation, the variance of returns for a portfolio that consists of these two assets will equal zero.
      C. The covariance of a two-stock portfolio is equal to the correlation coefficient times the standard deviation of one stock's returns times the standard deviation of the other stock's returns.

Use the following data to answer Questions 5 and 6.

A portfolio was created by investing 25% of the funds in Asset A (standard deviation = 15%) and the balance of the funds in Asset B (standard deviation = 10%).

5.   If the correlation coefficient is 0.75, what is the portfolio's standard deviation?
      A. 10.6%.
      B. 12.4%.
      C. 15.0%.

6.   If the correlation coefficient is −0.75, what is the portfolio's standard deviation?
      A. 2.8%.
      B. 4.2%.
      C. 5.3%.

7. Which of the following statements about correlation is *least likely* correct?
    A. Potential benefits from diversification arise when correlation is less than +1.
    B. If the correlation coefficient were 0, a zero variance portfolio could be constructed.
    C. The lower the correlation coefficient, the greater the potential benefits from diversification.

8. A measure of how the returns of two risky assets move together is the:
    A. range.
    B. covariance.
    C. standard deviation.

9. A portfolio manager adds a new stock to a portfolio that has the same standard deviation of returns as the existing portfolio but has a correlation coefficient with the existing portfolio that is less than +1. If the new stock is added, the portfolio's standard deviation will:
    A. decrease.
    B. not change.
    C. increase by less than the amount of the new stock's standard deviation.

10. An investor currently owns Brown Co. and is thinking of adding either James Co. or Beta Co. to his holdings. All three stocks offer the same expected return and total risk. The correlation of returns between Brown Co. and James Co. is –0.5 and the correlation between Brown Co. and Beta Co. is +0.5. Which of choices below *best* describes the portfolio's risk? The portfolio's risk would:
    A. decline more if only Beta Co. is purchased.
    B. decline more if only James Co. is purchased.
    C. remain unchanged if both stocks are purchased.

11. Which of the following portfolios falls *below* the Markowitz efficient frontier?

Portfolio	Expected return	Expected standard deviation
A. A	7%	14%
B. B	9%	26%
C. C	12%	22%

12. The standard deviation of returns is 0.30 for Stock A and 0.20 for Stock B. The covariance between the returns of A and B is 0.006. The correlation of returns between A and B is:
    A. 0.10.
    B. 0.20.
    C. 0.30.

ANSWERS – CONCEPT CHECKERS

1. **B** $(0.5 \times 0.2) + (0.25 \times 0.1) + (0.25 \times -0.1) = 0.1$, or 10%

2. **B** $[0.5(0.2 - 0.1)^2] + [0.25(0.1 - 0.1)^2] + [0.25(-0.1 - 0.1)^2] = 0.005 + 0 + 0.01 = 0.015$

3. **C** $\sqrt{0.015} = 0.1225 = 12.25\%$

4. **B** If the correlation of returns between the two assets is –1, the set of possible portfolio risk/return combinations becomes two straight lines (see Figure 5). A portfolio of these two assets will have a positive variance unless their portfolio weights are those that minimize the portfolio variance. Covariance is equal to the correlation coefficient times the product of the standard deviations of the returns of the two stocks in a two-stock portfolio. If covariance is zero then correlation is also zero, which implies that there is no linear relationship between the two stocks' returns.

5. **A** $\sqrt{[(0.25)^2(0.15)^2] + [(0.75)^2(0.10)^2] + [2(0.25)(0.75)(0.15)(0.10)(0.75)]} =$

   $\sqrt{(0.001406) + (0.005625) + (0.004219)} = \sqrt{(0.01125)} = 0.106 = 10.6\%$

6. **C** $\sqrt{[(0.25)^2(0.15)^2] + [(0.75)^2(0.10)^2] + [2(0.25)(0.75)(0.15)(0.10)(-0.75)]} =$

   $\sqrt{(0.001406) + (0.005625) - (0.004219)} = \sqrt{(0.002812)} = 0.053 = 5.3\%$

7. **B** A zero-variance portfolio can only be constructed if the correlation coefficient between assets is –1. Diversification benefits can arise when correlation is less than +1, and the lower the correlation, the greater the potential benefit.

8. **B** The covariance is defined as the co-movement of the returns of two assets, or how well the returns of two risky assets move together. Note that range and standard deviation are measures of dispersion and measure risk, not how assets move together.

9. **A** There are potential benefits from diversification any time the correlation coefficient with the existing portfolio is less than one. Because the correlation coefficient of the asset being added with the existing portfolio is less than one, the overall risk of the portfolio should decrease, resulting in a lower standard deviation.

10. **B** The overall risk would decline if either asset were added to the portfolio because both assets have correlation coefficients of less than one. The risk would decline more if James Co. were added because it has the lower correlation coefficient.

11. **B** Portfolio B must be the portfolio that falls below the Markowitz efficient frontier because there is a portfolio (Portfolio C) that offers a higher return and lower risk.

12. **A** Correlation = $0.006/[(0.30)(0.20)] = 0.10$

AN INTRODUCTION TO ASSET PRICING MODELS

EXAM FOCUS

This topic review picks up where our review of the work of Professor Markowitz left off. Adding a riskless asset to the opportunity set transforms portfolio theory into capital market theory. Key concepts in this topic review include the development of the capital market line, the separation of risk into systematic and unsystematic components, and the development of the capital asset pricing model. Be sure that you can discuss each of the major concepts and that you can value an asset using the capital asset pricing model. You should also be familiar with the difference between the necessary assumptions for these pricing models.

LOS 51.a: Explain the capital market theory, including its underlying assumptions, and explain the effect on expected returns, the standard deviation of returns, and possible risk-return combinations when a risk-free asset is combined with a portfolio of risky assets.

The **assumptions of capital market theory** are:

- *Markowitz investors.* All investors use the Markowitz mean-variance framework to select securities. This means they want to select portfolios that lie along the efficient frontier, based on their utility functions.
- *Unlimited risk-free lending and borrowing.* Investors can borrow or lend any amount of money at the risk-free rate.
- *Homogeneous expectations.* This means that when investors look at a stock, they all see the same risk/return distribution.
- *One-period horizon.* All investors have the same one-period time horizon.
- *Divisible assets.* All investments are infinitely divisible.
- *Frictionless markets.* There are no taxes or transaction costs.
- *No inflation and constant interest.* There is no inflation, and interest rates do not change.
- *Equilibrium.* The capital markets are in equilibrium.

The Markowitz efficient frontier is constructed using only risky assets. **Adding a risk-free asset** to the Markowitz portfolio construction process extends portfolio theory into capital market theory. Here's the bottom line (no pun intended): The introduction of a risk-free asset changes the Markowitz efficient frontier from a curve into a straight line called the **capital market line** (CML). Let's see how this conclusion is derived.

If you invest a portion of your total funds in a risky Portfolio M and the remaining portion in the risk-free asset, the equation for the expected return of the resulting portfolio will be:

$$E(R_p) = (1 - w_M)RFR + w_M E(R_M) = RFR + w_M[E(R_M) - RFR]$$

where:
RFR $\quad=\quad$ the risk-free rate
$E(R_M)\quad=\quad$ the expected return on Portfolio M
$w_M\quad=\quad$ percentage (weight) of the total portfolio value invested in Portfolio M
$1 - w_M\quad=\quad$ the percentage (weight) of the total portfolio value invested in the risk-free asset

Professor's Note: You do not need to memorize the preceding formula! We are going to use it to derive the equation for the CAPM, but on the exam, you can always determine the $E(R_p)$ for a two-stock portfolio (even if it contains the risk-free asset) using the equation: $E(R_p) = w_{RFR}RFR + w_M E(R_M)$.

If you combine the risk-free asset with a risky portfolio, the equation for the expected standard deviation of the resulting portfolio will be the same as for a two-risky-asset portfolio:

$$\sigma_P = \sqrt{(1 - w_M)^2 \sigma_{RFR}^2 + w_M^2 \sigma_M^2 + 2(1 - w_M)w_M \sigma_{RFR}\sigma_M \rho_{RFR,M}}$$

where:
$\sigma_{RFR}\quad$ = standard deviation of the risk-free asset
$\sigma_M\quad$ = standard deviation of the expected returns on Portfolio M
$\rho_{RFR,M}\quad$ = correlation between the risk-free asset and Portfolio M

When one of the assets is risk-free, the calculation is much easier! By definition, under the assumptions of portfolio theory and capital market theory, if an asset is risk-free, its return does not vary. Thus, its variance and standard deviation are zero. If an asset has no variance, its expected return doesn't move. If the risk-free rate, RFR, is constant, it can't co-vary with other assets. In other words, the risk-free rate is stationary. Thus, its correlation coefficient with all other assets is zero.

Since $\sigma_{RFR} = \rho_{RFR,M} = 0$, the equation for portfolio standard deviation simplifies to:

$$\sigma_P = w_M \sigma_M$$

If we put 40% of our portfolio assets in the risky portfolio and the remainder in the risk-free asset, the resulting portfolio has 40% of the standard deviation of the risky portfolio! The risk/return relationship is now linear.

Combining this with our expected return equation gives us the following linear equation for the expected portfolio return as a function of portfolio standard deviation:

$$E(R_P) = RFR + \sigma_P \left\{ \frac{[E(R_M) - RFR]}{\sigma_M} \right\}$$

This is the equation for the capital market line (CML). The CML represents all possible portfolio allocations between the risk-free asset and a risky portfolio. The CML has an intercept of RFR and a slope equal to:

$$\frac{\left[E(R_M) - RFR\right]}{\sigma_M}$$

How do we select the optimal risky portfolio when a risk-free asset is also available? First, let's pick a risky portfolio (like Portfolio X in Figure 1) that's on the Markowitz efficient frontier, since we know that these efficient portfolios dominate everything below them in terms of return offered for risk taken. Now, let's combine the risk-free asset with Portfolio X. Remember, the risk/return relationship resulting from the combination of the risk-free asset and a risky portfolio is a straight line.

Now, choose a risky portfolio that is above Portfolio X on the efficient frontier, such as Portfolio Y. Portfolios on the line from RFR to Y will be preferred to portfolios on the line from RFR to X because we get more return for a given amount of systematic risk. Actually, we can keep getting better portfolios by moving up the efficient frontier. At point M, you reach the best possible combination. Portfolio M is at the point where the risk-return tradeoff line is just tangent to the efficient frontier. The line from RFR to M represents portfolios that are preferred to all the portfolios on the "old" efficient frontier, except M.

Figure 1: Capital Market Line
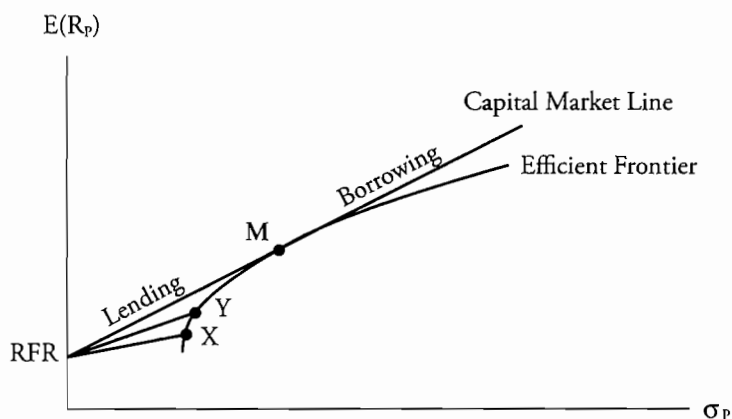
Investors at point RFR have 100% of their funds invested in the risk-free asset. Investors at point M have 100% of their funds invested in Portfolio M. Between RFR and M, investors hold both the risk-free asset and Portfolio M. This means investors are *lending* some of their funds at the risk-free rate (i.e., buying the risk-free asset) and investing the rest in Portfolio M. To the right of M, investors hold more than 100% of Portfolio M. This means they are *borrowing* funds to buy more of Portfolio M. The *levered positions* represent a 100% investment in Portfolio M and borrowing to buy even more of Portfolio M.

The introduction of a risk-free asset changes the Markowitz efficient frontier into a straight line called the CML.

LOS 51.b: Identify the market portfolio and describe the role of the market portfolio in the formation of the capital market line (CML).

All investors have to do to get the risk and return combination that suits them is to simply vary the proportion of their investment in the risky Portfolio M and the risk-free asset. So, in the CML world, all investors will hold some combination of the risk-free asset and Portfolio M. Since all investors will want to hold the same risky portfolio, **risky Portfolio M must be the market portfolio.**

The market portfolio is the portfolio consisting of every risky asset; the weights on each asset are equal to the percentage of the market value of the asset to the market value of the entire market portfolio. For example, if the market value of a stock is $100 million and the market value of the market portfolio is $5 billion, that stock's weight in the market portfolio is 2% ($100 million / $5 billion).

Logic tells us that the market portfolio, which will be held by all investors, has to contain all the stocks, bonds, and risky assets in existence because all assets have to be held by someone. This market portfolio theoretically includes all risky assets, so it is completely diversified.

LOS 51.c: Define systematic and unsystematic risk and explain why an investor should not expect to receive additional return for assuming unsystematic risk.

When you diversify across assets that are not perfectly correlated, the portfolio's risk is less than the weighted sum of the risks of the individual securities in the portfolio. The risk that disappears in the portfolio construction process is called the asset's **unsystematic risk** (also called *unique, diversifiable, or firm-specific risk*). Since the market portfolio contains *all* risky assets, it must represent the ultimate in diversification. All the risk that can be diversified away must be gone. The risk that is left cannot be diversified away, since there is nothing left to add to the portfolio. The risk that remains is called the **systematic risk** (also called *nondiversifiable risk* or *market risk*).

The concept of systematic risk applies to individual securities as well as to portfolios. Some securities are very sensitive to market changes. Typical examples of firms that are very sensitive to market movements are luxury goods manufacturers such as Ferrari automobiles and Harley Davidson motorcycles. Small changes in the market will lead to large changes in the value of luxury goods manufacturers. These firms have high systematic risk (i.e., they are very responsive to market, or systematic, changes). Other firms, such as utility companies, respond very little to changes in the overall market. These firms have very little systematic risk. Hence, total risk (as measured by standard deviation) can be broken down into its component parts: unsystematic risk and systematic risk. Mathematically:

total risk = systematic risk + unsystematic risk

Professor's Note: Know this concept!

Do you actually have to buy all the securities in the market to diversify away unsystematic risk? No. Academic studies have shown that as you increase the number of stocks in a portfolio, the portfolio's risk falls toward the level of market risk. One study showed that it only took about 12 to 18 stocks in a portfolio to achieve 90% of the maximum diversification possible. Another study indicated it took 30 securities. Whatever the number, it is significantly less than *all* the securities. Figure 2 provides a general representation of this concept. Note, in the figure, that once you get to 30 or so securities in a portfolio, the standard deviation remains constant. The remaining risk is systematic, or nondiversifiable, risk. We will develop this concept later when we discuss beta, a measure of systematic risk.

Figure 2: Risk vs. Number of Portfolio Assets
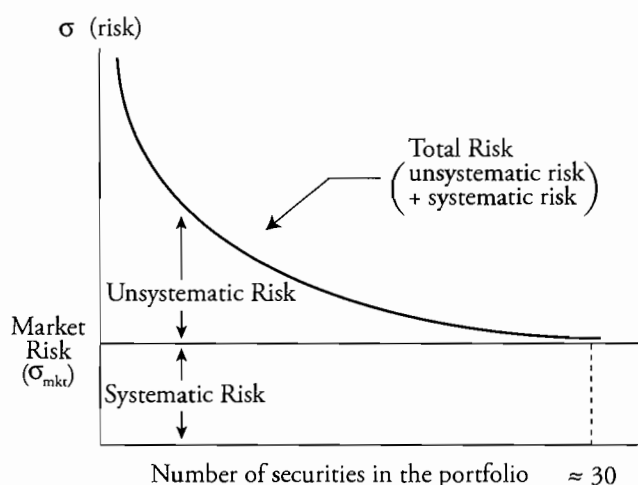
Systematic Risk is Relevant in Portfolios

One important conclusion of capital market theory is that equilibrium security returns depend on a stock's or a portfolio's systematic risk, not its total risk as measured by standard deviation. One of the assumptions of the model is that diversification is free. The reasoning is that investors will not be compensated for bearing risk that can be eliminated at no cost. If you think about the costs of a no-load index fund compared to buying individual stocks, diversification is actually very low cost if not actually free.

The implications of this conclusion are very important to asset pricing (expected returns). The riskiest stock, with risk measured as standard deviation of returns, does not necessarily have the greatest expected return. Consider a biotech stock with one new drug product that is in clinical trials to determine its effectiveness. If it turns out that the drug is effective and safe, stock returns will be quite high. If, on the other hand, the subjects in the clinical trials are killed or otherwise harmed by the drug, the stock will fall to approximately zero and returns will be quite poor. This describes a stock with high standard deviation of returns (i.e., high total risk).

The high risk of our biotech stock, however, is primarily from firm-specific factors, so its unsystematic risk is high. Since market factors such as economic growth rates have little to do with the eventual outcome for this stock, systematic risk is a small proportion of the total risk of the stock. Capital market theory says that the equilibrium return on

this stock may be less than that of a stock with much less firm-specific risk but more sensitivity to the factors that drive the return of the overall market. An established manufacturer of machine tools may not be a very risky investment in terms of total risk, but may have a greater sensitivity to market (systematic) risk factors (e.g., GDP growth rates) than our biotech stock. Given this scenario, the stock with more total risk (the biotech stock) has less systematic risk and will therefore have a lower equilibrium rate of return according to capital market theory.

Note that holding many biotech firms in a portfolio will diversify away the firm-specific risk. Some will have blockbuster products and some will fail, but you can imagine that when 50 or 100 such stocks are combined into a portfolio, the uncertainty about the portfolio return is much less than the uncertainty about the return of a single biotech firm stock.

To sum up, unsystematic risk is not compensated in equilibrium because it can be eliminated for free through diversification. Systematic risk is measured by the contribution of a security to the risk of a well diversified portfolio and the expected equilibrium return (required return) on an individual security will depend on its systematic risk.

LOS 51.d: Explain the capital asset pricing model, including the security market line (SML) and beta and describe the effects of relaxing its underlying assumptions.

Given that the only relevant risk for an individual asset i is the covariance between the asset's returns and the return on the market, $Cov_{i,mkt}$, we can plot the relationship between risk and return for individual assets using $Cov_{i,mkt}$ as our measure of systematic risk. The resulting line, plotted in Figure 3, is one version of what is referred to as the **security market line** (SML).

Figure 3: Security Market Line
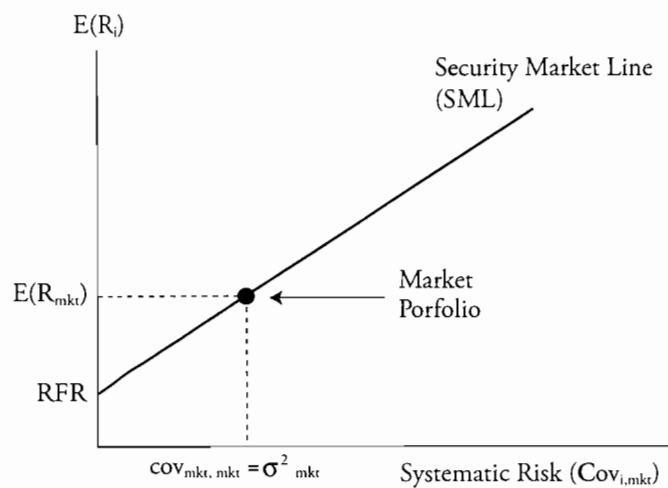
The equation of the SML is:

$$E(R_i) = RFR + \frac{E(R_{mkt}) - RFR}{\sigma^2_{mkt}}(Cov_{i,mkt})$$

which can be rearranged and stated as:

$$E(R_i) = RFR + \frac{Cov_{i,mkt}}{\sigma^2_{mkt}}\left[E(R_{mkt}) - RFR\right]$$

The line described by this last equation is presented in Figure 4, where we let the standardized covariance term, $\frac{Cov_{i,mkt}}{\sigma^2_{mkt}}$, be defined as beta, β_i. This is the most common means of describing the SML, and this relation between beta (systematic risk) and expected return is known as the **capital asset pricing model** (CAPM).

Figure 4: The Capital Asset Pricing Model
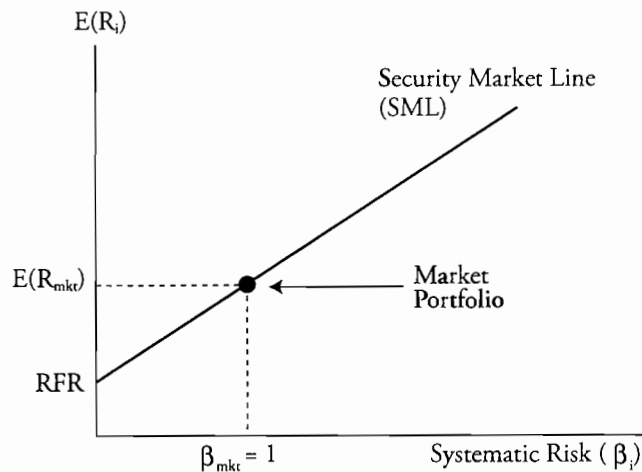
So, we can **define beta**, $\beta = \frac{Cov_{i,mkt}}{\sigma^2_{mkt}}$, as a standardized measure of systematic risk. Beta measures the sensitivity of a security's returns to changes in the market return.

Formally, the CAPM is stated as:

$$E(R_i) = RFR + \beta_i[E(R_{mkt}) - RFR]$$

The CAPM holds that, in equilibrium, the expected return on risky asset $E(R_i)$ is the risk-free rate (RFR) plus a beta-adjusted market risk premium, $\beta_i[E(R_{mkt}) - RFR]$. Beta measures systematic risk.

Comparing the CML and the SML

It is important that you recognize that the CML and SML are very different. Recall the equation of the CML:

$$E(R_P) = RFR + \sigma_P \left\{ \frac{\left[E(R_M) - RFR \right]}{\sigma_M} \right\}$$

The CML uses total risk = σ_p on the X-axis. Hence, only efficient portfolios will plot on the CML. On the other hand, the SML uses beta (systematic risk) on the X-axis. So in a CAPM world, *all properly priced securities and portfolios of securities will plot on the SML*, as shown in Figure 5.

Figure 5: Comparing the CML and the SML

(a) Capital Market Line

(b) Security Market Line
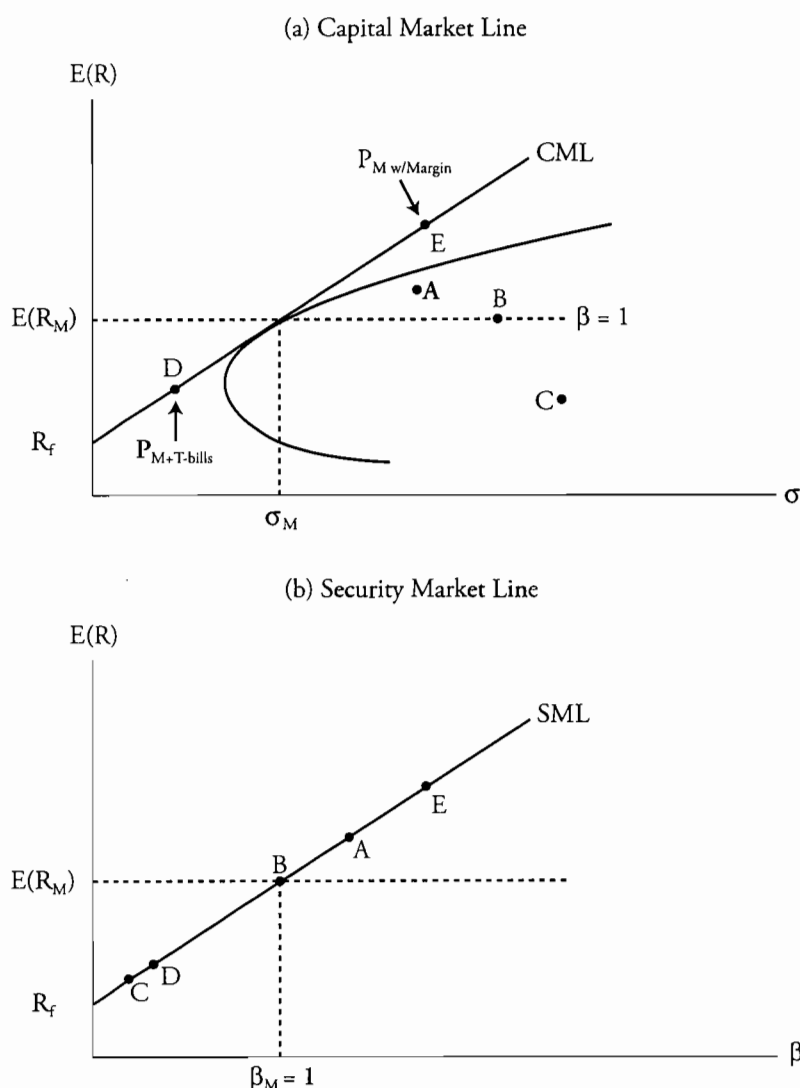
Portfolios that are not well-diversified (efficient) plot inside the efficient frontier and are represented by risk-return combinations such as points A, B, and C in panel (a) of Figure 5. Individual securities are one example of such inefficient portfolios. According to the CAPM, the expected returns on all portfolios, well-diversified or not, are

determined by their systematic risk. Thus, according to the CAPM, Point A represents a high-beta stock or portfolio, point B a stock or portfolio with a beta of one, and point C a low-beta stock or portfolio. We know this because the expected return at Point B is equal to the expected return on the market, and the expected returns at Point A and C are greater and less than the expected return on the market (tangency) portfolio, respectively.

Note that a low-beta stock, such as represented by Point C, is not necessarily a low-risk stock when total risk is considered. While its contribution to the risk of a well-diversified portfolio may be low, its risk when held by itself can be considered quite high. A firm whose only activity is developing a new, but as yet unproven, drug may be quite speculative with highly uncertain returns. It may also have quite low systematic risk if the uncertainty about its future returns derives primarily from firm-specific factors.

All stocks and portfolios that plot along the line labeled $\beta = 1$ in Figure 5 have the same expected return as the market portfolio and thus, according to the CAPM, have the same systematic risk as the market portfolio, i.e., they all have betas of one.

All points on the CML (except the tangency point) represent the risk-return characteristics of portfolios formed by either combining the market portfolio with the risk-free asset or borrowing at the risk-free rate in order to invest more than 100% of the portfolio's net value in the risky market portfolio (investing on margin). Point D in Figure 5 represents a portfolio that combines the market portfolio with the risk-free asset, while points above the point of tangency, such as Point E, represent portfolios created by borrowing at the risk-free rate to invest in the market portfolio. Portfolios that do not lie on the CML are not efficient and therefore have risk that will not be rewarded with higher expected returns in equilibrium.

According to the CAPM, all securities and portfolios, diversified or not, will plot on the SML in equilibrium. In fact, all stocks and portfolios along the line labeled $\beta = 1$ in Figure 5, including the market portfolio, will plot at the same point on the SML. They will plot at the point on the SML with beta equal to one and expected return equal to the expected return on the market, regardless of their total risk.

The CAPM is one of the most fundamental concepts in investment theory. The CAPM is an equilibrium model that predicts the expected return on a stock, given the expected return on the market, the stock's beta coefficient, and the risk-free rate.

Example: Capital asset pricing model

The expected return on the market is 15%, the risk-free rate is 8%, and the beta for Stock A is 1.2. Compute the rate of return that would be expected (required) on this stock.

Answer:

$$E(R_A) = 0.08 + 1.2 \, (0.15 - 0.08) = 0.164$$

Note: $\beta_A > 1$ so $E(R_A) > E(R_{mkt})$

Professor's Note: Know this calculation!

Example: Capital asset pricing model

The expected return on the market is 15%, the risk-free rate is 8%, and the beta for Stock B is 0.8. Compute the rate of return that would be expected (required) on this stock.

Answer:

$$E(R_B) = 0.08 + 0.8\,(0.15 - 0.08) = 0.136$$

Note: Beta < 1 so $E(R_B) < E(R_{mkt})$

Relaxing the Assumptions Underlying the SML

The CAPM requires a number of assumptions, many of which do not reflect the true nature of the investment process. This section addresses the impact on the CAPM of relaxing some of the assumptions required in the derivation of the model.

Different borrowing and lending rates. One of the key assumptions of the CAPM is the ability of investors to lend and borrow at the risk-free rate. This assumption is what makes the CML straight. A straight CML allows risk to be separated into its systematic and unsystematic components. Without an equal lending and borrowing rate, you cannot determine a security's systematic risk, and, therefore, you cannot derive the SML. Without the SML, you cannot derive the CAPM.

Investors can lend all they want by buying investments at the risk-free rate, but investors must pay a premium over the risk-free rate to borrow. The graph in Figure 6 shows what this does to the CML. With unequal borrowing and lending rates, the CML follows the Markowitz efficient frontier (i.e., the no risk-free asset efficient frontier) between points A and B. Essentially, this puts a kink in the CML.

Figure 6: CAPM with Unequal Borrowing and Lending Rates
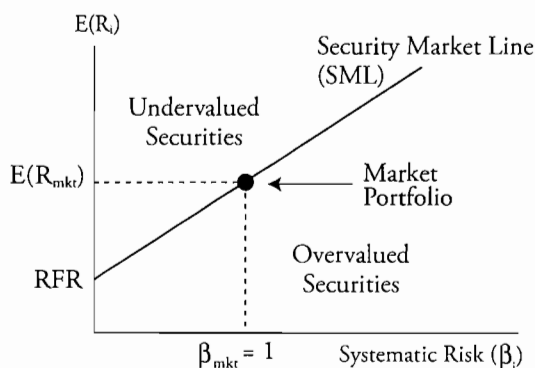
Without borrowing and lending at the same rate, can the validity of the CAPM be maintained? Yes, by the introduction of the **zero-beta portfolio**. The CAPM cannot be derived without equal borrowing and lending rates or some substitute for equal borrowing and lending rates. Fortunately, we have a substitute—the zero-beta model.

The zero-beta version of the CAPM assumes that investors can find a *portfolio of securities with returns that are uncorrelated with market returns.* Since the portfolio is uncorrelated with the market, the portfolio will have a beta of zero, that is, no systematic risk.

As long as the expected return on the zero-beta portfolio is assumed to be greater than the risk-free lending rate, the resulting security market line will have a smaller risk premium (i.e., a flatter slope). With the introduction of a zero-beta portfolio with expected returns greater than those of the risk-free asset, we can still derive a linear relation between systematic risk and expected returns, a zero-beta CAPM. This relation can be expressed as:

$$E(R_{stock}) = E(R_{zero\ beta\ portfolio}) + (Beta_{stock})\left[E(R_{market}) - E(R_{zero\ beta\ portfolio})\right]$$

Transaction costs. The no-transaction-costs assumption guarantees that all securities move to the SML. Why? Securities below the SML are overpriced, and securities above the SML are underpriced. Investors will buy the underpriced securities and sell the overpriced securities until no excess return opportunities exist. When all excess return opportunities have been eliminated, all securities will lie on the SML.

However, with transaction costs, securities that are just slightly mispriced will not be brought back to the SML, because the transaction costs will be greater than the profit potential. This will allow a band of expected returns to exist around the SML. The width of the band is a function of the size of the transaction costs: the higher the costs, the wider the band.

Heterogeneous expectations and planning periods. If investors have different risk and return expectations or project their expectations over different time horizons, each investor will have a unique view of the SML. The homogeneous expectations and single holding period assumptions are necessary to bring the multitude of individual security market lines together into one SML and one CML. If these assumptions are not valid, there will be many SMLs and CMLs. The composite graph would be a band of lines with the width of the band determined by the divergence of expectations and time horizons; the greater the divergence of expectations and planning periods, the wider the band. The impact of heterogeneous expectations and multiple planning periods on the CAPM is similar to the impact of transactions costs—the SML becomes a band rather than a line.

Taxes. The expected after-tax returns for taxable investors are usually much different from the pre-tax returns we used in developing the CAPM. Individual investors pay ordinary income tax on dividend income and capital gains tax on realized gains. Individual investors facing different marginal tax rates will have different after-tax return expectations, so their security market lines and capital market lines will be quite different.

LOS 51.e: Calculate, using the SML, the expected return on a security and evaluate whether the security is overvalued, undervalued, or properly valued.

Let's clarify some terminology before we continue. The LOS asks for expected return based on the SML. You should also think of this as the "required return." There is another type of "expected return" which is based on *opinions* of the returns that can be earned on the stock given our future price and dividend forecasts. To keep this straight, we will refer to the expected return based on the theory of the CAPM as the *required* return, and the expected return based on perception and opinion as an *estimated* or *forecast* return.

In a CAPM world, all asset returns should fall on the SML. The SML tells us an asset's *required return* given its level of systematic risk (as measured by beta). The way we can use the CAPM to identify mispriced securities is to compare an asset's *estimated return* (given our forecasts of future prices and dividends) to the required return according to the SML. If the returns are not equal, the asset is either overvalued or undervalued and an appropriate trading strategy may be implemented:

- An asset with an estimated return greater than its required return from the SML is undervalued; we should buy it (return too high, price too low).
- An asset with an estimated return less than its required return from the SML is overvalued; we should sell it (return too low, price too high).
- An asset with an estimated return equal to its required return from the SML is properly valued; we're indifferent between buying or selling it.

> *Professor's Note: This is the most important LOS in this review. You are likely to see this material on the exam. Make sure you know it and nail the exam question!*

Example: Identifying mispriced securities

The following figure contains information based on analyst's forecasts for three stocks. Assume a risk-free rate of 7% and a market return of 15%. Compute the expected and required return on each stock, determine whether each stock is undervalued, overvalued, or properly valued, and outline an appropriate trading strategy.

Forecast Data

Stock	Price Today	E(Price) in 1 Year	E(Dividend) in 1 Year	Beta
A	$25	$27	$1.00	1.0
B	40	45	2.00	0.8
C	15	17	0.50	1.2

Answer:

Expected and required returns computations are shown in the following figure.

Forecasts vs. Required Returns

Stock	Forecast Return	Required Return
A	($27 − $25 + $1) / $25 = 12.0%	0.07 + (1.0)(0.15 − 0.07) = 15.0%
B	($45 − $40 + $2) / $40 = 17.5%	0.07 + (0.8)(0.15 − 0.07) = 13.4%
C	($17 − $15 + $0.5) / $15 = 16.6%	0.07 + (1.2)(0.15 − 0.07) = 16.6%

- Stock A is *overvalued*. It is expected to earn 12%, but based on its systematic risk it should earn 15%. It plots *below* the SML.
- Stock B is *undervalued*. It is expected to earn 17.5%, but based on its systematic risk it should earn 13.4%. It plots *above* the SML.
- Stock C is *properly valued*. It is expected to earn 16.6%, and based on its systematic risk it should earn 16.6%. It plots *on* the SML.

The appropriate trading strategy is:

- Short sell Stock A.
- Buy Stock B.
- Buy, sell, or ignore Stock C.

We can do this same analysis graphically. The expected return/beta combinations of all three stocks are graphed in the following figure relative to the SML.

Identifying Mispriced Securities
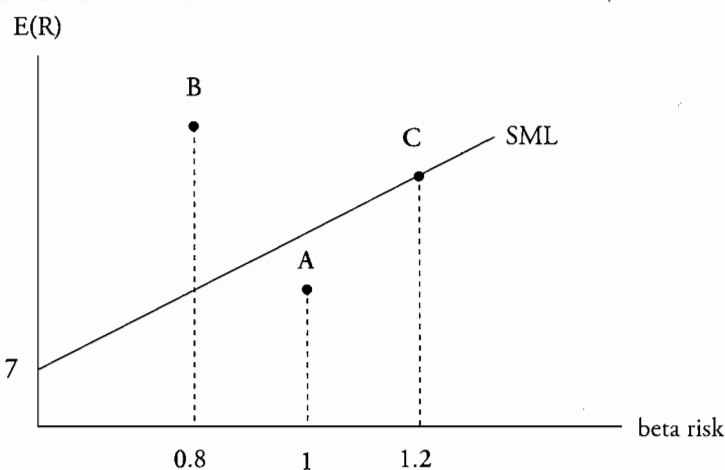
Professor's Note: A trick to use when working these types of problems is: if the estimated return plots "over" the SML, the security is "under" valued. If the estimated return plots" under" the SML, the security is "over" valued.

Remember, all stocks should plot on the SML; any stock not plotting on the SML is mispriced. Notice that Stock A falls below the SML, Stock B lies above the SML, and Stock C is on the SML. If you plot a stock's expected return and it falls below the SML, the stock is overpriced. That is, the stock's expected return is too low given its systematic risk. If a stock plots above the SML, it is underpriced and is offering an expected return greater than required for its systematic risk. If it plots on the SML, the stock is properly priced.

Since the equation of the SML is the capital asset pricing model, you can determine if a stock is over- or underpriced graphically or mathematically. Your answers will always be the same.

KEY CONCEPTS

LOS 51.a
The assumptions of capital market theory are:
- All investors use the Markowitz mean-variance framework to select securities.
- Investors can borrow or lend unlimited amounts at the risk-free rate.
- All investors have homogeneous (the same) expectations for expected returns, standard deviation of returns, and returns correlations.
- All investors have the same one-period time horizon.
- All investments are infinitely divisible.
- There are no taxes or transaction costs.
- There is no inflation, and interest rates do not change in the period of analysis.
- Capital markets (prices) are in equilibrium.

The introduction of a risk-free asset changes the efficient frontier from a curve into a straight line called the Capital Market Line. The equation of the CML is:

$$E(R_P) = RFR + \sigma_P \times \left\{ \frac{\left[E(R_M) - RFR \right]}{\sigma_M} \right\}$$

where R_M and σ_M are the return and standard deviation of the market portfolio.

LOS 51.b
The market portfolio is at the point on the efficient frontier where the Capital Market Line (CML) is tangent to it. The CML represents the risk and expected returns of all the portfolios that can be constructed by combining the market portfolio with the risk-free asset.

LOS 51.c
Systematic (market or covariance) risk is due to factors, such as GDP growth and interest rate changes, that affect the values of all risky securities and therefore it cannot be reduced by diversification. Unsystematic (firm-specific) risk can be reduced by portfolio diversification.

Because one of the assumptions underlying the CAPM is that portfolio diversification to eliminate unsystematic risk is costless, investors cannot increase expected equilibrium portfolio returns by taking on unsystematic risk.

LOS 51.d

The equation of the Security Market Line illustrates the conclusion of the Capital Asset Pricing Model, that expected security returns depend only on systematic risk as measured by beta and that the relation between beta and expected returns is linear with slope equal to $[E(R_M) - RFR]$.

Beta (β) is a standardized measure of systematic risk in units of "market risk" and is equal to:

$$\beta_i = \frac{Cov_{i,mkt}}{\sigma^2_{mkt}} = \left(\frac{\sigma_i}{\sigma_{mkt}}\right) \times \rho_{i,mkt}$$

Relaxing the CAPM assumptions changes the model's implications.
*   The CAPM cannot be derived without equal borrowing and lending rates, unless investors can create a zero-beta portfolio.
*   Positive transactions costs, heterogeneous expectations, and a multi-period investment horizon will each produce a Security Market band rather than a Security Market Line.
*   Introducing taxes with different tax rates for different investors produces heterogeneous after-tax returns expectations and results in different SMLs for different investors.

LOS 51.e

The SML shows assets' required returns given their level of systematic risk as measured by beta, i.e., $E(R_i) = RFR + \beta_i[E(R_M) - RFR]$.

The graph of the SML equation is:
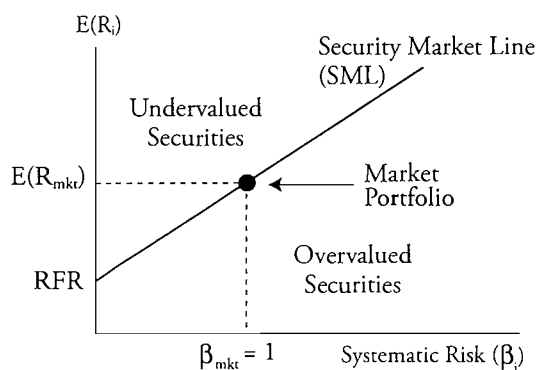
Comparing analyst forecasts of expected returns to equilibrium expected returns from the SML will indicate whether securities are over- or underpriced as they will plot below or above the SML, respectively.

CONCEPT CHECKERS

1. An investor put 60% of his money into a risky asset offering a 10% return with a standard deviation of returns of 8%, and he put the balance of his funds in the risk-free asset offering 5%. What is the expected return and standard deviation of his portfolio?

	Expected return	Standard deviation
A.	6.0%	6.8%
B.	8.0%	4.8%
C.	10.0%	6.6%

2. What is the risk measure associated with the capital market line (CML)?
   A. Beta.
   B. Market risk.
   C. Standard deviation.

3. A portfolio to the right of the market portfolio on the CML is:
   A. a lending portfolio.
   B. a borrowing portfolio.
   C. an inefficient portfolio.

4. As the number of stocks in a portfolio increases, the portfolio's systematic risk:
   A. can increase or decrease.
   B. decreases at a decreasing rate.
   C. decreases at an increasing rate.

5. Total risk equals:
   A. unique plus diversifiable risk.
   B. market plus nondiversifiable risk.
   C. systematic plus unsystematic risk.

6. What is the required rate of return for a stock with a beta of 1.2, when the risk-free rate is 6% and the market is offering 12%?
   A. 7.2%.
   B. 12.0%.
   C. 13.2%.

7. What is the required rate of return for a stock with a beta of 0.7, when the risk-free rate is 7% and the market is offering 14%?
   A. 11.9%.
   B. 14.0%.
   C. 16.8%.

8. The risk-free rate is 6% and the expected market return is 15%. An investor sees a stock with a beta of 1.2 selling for $25 that will pay a $1 dividend next year. If he thinks the stock will be selling for $30 at year end, he thinks it is:
   A. overpriced, so short it.
   B. underpriced, so buy it.
   C. underpriced, so short it.

9.   A stock with a beta of 0.7 currently priced at $50 is expected to increase in price to $55 by year end and pay a $1 dividend. The expected market return is 15%, and the risk-free rate is 8%. The stock is:
     A.   overpriced, so do not buy it.
     B.   underpriced, so buy it.
     C.   properly priced, so buy it.

10. The market is expected to return 15% next year and the risk-free rate is 7%. What is the expected rate of return on a stock with a beta of 1.3?
     A.   16.3%.
     B.   17.1%.
     C.   17.4%.

11. The market is expected to return 12% next year and the risk free rate is 6%. What is the expected rate of return on a stock with a beta of 0.9?
     A.   10.8%.
     B.   11.4%.
     C.   13.0%.

12. The covariance of the market's returns with the stock's returns is 0.005 and the standard deviation of the market's returns is 0.05. What is the stock's beta?
     A.   1.0.
     B.   1.5.
     C.   2.0.

13. The covariance of the market's returns with the stock's returns is 0.008. The standard deviation of the market's returns is 0.08 and the standard deviation of the stock's returns is 0.11. What is the correlation coefficient between the returns of the stock and returns of the market?
     A.   0.91.
     B.   1.00.
     C.   1.25.

14. Which of the following statements about the SML and the CML is *least likely* correct?
     A.   Securities that plot above the SML are undervalued.
     B.   Investors expect to be compensated for systematic risk.
     C.   Securities that fall on the SML have no intrinsic value to the investor.

15. Susan Kinicki is an analyst. She is talking with a colleague, Charles Riker, about how to determine whether a security is undervalued or overvalued. After meeting with her supervisor, she meets Riker for lunch. During lunch, Kinicki makes the following statements:

Statement 1: I'm not recommending ONJ stock because the expected return is greater than the return I calculated using the CAPM.
Statement 2: Relaxing the standard assumptions of homogeneous expectations and zero transactions costs have the same effect on the SML—the SML becomes a band rather than a straight line.

Riker considers Kinicki's statements and then replies, "I agree with you about the ONJ stock; I don't intend to recommend it either. However, I thought that heterogeneous expectations and positive transactions costs affected the SML differently. I know that transactions costs result in a band, but I don't think introducing heterogeneous expectations has that effect."

In context of the SML, Riker is correct with regard to:
A. both of Kinicki's statements.
B. only one of Kinicki's statements.
C. neither of Kinicki's statements.

ANSWERS – CONCEPT CHECKERS

1. **B** Expected return: $(0.60 \times 0.10) + (0.40 \times 0.05) = 0.08$, or 8.0%.

    Standard deviation: $0.60 \times 0.08 = 0.048$, or 4.8%.

2. **C** Remember that the capital market line (CML) plots return against *total risk* which is measured by standard deviation.

3. **B** A portfolio to the right of a portfolio on the CML has more risk than what is offered by the market. Investors seeking to take on more risk will *borrow* at the risk-free rate to purchase more of the market portfolio.

4. **A** When you increase the number of stocks in a portfolio, *unsystematic risk* will decrease at a decreasing rate. However, the portfolio's *systematic risk* can be increased by adding higher-beta stocks or decreased by adding lower-beta stocks.

5. **C** Total risk equals systematic plus unsystematic risk. Unique risk is diversifiable. Market (systematic) risk is nondiversifiable.

6. **C** $6 + 1.2(12 - 6) = 13.2\%$

7. **A** $7 + 0.7(14 - 7) = 11.9\%$

8. **B** Required rate = $6 + 1.2(15 - 6) = 16.8\%$

    Return on stock = $(30 - 25 + 1) / 25 = 24\%$

    Based on risk, the stock plots above the SML and is underpriced, so buy it!

9. **A** Required rate = $8 + 0.7(15 - 8) = 12.9\%$

    Return on stock = $(55 - 50 + 1) / 50 = 12\%$

    The stock falls below the SML so it is *overpriced*.

10. **C** $7 + 1.3(15 - 7) = 17.4\%$

11. **B** $6 + 0.9(12 - 6) = 11.4\%$

12. **C** Beta = covariance / market variance

    Market variance = $0.05^2 = 0.0025$

    Beta = $0.005 / 0.0025 = 2.0$

13. **A** $\rho_{1,2} = \dfrac{Cov_{1,2}}{\sigma_1 \sigma_2} = \dfrac{0.008}{(0.08)(0.11)} = 0.909$

14. **C** Securities that fall on the SML are expected to earn the market rate of return and, therefore, do have intrinsic value to the investor (and may have diversification benefits). The other statements are true.

15. **C** Riker is incorrect to agree with Kinicki about ONJ stock—a stock with an expected return greater than that calculated with the CAPM is undervalued. He is incorrect with respect to statement 2 as well. Introducing heterogeneous expectations and positive transactions costs both make the SML relationship a band rather than a line.

6 questions: 9 minutes

1. Differences in average portfolio allocations to equities across countries are *least likely* a result of:
   A. availability of equities.
   B. differences in historical inflation.
   C. different historical attitudes toward financial risk.

2. Based on studies showing that differences in target asset allocations explain as much as 90% of the variation in a portfolio's returns over time, it is *most likely* that:
   A. market timing with respect to asset class exposure has not greatly improved returns.
   B. target asset allocations should match the weights of asset classes in the market as a whole.
   C. on average, managers are better at selecting asset class allocations than selecting stocks.

3. According to the Capital Asset Pricing Model:
   A. an investor who is risk averse should hold at least some of the risk-free asset in his portfolio.
   B. a stock with high risk, measured as standard deviation of returns, will have high expected returns.
   C. any investor who takes on risk will hold some of the market portfolio.

4. Beta is *best* described as the:
   A. slope of the Security Market Line.
   B. correlation of returns with those of the market portfolio.
   C. covariance of returns with the market portfolio in terms of its variance of returns.

5. According to Markowitz portfolio theory:
   A. combining any two risky assets in a portfolio will reduce unsystematic risk compared to a portfolio holding only one of the two risky assets.
   B. adding a risky stock to a (less risky) bond portfolio can decrease portfolio risk.
   C. when there is no risk-free asset, choosing any portfolio on the efficient frontier will minimize portfolio risk.

6. An analyst has determined that the expected returns for an asset, conditional on the performance of the overall economy, are:

Return	Probability	Economic Growth
5%	20%	Poor
10%	40%	Average
14%	40%	Good

The conditional expected returns on the market portfolio are:

Return	Probability	Economic Growth
2%	20%	Poor
10%	40%	Average
15%	40%	Good

If the risk-free rate is 5% and the risky asset has a beta of 1.1, with respect to the market portfolio, the analyst should:
A. sell (or sell short) the risky asset because its expected return is less than equilibrium expected return on the market portfolio.
B. buy the risky asset because the analyst expects the return on it to be higher than its required return in equilibrium.
C. sell (or sell short) the risky asset because its expected return is not sufficient to compensate for its market risk.

SELF-TEST ANSWERS: PORTFOLIO MANAGEMENT

1. **A** Differences in attitudes toward financial risk cause more risk-averse investors, such as those in Germany, to hold less equities on average. Investors in countries with high historical inflation tend to invest more in equities on average. Availability of equities is not a likely cause of differences in average allocations to equities.

2. **A** The results highlight the importance of asset allocation in determining overall portfolio returns. While successful market timing or stock selection could lead to superior returns, these studies show that achieving it may be difficult or impossible on average. Target asset allocations should be based on the objectives and constraints of the investor. The fact that asset allocation is more important on average than stock selections does not imply that managers are good (or bad) at either one.

3. **C** One of the assumptions of the CAPM is that anyone who holds any risky assets will allocate a portion of their portfolio to the market portfolio. Risk aversion means an investor will accept more risk only if compensated with a higher expected return. In capital market theory all investors exhibit risk aversion, even an investor who is short the risk-free asset. A stock's risk is measured as its beta, not its standard deviation of returns, in the CAPM.

4. **C** A stock or portfolio's beta is its covariance with the returns of the market portfolio divided by the variance of the market portfolio.

5. **B** Since bond and stock returns are less than perfectly positively correlated, adding some of a stock to a bond portfolio will initially decrease the total portfolio risk. If two risky assets have returns that are perfectly positively correlated and have the same total risk, there is no risk-reduction benefit to combining the two. With no risk-free asset, the minimum risk portfolio is one specific portfolio on the efficient frontier, not any portfolio on the efficient frontier.

6. **C** According to the analyst's forecast, the expected return or required return in equilibrium on the risky asset is $5(0.2) + 10(0.4) + 14(0.4) = 10.6\%$. The expected/equilibrium return on the market portfolio is $2(0.2) + 10(0.4) + 15(0.4) = 10.4\%$. The CAPM equilibrium expected return (required return in equilibrium) on the risky asset is $5 + 1.1(10.4 - 5) = 10.94\%$. Since the analyst's forecast return on the risky asset is less than its required return in equilibrium, the asset is overpriced and the analyst would sell if he owned it and possibly sell it short.

The following is a review of the Analysis of Equity Investments principles designed to address the learning outcome statements set forth by CFA Institute®. This topic is also covered in:

ORGANIZATION AND FUNCTIONING OF SECURITIES MARKETS

EXAM FOCUS

This review covers securities markets, explains how and where securities are traded, and introduces much of the terminology of securities trading. It's all testable material and you should pay special attention to the calculations dealing with margin accounts. The other important topic areas here include the difference between primary and secondary markets, the mechanics of short sales, the difference between a dealer market and an exchange market, types of orders, and the different arrangements with investment bankers that can be made when issuing new securities.

LOS 52.a: Describe the characteristics of a well-functioning securities market.

A well-functioning securities market will offer the following characteristics:

- **Timely and accurate information** on the price and volume of past transactions and on current supply and demand conditions.
- **Liquidity** (the ability to buy or sell quickly at a known price), which requires *marketability* (the ability to sell the security quickly) and *price continuity* (prices don't change much from one transaction to the next in the absence of news because numerous buyers and sellers are willing to trade at prices above and below the current price).
- **Internal efficiency** refers to low transaction costs.
- **Informational (external) efficiency**, which means that prices adjust rapidly to new information so the prevailing market price reflects all available information regarding the value of the asset.

LOS 52.b: Distinguish between primary and secondary capital markets and explain how secondary markets support primary markets.

Primary capital markets refers to the sale of *new* issues of securities. Most issues are distributed with the aid of an underwriter. The underwriter provides three services to the issuer:

1. *Origination*, which involves the design, planning, and registration of the issue.

2. *Risk bearing*, which means the underwriter insures or guarantees the price by purchasing the securities.

3. *Distribution*, which is the sale of the issue.

Corporate stock or bond issues are almost always sold with the assistance of an investment banking firm.

New equity issues involve either:

- New shares issued by firms whose shares are already trading in the marketplace. These issues are called *seasoned* or *secondary issues*.
- First-time issues by firms whose shares are not currently trading in the marketplace. These are called *initial public offerings* (IPOs).

The relationship between the firm and the investment banker underwriting the issue can take one of three forms: competitive bids, negotiation, or best efforts. A *best efforts* underwriting indicates that the investment banker does not take the price risk. That is, the underwriter sells the issue for the best available price with no price guarantees to the issuing firm.

Secondary financial markets are where securities trade after their initial offerings. Secondary markets are important because they provide liquidity. The greater liquidity the securities have, the more willing investors are to buy the securities. Liquid secondary markets also provide investors with continuous information about the market price of their securities. The better the secondary market, the easier it is for firms to raise external capital in the primary market.

LOS 52.c: Distinguish between call and continuous markets.

Securities exchanges are places where buyers and sellers conduct the trade of securities. They may be structured as call markets or continuous markets:

- In *call markets*, the stock is only traded at specific times. All trades, bids, and asks are declared, and then one negotiated price is set that clears the market for the stock. This method is used in smaller markets and to set opening prices and prices after trading halts on major exchanges.
- In *continuous markets*, trades occur at any time the market is open. The price is set by either the auction process or by dealer bid-ask quotes.

LOS 52.d: Compare and contrast the structural differences among national stock exchanges, regional stock exchanges, and the over-the-counter (OTC) markets.

Primary listing markets are the exchanges that formally list a corporation's stock. In the United States, primary listing markets include the traditional stock exchanges (New York Stock Exchange and American Stock Exchange) and the Nasdaq market.

- The New York Stock Exchange (NYSE) lists more than 2,700 firms and has an average daily volume of 1.5 billion shares.
- The American Stock Exchange (AMEX) primarily lists stocks not traded on the NYSE, along with foreign shares, warrants, options, and exchange-traded funds (ETFs).

- As in the United States, global stock exchanges tend to feature one dominant national stock exchange in each country, such as the Tokyo, Frankfurt, and London stock exchanges. Stocks with a worldwide following trade in a "global 24-hour market" by listing on a U.S. exchange, as well as on exchanges in other countries.
- The Nasdaq National Market System (NMS) has traditionally been described as an **over-the-counter (OTC) market**. Trades occur electronically rather than on a physical trading floor. The Nasdaq system also includes the Small-Cap Market and OTC Electronic Bulletin Board segments, as well as the National Quotation Bureau Pink Sheets.

The Nasdaq system is the largest part of the secondary market in the United States as measured by the number of issues traded. However, in terms of value, the Nasdaq market is about 60% of the size of the NYSE.

On the NYSE and many other national and regional exchanges, buyers and sellers submit their orders to a central location, and buy and sell orders are matched by brokers. These exchange markets are referred to alternatively as *order-driven*, *price-driven*, or *pure auction markets*. The specialists at stock exchanges stand ready to buy or sell securities for their own accounts to provide liquidity and orderly markets.

In contrast, the Nasdaq NMS is a *dealer market*, a system in which a number of market makers (dealers) provide a bid price quote at which they will buy securities, and an ask price quote at which they will sell securities, continuously during the hours the market is open. Such dealer markets are also referred to as *quote-driven markets*. Dealer markets bring together and compile the bid-ask quotes of competing dealers so that buyers and sellers can transact at the best (highest) bid price and at the best (lowest) ask (or offer) price.

Listing requirements for the NYSE include a minimum pretax income of $2.5 million in the last year and $2.0 million in the last two years, 1.1 million publicly held shares with a market value of at least $100 million, and a minimum of 2,000 shareholders. The Nasdaq NMS has standards for initial and continued listing that are less stringent than those of the NYSE.

Regional exchanges have the same operating procedures as national exchanges but give local brokerage firms that are not members of national exchanges access to stocks. U.S. regional exchanges include the Chicago and Pacific stock exchanges. The listing requirements for regional exchanges are less stringent than they are for national exchanges. Although regional exchanges tend to list smaller firms of more local interest, they also provide access to some of the same stocks traded on national exchanges.

Third market. Stocks listed on a registered exchange may also be traded in the OTC market. Nonmember investment firms can make markets in and trade registered securities without going through the exchange. This segment of the OTC market is called the *third market*.

Alternative trading systems refer to computerized systems that do not formally list stocks. These include *electronic communications networks* that serve retail brokers and small institutional traders, and *electronic crossing systems* that match large buy and sell

orders. These systems do not list stocks, but stocks that are listed on exchanges trade on the alternative systems. This is referred to as "fourth market" trading.

LOS 52.e: Compare and contrast major characteristics of various exchange markets, including exchange membership, types of orders, and market makers.

Exchange membership. Membership on the U.S. exchanges falls into one of four categories:

1. The *specialist* controls the limit order books, posts bid and ask prices, and trades for his own account.

2. The *commission broker* executes customer trades for a brokerage firm.

3. *Floor brokers* act as freelance brokers for other commission brokers.

4. *Registered traders* trade for their own accounts. Some registered traders are called *registered competitive market makers* (RCMMs) *with additional trading responsibilities determined by the exchange.*

Types of orders. There are four types of orders: market orders, limit orders, short sale orders, and stop loss orders.

1. *Market orders* are orders to buy or sell at the best price available.

2. *Limit orders* are orders to buy or sell that specify a maximum or minimum price. A *limit buy* typically has a limit below the current price. A *limit sell order* typically has a limit above the current price. Limit orders have a time limit, such as instantaneous, one day, one week, one month, or good till canceled (GTC). Limit orders are turned over to the specialist by the commission broker. A sell order with a limit of 15 will execute only if a buyer will pay 15 or more. A buy order with a limit of 15 will be executed only at a price of 15 or less.

3. *Short sale orders* are orders where a trader borrows stock, sells it, and then purchases the stock later to return the stock back to the original owner. Short sales are discussed in greater detail later in this review.

4. *Stop loss orders* are used to prevent losses or to protect profits. Suppose you own a stock currently selling for $40. You are afraid that it may drop in price, and if it does, you want your broker to sell it, thereby limiting your losses. You would place a *stop loss sell* order at a specific price (e.g., $35); if the stock price drops to this level, your broker will place a sell market order. A *stop loss buy* order is usually combined with a short sale to limit losses. If the stock price rises to the "stop" price, the broker enters a market order to buy the stock.

Market makers. Specialists are the *exchange market makers* on the U.S. exchanges. Specialists provide two basic functions to the exchange:

1. They act as brokers handling the *limit order book*, where limit and stop orders are maintained.

2. They act as dealers by buying and selling stocks for their own accounts to maintain an orderly market and provide liquidity to the market if there is an inadequate order flow.

The specialist has sole access to the information in the limit order book and is expected to use this information to add liquidity and help stabilize the market. The specialist provides *bridge liquidity* to the market by acting as a seller in an up market and as a buyer in a down market. This will tend to narrow the bid-ask spread and improve market continuity. The specialist's income comes from broker commissions on the limit order book trades and from the dealer bid-ask spread on the liquidity trades.

LOS 52.f: Describe the process of selling a stock short and discuss an investor's likely motivation for selling short.

Short sales are orders to sell securities that the seller does not own. For a short sale, the short seller (1) simultaneously borrows and sells securities through a broker, (2) must return the securities at the request of the lender or when the short sale is closed out, and (3) must keep a portion of the proceeds of the short sale on deposit with the broker.

Why would anyone ever want to sell securities short? The seller thinks the current price is too high and that it will fall in the future, so the short seller hopes to sell high and then buy low. If a short sale is made at $30 per share and the price falls to $20 per share, the short seller can buy shares at $20 to replace the shares borrowed and keep $10 per share as profit.

Three rules apply to short selling:

1. The **uptick rule** states that stocks can only be shorted in an up market. Thus, a short sale can only trade at a price higher than the previous trade. Zero ticks, where there is no price change, keep the sign change of the previous order.

2. The short seller must pay all dividends due to the lender of the security.

3. The short seller must deposit collateral to guarantee the eventual repurchase of the security.

> *Professor's Note: The Securities and Exchange Commission eliminated the uptick rule for short sales as of June 2007.*

LOS 52.g: Describe the process of buying a stock on margin, compute the rate of return on a margin transaction, define maintenance margin, and determine the stock price at which the investor would receive a margin call.

Margin transactions involve buying securities with borrowed money. Brokerage firms can lend their customers money and keep the securities as collateral. The margin lending rate is about 1.5 percentage points above the bank *call money rate* (which is about 1 percentage point below the prime rate). In the United States, margin lending limits are set by the Federal Reserve Board under Regulations T and U. The required equity position is called the *margin requirement*. The *initial margin* requirement is currently

50%. This means the borrower must provide 50% of the funds in the trade. An initial margin requirement of 40% would mean that the investor must put up 40% of the funds, and the brokerage firm could lend the 60% balance.

After the trade, the price of the stock will change, causing the balance of the margin account to fluctuate. Should the stock price go up, the customer's profits accumulate at a faster pace than a 100% equity position. This leverage is the benefit of margin trading. It is also the risk. Just as leverage may enhance returns, it can also magnify losses.

Example: Return on margin trade

Assume that an investor purchases 100 shares of a stock for $75 per share (total cost of $7,500). Compute the investor's return if the stock is sold for $150 per share (total value of $15,000) and the transaction was:

1. 100% cash.

2. A margin purchase with an initial margin requirement of 60%.

Answer:

1. As a 100% cash (equity) transaction, the investor would have had a return equal to:

$$\frac{\$15,000}{\$7,500} - 1 = 100\%$$

2. With an initial margin of 60%, the cost of the investment (equity in the position) would be only $4,500 = 0.6 × ($75 × 100). The other $3,000 of the purchase will be borrowed from the brokerage firm. If the shares were then sold at $150 per share, the position would be worth $12,000 (i.e., $15,000 − $3,000). In this situation, the investor would have a return equal to:

$$\frac{\$12,000}{\$4,500} - 1 = 167\%$$

Professor's Note: The calculated return in this example is artificially high because we ignored commissions and interest paid on the margin loan. Nevertheless, the potential gains from leverage for a margined investment remain substantial.

The **maintenance margin** for an investment account is the investor's required equity position in the account. It is applicable to both margin purchases and short sales. The Federal Reserve sets maintenance margins in the United States, but brokerage firms can increase them. For stock transactions, the maintenance margin is currently 25%. If an investor's margin account balance falls below the maintenance margin, the investor will receive a *margin call* and will be required to either liquidate the position or bring the account back to its maintenance (minimum) margin requirement. The following formula indicates the stock price at which a margin account is just at the maintenance margin.

$$\text{trigger price} = P_0 \left(\frac{1 - \text{initial margin}}{1 - \text{maintenance margin}} \right)$$

where:
P_0 = initial purchase price

Example: Margin call price

Assume you bought a stock for $40 per share. If the initial margin requirement is 50% and the maintenance margin requirement is 25%, at what price will you get a margin call?

Answer:

$$\frac{\$40(1 - 0.5)}{1 - 0.25} = \$26.67$$

A margin call is triggered at a price below $26.67.

KEY CONCEPTS

LOS 52.a
Characteristics of a well-functioning market are:
- Timely and accurate information.
- Liquidity.
- Internal efficiency (low transactions costs).
- External (informational) efficiency, i.e., rapid and unbiased price adjustment to new information.

LOS 52.b
The primary market refers to the sale of newly issued securities (e.g., auctions of U.S. Treasury securities, new issues of common stock).

Secondary markets refer to the markets for previously issued securities (e.g., New York Stock Exchange, Nasdaq market).

Well-functioning secondary markets make it easier for firms to raise capital in the primary market as they provide both value information and liquidity.

LOS 52.c
In call markets, securities trades are executed at specific times at a single price after buy and sell orders have accumulated.

In continuous markets, trading takes place at various prices and times as buy and sell orders arrive.

LOS 52.d
Stock exchanges are physical places where traders and dealers gather to trade with each other.

National stock exchanges list the shares of large and well-known firms and have more stringent listing requirements than regional or over-the-counter markets.

Regional stock exchanges trade the shares of local firms (typically smaller than those listed on national exchanges), and of some firms also listed on national exchanges.

The over-the-counter market is a network of dealers (market makers) in various locations who stand ready to purchase or sell securities at posted prices during the hours the market is open.

LOS 52.e

Types of stock exchange members include specialists who act as market makers, traders who provide liquidity by trading for their own accounts, and commission brokers and floor brokers who execute public orders.

Important types of orders are market orders, limit orders, stop orders, and short sales.

Specialists are the exchange market makers that handle the limit order book and maintain an orderly market by buying and selling shares for their own accounts.

LOS 52.f

Selling short refers to borrowing securities and selling them at the market price with the expectation of profit from buying and returning the securities at a lower price in the future.

A short seller must pay any dividends to the lender of the securities as they are due, and must deposit margin as a guarantee of payment in case stock price increases lead to losses.

LOS 52.g

In a margin transaction, investors borrow against securities to purchase them, leaving the securities at the brokerage house as collateral for the loan.

The rate of return on a margin transaction is calculated as the profit or loss on the security position divided by the cash equity (margin) deposited to make the trade.

The stock price at which an investor who purchases a stock on margin will receive a margin call can be calculated as:

$$\text{trigger price} = P_0\left(\frac{1 - \text{initial margin}}{1 - \text{maintenance margin}}\right)$$

CONCEPT CHECKERS

1. A market is said to have external or informational efficiency if it features:
   A. market prices that reflect all available information about the value of the securities traded.
   B. timely and accurate information about past transactions and current supply and demand conditions.
   C. many buyers and sellers that are willing to trade at prices above and below the prevailing market price.

2. New issues of securities occur in the:
   A. primary market.
   B. secondary market.
   C. national stock exchanges.

3. The trading of exchange-listed shares on an electronic communications network is called:
   A. a block trade.
   B. the third market.
   C. the fourth market.

4. A stock is selling at $50. An investor's valuation model predicts that it should be selling at $40. If she believes her model, she would *most likely* place a:
   A. short sale order.
   B. stop order to buy.
   C. market order to buy.

Use the following data to answer Questions 5 through 8.
- An investor buys 100 shares of XYZ.
- The market price is $50 on full margin.
- The initial margin requirement is 40%.
- The maintenance margin requirement is 25%.

5. How much equity must the investor have in the account?
   A. $2,000.
   B. $4,000.
   C. $5,000.

6. At what price will the investor get a margin call?
   A. $26.67.
   B. $37.50.
   C. $40.00.

7. If the price of the stock falls to $45, what is the equity balance in the margin account?
   A. $1,000.
   B. $1,500.
   C. $2,500.

8. If the stock is sold one year later for $60, what is the investor's rate of return?
    A. 20%.
    B. 50%.
    C. 100%.

9. In the United States, who sets the initial margin requirements?
    A. The Federal Reserve Board.
    B. The New York Stock Exchange.
    C. The Securities Exchange Commission.

10. At U.S. stock exchanges, the limit order book is controlled by:
    A. specialists.
    B. floor brokers.
    C. commission brokers.

11. In which of the following market types can stocks trade any time the market is open?
    A. Internally efficient markets.
    B. Call markets.
    C. Continuous markets.

ANSWERS – CONCEPT CHECKERS

1. **A**   Informational or external efficiency means the prevailing price reflects all available information about the value of the asset, and the price reacts quickly to new information. Timely and accurate information and liquidity are other characteristics of well-functioning securities markets.

2. **A**   The primary market refers to new issues of securities.

3. **C**   The fourth market refers to trading of exchange-listed stocks on alternative trading systems.

4. **A**   If the investor believes the stock is overvalued, the investor should place a short sale order, which would benefit the investor if the stock declined to its equilibrium value.

5. **A**   Initial margin requirement ($) = (initial margin %)(number of shares × price per share) = 0.4 × (100 × $50.00) = $2,000.

6. **C**   For a long position, the formula for the margin call = original price

$$= \frac{\text{original price} \times (1 - \text{initial margin \%})}{1 - \text{maintenance margin \%}} = \frac{50 \times (1 - 0.4)}{1 - 0.25} = \$40.00.$$

7. **B**   The new margin account balance = initial margin balance – change in stock value = 2,000 – 500 = $1,500 (note the $2,000 equity balance comes from the answer to question 5). The $500 represents the $5 loss per share.

8. **B**   First, determine the sales proceeds: ($60 × 100 shares) = $6,000. Then, calculate the loan payoff = total cost of purchase – initial margin amount) = 5,000 – 2,000 = 3,000. The return = [(proceeds from sale – loan payoff) / equity] – 1 = [(6,000 – 3,000) / 2,000] – 1 = 1.50 – 1 = 0.50, or 50%. An alternative is to divide the profit by the initial

$$\text{equity} = \frac{6,000 - 5,000}{2,000} = 0.50, \text{ or } 50\%.$$

9. **A**   In the United States, margin lending limits are set by the Federal Reserve Board under Regulations T and U.

10. **A**   Specialists are exchange market makers who handle the limit order book and act as dealers, buying and selling their specific stocks to provide market liquidity. Floor brokers, registered traders, and commission brokers only trade for various accounts.

11. **C**   Continuous markets are defined as markets where stocks can trade anytime the market is open.

SECURITY-MARKET INDEXES

EXAM FOCUS

Stock market index series are used to measure the performance of markets, as benchmarks to evaluate portfolio performance, and as a proxy for the overall market in academic studies. It is important for you to know how price-weighted, value-weighted, and equal-weighted indexes are constructed and the potential biases of each method. Be familiar with the major indexes and learn a couple of the problems with constructing bond indexes.

SECURITY MARKET INDEXES

Security market indexes are used in the following areas of investment management:

- Measuring portfolio performance over various time periods. Since it takes no effort to earn the market return, the performance measure would be what you earn above the market index's return for the period under study. Remember that returns must be adjusted for risk.
- Helping in the construction of index portfolios. Since index portfolios are designed to track the index, you need a market index for each segment of the market.
- Evaluating the financial variables that influence overall security price movements.
- Aiding market technicians in their investment decisions.
- Helping in the calculation of beta and portfolio theory studies.

Indexes are intended to represent the behavior of a market. When constructing an index, you need to decide what market you want to evaluate and what aspect of the market's performance you want to measure.

- The sample must be representative of the population. You must consider the source, size, and breadth of the sample. If not, your results may be biased.
- Next, you must decide the weighting to give the individual items in your sample. You can weight the items by price or total value, or you can weight them equally.
- Finally, you must decide on the mathematical or computational procedure you will use to combine the individual items into the whole index. You may use arithmetic averaging, geometric averaging, or base-period weighting.

LOS 53.a: Compare and contrast the characteristics of, and discuss the source and direction of bias exhibited by, each of the three predominant weighting schemes used in constructing stock market indices and compute a price-weighted, a value-weighted, and an unweighted index series for three stocks.

A **price-weighted index** is the arithmetic average of current security prices. As such, movements in the series are influenced by the different prices of the index components.

Computationally, a price-weighted index adds together the market price of each stock in the index and then divides this total by the number of stocks in the index. *The returns on a price-weighted index could be matched by purchasing an equal number of shares of each stock represented in the index.* Since the index is price-weighted, a percentage change in a high-priced stock will have a relatively greater effect on the index than the same percentage change in a low priced stock. Also, due to the price weighting, the denominator must be adjusted for stock splits and other changes in the index portfolio to maintain the continuity of the series.

$$\text{price-weighted index} = \frac{\text{sum of stock prices}}{\text{number of stocks in index adjusted for splits}}$$

Example: Adjusting a Price-Weighted Index for Stock Splits

> *Professor's Note: We provide this example to show how the adjustment works, but the LOS does not require you to perform this calculation on the exam.*

At the market close on Day 1, Stock A has a price of $10, Stock B has a price of $20, and Stock C has a price of $90. The value of a price-weighted index of these three stocks is $(10 + 20 + 90) / 3 = 40$ at the close of trading. If Stock C splits 2-for-1, effective on Day 2, what is the new denominator for the index?

Answer:

The effect of the split on the price of Stock C, in the absence of any change from the price at the end of Day 1, would be to reduce it to $90 / 2 = 45. The index denominator will be adjusted so that the index value would remain at 40 if there were no changes in the stock prices other than to adjust for the split. The new denominator, d, must satisfy $(10 + 20 + 45) / d = 40$ and equals 1.875.

The two major price-weighted indexes are the Dow Jones Industrial Average (DJIA) and the Nikkei Dow Jones Stock Average.

The DJIA is a price-weighted index that uses 30 stocks. Criticisms of the DJIA are:

- Limited number of stocks in the index.
- Downward bias in the computation of the index.
- Large size of the companies included in the index.

The Nikkei Dow is the arithmetic average of the prices of 225 stocks that trade in the first section of the Tokyo Stock Exchange. It is calculated the same way as the DJIA. The Nikkei Dow represents only 15% of the first section stocks.

A **market value-weighted index** is calculated by summing the total value (current stock price times the number of shares outstanding) of all the stocks in the index. This sum is then divided by a similar sum calculated during the selected base period. The ratio is then multiplied by the index's base value (typically 100). *A value-weighted index assumes you make a proportionate market value investment in each company in the index.* The major problem with a value-weighted index is that firms with greater market capitalization have a greater impact on the index than do firms with lower market capitalization.

The Standard & Poor's 500 (S&P 500) Index Composite is an example of a value-weighted index.

> *Professor's Note: Some value-weighted indexes are based on the number of shares that are not held by insiders. These are referred to as "freely floating shares" or simply the "float." The S&P 500 index changed to this method in 2005. Companies with the greatest percentage of insider holdings, such as Wal-Mart and Microsoft, had the greatest reductions in their weights in the index. Companies with relatively small proportions of insider shares, such as Exxon, saw their weights in the index increase as a result of this change.*

An **unweighted index** places an equal weight on the returns of all index stocks, regardless of their prices or market values. A $20 stock is just as important as a $4,000 stock, and a small-size company is just as important as a large-size company. The procedure used to compute an unweighted index value assumes *that the index portfolio makes and maintains an equal dollar investment in each stock in the index.* In effect, you are working with percentage price changes.

The change in value of an unweighted index may be calculated using two methods:

1. Arithmetic mean: change in the average index value $= \dfrac{\sum X_i}{n}$, where X_i = the return on each stock from time = t to time = t + 1.

2. Geometric mean: change in the average index value $= \sqrt[n]{X_1 \times X_2 \times ... \times X_n} - 1$, where $X_i = (1 + HPR_i) = \dfrac{Price_{t+1}}{Price_t}$ for stock i.

The use of the geometric mean rather than the arithmetic mean will result in a lower index value. Recall that the geometric mean of returns is always less than the arithmetic mean, unless all returns are equal.

*   The Value Line (VL) Composite Average is an equal-weighted index where VL's 1,695 stock returns are averaged using the geometric mean.
*   The Financial Times Ordinary Share Index is a geometric average of 30 major stocks on the London Stock Exchange.
*   Most academic studies are conducted using arithmetically averaged equal-weighted indexes.

> *Professor's Note: None of these indexes considers dividend income. Index returns are net of dividends (based only on prices). "Total return index" is the term we use to describe the return on an index under the assumption that dividends are reinvested.*

Source and Direction of Bias

Price-weighting bias. Once a price-weighted index is established, the denominator must be adjusted to reflect stock splits and changes in the sample over time. After a stock split, the denominator is adjusted downward, so the index is the same before and after the split. This places a downward bias on the index because large successful firms tend

to split their stocks more often than low growth stocks and will lose weight within the index simply by splitting their stock.

Value-weighting bias. The major problem with a value-weighted index is that firms with greater market capitalization have a greater impact on the index than do firms with lower market capitalization. Thus, if large market capitalization growth firms have exceptionally high returns, much of the S&P 500 Index return could be attributable to only a few firms.

Unweighted (i.e., equal-weighted) bias. As noted earlier, the use of the geometric mean rather than the arithmetic mean causes a downward bias in the index. The geometric average will always be lower than the arithmetic average unless all stocks have equal-percentage price changes.

Computing Price-Weighted, Market-Weighted, and Unweighted Indexes

Example: Price-weighted index

Given the information for the three stocks presented in the following figure, calculate a price-weighted and value-weighted index return over a 1-month period.

Index Firm Data

	As of December 31, 2006			As of January 31, 2007		
	Share Price	Number of Shares Outstanding (000's)	Total Market Value (000's)	Share Price	Number of Shares Outstanding (000's)	Total Market Value (000's)
Stock X	$10	3,000	$30,000	$20	3,000	$60,000
Stock Y	$20	1,000	$20,000	$15	1,000	$15,000
Stock Z	$60	500	$30,000	$40	500	$20,000
Total	$90	4,500	$80,000	$75	4,500	$95,000

Answer:

The price-weighted index is $[(10 + 20 + 60) / 3] = 30$ as of December 31 and $[(20 + 15 + 40) / 3] = 25$ as of January 31. Hence, the price-weighted 1-month percentage return is:

$$\frac{25}{30} - 1 = -16.7\%$$

Value-weighted indexes normally use a beginning (base year) index value of 100. The total market values of the index portfolio on December 31 and January 31 are $80 million and $95 million, respectively. So the index value at the end of January is:

$$\text{current index value} = \frac{\text{current total market value of index stocks}}{\text{base year total market value of index stocks}}$$
$$\times \text{base year index value}$$

$$\text{current index value} = \frac{\$95\text{ million}}{\$80\text{ million}} \times 100 = 118.75$$

Thus, the value-weighted index percentage return is:

$(118.75/100) - 1 = 18.75\%$

Let's look at an example of price-weighting versus market value-weighting designed to show how these two indexes are calculated and how they differ.

Example: Price-weighted vs. market-weighted indexes

Consider the three firms described below. Calculate the price-weighted and value-weighted index values if Stock A doubles in price, and if Stock C doubles in price.

Index Firm Data

Company	Number of Shares Outstanding (000's)	Stock Price	Capitalization (000's)
A	100	$100	$10,000
B	1,000	$10	$10,000
C	20,000	$1	$20,000

Answer:

The price-weighted index equals:

$$\frac{100 + 10 + 1}{3} = 37$$

If Stock A doubles in price to $200, the index value is:

$$\frac{200 + 10 + 1}{3} = 70.33$$

If Stock C doubles in price to $2, the index value is:

$$\frac{100 + 10 + 2}{3} = 37.33$$

If A doubles in value, the index goes up 33.33 points; while if C doubles in value, the index only goes up 0.33 points. Changes in the value of the firm with the highest stock price have a disproportionately large influence on a price-weighted index.

Using a base market capitalization of $40,000,000 = [(100,000 × $100) + (1,000,000 × $10) + (20,000,000 × $1)] and a base index value of 100, we can also calculate the market value-weighted index return.

If Stock A doubles in price to $200, the index goes to:

$$\frac{100,000 \times \$200 + 1,000,000 \times \$10 + 20,000,000 \times \$1}{\$40,000,000} \times 100 = 125$$

If Stock C doubles in price to $2, the index goes to:

$$\frac{100,000 \times \$100 + 1,000,000 \times \$10 + 20,000,000 \times \$2}{\$40,000,000} \times 100 = 150$$

In the market value-weighted index, the returns on Stock C have the greatest influence on the index return because Stock C's market capitalization is larger than that of Stock A or Stock B. Note that the value-weighted index automatically adjusts for stock splits, since if the number of shares goes up, the price of each share will fall so that the total market value of firm shares remains the same.

Example: Unweighted (equal-weighted) index

Calculate both the arithmetic and geometric unweighted index values for the three stocks described below, assuming an initial index value of 131.

Unweighted Index Data

Stock	Initial Price	Current Price	Price Change
A	$12.00	$15.00	+25%
B	$52.00	$48.00	–7.7%
C	$38.00	$45.00	+18.4%

Answer:

Arithmetic: change in index = $\dfrac{25\% - 7.7\% + 18.4\%}{3} = 11.9\%$

new index value = 131(1 + 0.119) = 146.59

Geometric: change in index = $(1.25 \times 0.923 \times 1.184)^{1/3} - 1 = 10.96\%$

new index value = 131(1 + 0.1096) = 145.36

Using the geometric mean instead of the arithmetic mean generates a lower unweighted index value.

LOS 53.b: Compare and contrast major structural features of domestic and global stock indices, bond indices, and composite stock-bond indices.

Domestic equity indexes. The Dow Jones Industrial Average in the United States and the Nikkei Dow Jones Stock Market Average for Japan's Tokyo Stock Exchange are examples of domestic equity indexes. As we discussed above, both of these indexes are price-weighted.

Global equity indexes. Global equity indexes were created to circumvent the comparability problems with using locally created indexes. These problems were from the different sample selection, weighting, and computational procedures across borders. The most common global indexes are:

- Financial Times/S&P Actuaries World Indexes are based on about 2,500 stocks from 30 countries. The indexes are market value-weighted and have a 1986 base value of 100.
- Morgan Stanley Capital International (MSCI) Indexes are made up of three international, 19 national, and 38 international industry indexes, all of which are market value-weighted. The indexes are reported in U.S. dollars and the country's local currency.
- Dow Jones World Stock Index represents 2,200 companies from around the globe, organized into 120 industry groups. The countries are grouped into three regions (Americas, Europe/Africa, and Asia/Pacific). The indexes are calculated in the domestic currency as well as the U.S. dollar.

Bond market indexes. Bond market indexes are relatively new. Furthermore, the creation of bond market indexes is more difficult than stock market indexes for several reasons:

- The bond universe is much broader than the universe of stocks.
- The bond universe is changing constantly due to the wide variety of new issues, bond maturities, calls, and sinking funds.
- The price volatility of a bond is constantly changing. Volatility is measured by the bond's duration, which changes with the bond's maturity and the market yield.
- There are significant problems in pricing the individual bond issues in an index due to the lack of continuous trade data like that found for most exchange-listed stocks.

Bond indexes fall into three basic categories:

1. *Investment-grade bond indexes* include those provided by Lehman Brothers, Merrill Lynch, Ryan Treasury, and Smith Barney. The correlation between investment-grade bond returns is 0.95, as bond returns are driven by aggregate interest rates changes.

2. *High-yield bond indexes* are maintained by CS First Boston, Lehman Brothers, Merrill Lynch, and Smith Barney. The correlation between the high-yield indexes is much weaker than between the investment-grade indexes.

3. *Global bond indexes* are made available by Lehman Brothers, Merrill Lynch, J.P. Morgan, and Smith Barney. These indexes show long-run risk return performance differences, low correlation between countries, and a significant exchange rate effect on volatility and correlations.

Composite stock-bond indexes. Composite stock-bond indexes are developed to measure the performance of all securities in a given country. The Merrill Lynch-Wilshire Capital Markets Index is an example of one of these indexes. The Brinson Partner Global Security Market Index contains U.S. stocks and bonds, non-U.S. equities and nondollar bonds, and cash.

Style indexes. Some financial data firms compile indexes that reflect investment styles used by portfolio managers, including indexes based on stocks' market capitalizations (small-cap, mid-cap, large-cap) and indexes based on investment classifications (growth stocks, value stocks). These indexes are often used as benchmarks for measuring portfolio managers' performance.

Comparison of indexes over time. The risk/return performances of indexes are different. This is explained by the fact that different indexes represent different asset classes (stocks versus bonds). Also, within a given asset class, there are indexes for different subclasses (e.g. small-cap indexes versus large-cap equity indexes). Studies have found a low correlation to exist between indexes within a given country and between different countries. These findings support the argument for diversification, both domestically and globally.

LOS 53.c: State how low correlations between global markets support global investment.

In our introduction to portfolio theory we learned the crucial role that the correlation of returns between portfolio assets plays in determining portfolio risk. When securities of different countries are combined into a global investment portfolio, the risk reduction due to diversification can be significant because the correlations of returns between securities of one country or region and another are often significantly less than perfectly positive.

As examples of such correlations, consider that the correlation of monthly returns on the S&P 500 with returns on the Nikkei Index (Japanese stocks) and with returns on the IFC Emerging Markets (stocks) Index are both close to 0.4.[1] Correlation of monthly returns of the S&P 500 Index and those of the *Financial Times* All-Share index (UK stocks) is estimated as 0.67, while with the Frankfurt (FAZ) Index it is estimated as 0.54.[2]

For bond portfolios, historical returns also show international correlations significantly less than one. The correlation of the Merrill Lynch World Government Bond Index (excluding U.S.) with the Lehman Brothers U.S. Government Bond Index has been estimated as 0.345 over the period 1986 to 2001, while correlations between various indexes of investment grade bonds within the United States are close to one.[3]

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1. These figures are for correlations of monthly returns over the period 1980 to 2001 as reported in Frank K. Reilly and David J. Wright, "An Analysis of Risk-Adjusted Performance for Global Market Assets," *Journal of Portfolio Management* 30, no. 3 (2004): 63–77.

2. Ibid.

3. Ibid.—based on U.S. dollar returns.

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The implication of correlations such as these is that the risk-reduction benefits from international diversification in both stock and bond portfolios can be significant. The fact that correlations between investment grade bond indexes are close to one indicates that there is little diversification benefit from combining positions in these indexes (bond sectors). Diversification of fixed income portfolios across world bonds and U.S. bonds or diversification between investment grade and lower-rated bonds will yield risk reduction benefits, however, because of their lower correlations.

KEY CONCEPTS

LOS 53.a

A price-weighted index for three stocks is calculated as $Index_{PW} = \dfrac{P_1 + P_2 + P_3}{3}$.

The divisor, however, must be adjusted for stock splits to ensure continuity. For a given percentage change in price, stocks with higher prices have a greater impact on a price-weighted index. Overall, a price-weighted index is biased downward because firms with the greatest increases in value tend to split their shares, which decreases their ongoing influence on the index.

A value-weighted index for three stocks is calculated as:

$$Index_{VW} = \frac{\text{total market value of shares of the three stocks on date X}}{\text{total market value of shares of the three stocks on base date}}$$

$$\times \text{ beginning index value (typically} = 100)$$

Firms with the greatest market capitalization (value) will have the greatest influence on the index.

An equal-weighted (unweighted) index return puts an equal weight on every stock in the index. The simple average of percentage changes in price for all the stocks in the index is often used. Some unweighted indexes use the geometric mean of the percentage changes in index-stock prices, which is biased downward compared to an unweighted index based on the arithmetic mean.

LOS 53.b

Global stock indexes are calculated for companies in many different countries.

Bond indexes are challenging to create because of inadequate price information on some bonds and a changing universe of bonds.

Composite indexes have both stock and bond components and can include only domestic securities or securities in many countries.

LOS 53.c

Correlations significantly less than one between different country stock indexes and between U.S. and world bond indexes provide opportunities for significant risk reduction through international diversification of portfolios.

CONCEPT CHECKERS

1. Which of the following will have the *least* effect on index returns?
   A. How the data are collected.
   B. The weighting scheme for the index firms.
   C. The computational procedure for calculating the index.

2. In which of the following weighting schemes do firms with greater market capitalizations have a greater impact on the index than do firms with less market capitalization?
   A. Price-weighted.
   B. Value-weighted.
   C. Equal-weighted.

3. Stock splits potentially cause a downward bias in which of the following index weighting schemes?
   A. Price-weighted.
   B. Value-weighted.
   C. Equal-weighted.

4. Which index weighting scheme would produce returns *closest* to those of a portfolio of index stock with an equal dollar investment in each stock in the index?
   A. Unweighted.
   B. Price-weighted.
   C. Value-weighted.

5. Which index weighting scheme would produce returns *closest* to those of a portfolio of index stocks with an equal number of shares of each index stock?
   A. Unweighted.
   B. Price-weighted.
   C. Value-weighted.

6. Which of the following is a reason why creating bond market indexes is more difficult than creating stock market indexes?
   A. The universe of bonds is much smaller than that of stocks.
   B. Bond markets have continuous trade data unlike stock markets.
   C. The universe of bonds is constantly changing because of numerous new issues, bond maturities, calls, and bond sinking funds.

Use the information in the following table to answer Questions 7 through 10.

	As of January 1		As of December 31	
	Share Price	Number of Shares Outstanding (000's)	Share Price	Number of Shares Outstanding (000's)
Stock A	$22	1,500	$28	1,500
Stock B	$40	10,000	$50	10,000
Stock C	$34	3,000	$30	3,000

7. The 1-year return on a price-weighted index of these three stocks is *closest* to:
   A. 12.5%.
   B. 13.5%.
   C. 18.0%.

8. The 1-year return on an unweighted index of these three stocks using the arithmetic mean is *closest* to:
   A. 12.0%.
   B. 12.5%.
   C. 13.5%.

9. The 1-year return on a value-weighted index of these stocks is *closest* to:
   A. 12.5%.
   B. 13.5%.
   C. 18.0%.

10. The 1-year return on an unweighted index of these three stocks using the geometric mean is *closest* to:
    A. 12.0%.
    B. 13.5%.
    C. 18.0%.

ANSWERS – CONCEPT CHECKERS

1. **A** Collecting the data for a market index is simply recording security prices. Selecting the sample, weighting the sample, and the method of computation are the key factors that influence index returns.

2. **B** Market capitalization has a large effect on value-weighted indexes because firms with the largest market cap may dominate the index.

3. **A** Stock splits potentially introduce a downward bias in a price-weighted index. Large, successful firms splitting their stock and, hence, lowering their representative weight in the index, cause the downward bias. Value- and equal-weighted indexes are not affected by stock splits.

4. **A** An unweighted price series assumes that the investor makes and maintains an equal dollar investment in each stock in the index. Don't confuse this with a price-weighted index, which assumes that an investor invests in an equal number of shares of each stock.

5. **B** A price-weighted series is an arithmetic average of the current prices of a sample of securities. A price-weighted index assumes an investor purchases an equal number of shares of each stock represented in the index.

6. **C** New issues, maturities, calls and sinking funds cause the universe of bonds to change constantly. The universe of bonds is much larger than that of stocks, and bond markets do not have continuous trade data.

7. **A** $\dfrac{22+40+34}{3}=32,\ \dfrac{28+50+30}{3}=36,\ \dfrac{36}{32}-1=0.125=12.5\%$

8. **C** $\left[\left(\dfrac{28}{22}-1\right)+\left(\dfrac{50}{40}-1\right)+\left(\dfrac{30}{34}-1\right)\right]\left(\dfrac{1}{3}\right)=0.135=13.5\%$

9. **C** Total portfolio value January 1:

    $\left[22(1,500)+40(10,000)+34(3,000)\right](1,000)=\$535,000,000$

    Total portfolio value December 31:

    $\left[28(1,500)+50(10,000)+30(3,000)\right](1,000)=\$632,000,000$

    $\dfrac{632}{535}-1=0.1813\approx18\%$

    From a base value of 100, the December 31 index value would be: $\dfrac{632}{535}\times100=118.13$

10. **A** $\left[\left(\dfrac{28}{22}\right)\left(\dfrac{50}{40}\right)\left(\dfrac{30}{34}\right)\right]^{\frac{1}{3}}-1=0.1197\approx12\%$

Efficient Capital Markets

Exam Focus

Market efficiency is a key concept. It has been tested extensively and has important implications for investment strategy. You must know the three forms of market efficiency and what the evidence from tests of the three forms has been. Know the types of tests for the various forms of market efficiency. Finally, you must understand the implications of the various forms of market efficiency for technical analysis, fundamental analysis, and the role of portfolio managers in the investment process.

LOS 54.a: Define an efficient capital market and describe and contrast the three forms of the efficient market hypothesis (EMH).

An **efficient capital market** is one in which the current price of a security fully reflects all the information currently available about that security, including risk. An informationally efficient capital market is one in which security prices adjust rapidly and completely to new information. Market efficiency is based on the following set of assumptions:

- A large number of profit maximizing participants are analyzing and valuing securities independent of each other.
- New information comes to the market in a random fashion, and news announcements are independent of each other in regard to timing.
- Investors adjust their estimates of security prices rapidly to reflect their interpretation of the new information received. Market efficiency does not assume that market participants correctly adjust prices, just that their price adjustments are unbiased. Some prices will over-adjust, and some will under-adjust.
- Expected returns implicitly include risk in the price of the security.

Under these assumptions, the competitive behavior of this large group of market participants should cause rapid price adjustments in response to any newly released information. The new price will reflect investors' new estimates of the investment's value and riskiness. Should these assumptions not hold (as in emerging markets), abnormal returns may be possible.

The Three Forms of the Efficient Market Hypothesis (EMH)

In an influential academic paper, Eugene Fama divided the efficient market hypothesis (EMH) into three categories.

1. **Weak-form efficient markets.** The weak form of the EMH states that current stock prices *fully reflect all currently available security market information.* Thus, past price and volume information will have no predictive power about the future direction of security prices. The conclusion is that an investor cannot achieve excess returns using technical analysis.

2. **Semistrong-form efficient markets.** The semistrong form of the EMH holds that security prices rapidly adjust to the arrival of all new public information. As such, current security prices *fully reflect all publicly available information.* The semistrong form says security prices include all security market and nonmarket information available to the public. The conclusion is that an investor cannot achieve abnormal returns using fundamental analysis.

3. **Strong-form efficient markets.** The strong form of the EMH states that stock prices *fully reflect all information from public and private sources.* The strong form includes all types of information: market, nonmarket public, and private (inside) information. This means that no group of investors has monopolistic access to information relevant to the formation of prices, and none should be able to consistently achieve abnormal returns.

> *Professor's Note: As a base level knowledge of the EMH, you should know that weak form addresses security market information; the semistrong form addresses security market and nonmarket public information; and the strong form addresses security market, nonmarket, and inside or private information.*

LOS 54.b: Describe the tests used to examine each of the three forms of the EMH, identify various market anomalies and explain their implications for the EMH, and explain the overall conclusions about each form of the EMH.

Since the efficient market hypothesis has major implications as to the value of security analysis, there have likely been more academic studies in finance on the topic of market efficiency than any other single area.

Weak-Form Tests of the EMH

There have been two types of tests of the weak form of the EMH, statistical tests and trading rule tests.

Statistical tests for independence. The weak form contends that, over time, security returns are independent of each other. Statistical tests have been conducted to test for this independence.

- Autocorrelation tests indicate that security returns are not significantly correlated over time.

- Runs tests also indicate that stock price changes (upticks and downticks) are independent over time.

Trading rule tests. A lot of EMH studies have been conducted to see if investors can earn abnormal returns following mechanical trading rules (filter rules) based on price data.

- Tests of filter rules show that investors cannot earn abnormal returns after accounting for the impact of transactions costs. (Filter rules entail trading stocks when prices move up or down certain amounts.)
- Researchers have tested other trading rules and generally found that such activity does not outperform a buy-and-hold policy on a risk-adjusted basis after taking account of commissions.

Semistrong-Form Tests of the EMH

Semistrong-form tests require that security returns be adjusted to reflect market returns and risk.

Early tests looked at a security's performance in excess of the market return. Abnormal returns were measured as the stock's actual return less the market's actual return.

$$\text{abnormal return} = R_{actual} - R_{mkt}$$

Later tests looked at the security's performance in excess of market returns adjusted for the security's volatility (beta risk): Abnormal returns are measured as the stock's actual return less the stock's expected return based on its beta risk.

$$\text{abnormal return} = R_{actual} - E(R) = R_{actual} - \{RFR + \beta[E(R_{mkt}) - RFR]\}$$

Example: Abnormal returns

A stock has a 10% return when the market return is 5% and the risk-free rate (RFR) is 2%. The stock's beta is 1.2. Compute the unadjusted and adjusted abnormal return for this security.

Answer:

The stock's non-risk-adjusted abnormal return is 10% − 5% = 5%. The stock's risk-adjusted abnormal return is 10% − [2% + 1.2(5% − 2%)] = 4.4%.

Return prediction studies to test the semistrong form of the EMH include time-series tests and event studies. **Time-series tests** are based on the assumption that, in efficient markets, the best estimate of future returns is the long-run historical rate of return. So if markets are semistrong-form efficient, an investor should not be able to improve upon these estimates in the short or long term. **Event studies** examine abnormal returns before and after the release of information about a significant firm-related event. The hypothesis is that investors should not be able to earn positive abnormal returns on average by buying or selling based on types of firm events.

Cross-sectional tests of the semistrong-form of the EMH are based on the assumption that markets are efficient when all securities' returns lie along the security market line.

That is, a security's rate of return should be directly related to its level of market risk (i.e., beta). So after adjusting returns for risk, all security returns should be equivalent or comparable. The hypothesis is that firm characteristics such as size, analyst coverage, or book value to market value ratios should not be useful in predicting abnormal returns. Note that the results of these tests depend on the effectiveness of the asset pricing model employed.

Strong-Form Tests of the EMH

In addition to informational efficiency, the strong-form EMH implies that no group of investors has access to private information that would allow the group to consistently experience above-average profits. (This implies perfect markets in addition to efficient markets.) Academic tests of the strong form look at the legal use of private information and exclude illegal insider trading. The reported tests identify and study four groups of investors who are expected to be able to outperform the market, or who claim to be able to do so because of their access to private information.

Insider trading. Tests of Securities Exchange Commission (SEC) insider trading filings indicate that inside purchasers have made above-average profits. Other tests show that public traders tracking the purchases of insiders via SEC filings were able to earn excess returns. However, studies conducted after 1976 indicate that this inefficiency seems to have been eliminated.

Exchange specialists. Stock exchange specialists, by the very nature of their membership on the exchange, have access to information in the limit order book that is only available to them. Tests show that specialists derive above-average returns from this information.

Security analysts. Some strong-form tests have addressed the question of whether analysts and their advice can provide excess returns. These tests are based on the assumption that analysts may have information that the rest of the market does not have.

- *The Value Line (VL) enigma.* Studies indicate that VL rankings of 1 and 5 contain significant information (stocks rated 1 are the most attractive). Changes in the rankings from 2 to 1 also appear to be significant. Recent studies, however, show that any information in the VL reports is already reflected in price by the second day after publication.
- *Analyst recommendations.* Studies of the "Heard on the Street" column in *The Wall Street Journal* show that stocks have a significant price change on the day they appear in the column.

Professional money managers. Tests indicate that mutual funds, bank trust departments, pension plans, and endowment funds are *not* able to match the performance of a simple buy-and-hold policy.

Various Market Anomalies and Their Implications for the EMH

An anomaly is something that deviates from the common rule. The common rule here is the efficient market hypothesis. Tests of the EMH are frequently called "anomaly studies," so in the efficient markets literature, an anomaly is something that helps to disprove the efficient markets hypothesis.

The following are **documented market anomalies:**

1. *Earnings surprises to predict returns.* Studies of quarterly earnings reports indicate that the markets have not adjusted stock prices to reflect the release of quarterly earnings surprises as fast as would be expected based on the semistrong EMH. As a result, it appears that earnings surprises can be used to identify individual stocks that will produce abnormal returns.

2. *Calendar studies.* The "January Anomaly" shows that, due to tax-induced trading at year-end, an investor can profit by buying stocks in December and selling them during the first week in January. The "weekend effect" shows that the average return for weekdays is positive but that a negative return is associated with the Friday close to the Monday open. Also, prices tend to rise on the last trade of the day.

3. *Price-earnings ratio* (P/E) tests indicate that low P/E ratio stocks experienced superior results relative to the market, while high P/E ratio stocks have significantly inferior results.

4. *Small firm effect.* Small firms consistently experienced significantly larger risk-adjusted returns than larger firms. This is called the *small firm effect.* Many academics claim these results reflect the inability of the asset-pricing model to provide a complete measure of risk for small-firm stocks.

5. The *neglected firms effect* is a result of tests of the small firm effect. Small firm tests also found that firms that have only a small number of analysts following them have abnormally high returns. These excess returns appear to be caused by the lack of institutional interest in the firms. The neglected firm effect applies to all sizes of firms.

6. *Book value/market value ratios* have been associated with abnormal returns. It has been found that the greater the ratio of book value/market value, the greater the risk-adjusted rate of return, regardless of firm size.

Overall Conclusions About the EMH

Most, but not all, evidence generated by testing the weak form of the EMH indicates that, after incorporating trading costs, simple trading rules cannot generate positive abnormal returns on average. Hence the results support the weak-form of the EMH.

The results are mixed for the semistrong form of the EMH. Event studies strongly support the EMH, while time-series and cross-sectional tests give evidence that markets are not always semistrong-form efficient.

Aside from the results on corporate insiders and specialists, the tests support the strong form of the EMH. It appears that corporate insiders and exchange specialists have monopolistic access to highly valuable information.

LOS 54.c: Explain the implications of stock market efficiency for technical analysis, fundamental analysis, the portfolio management process, the role of the portfolio manager, and the rationale for investing in index funds.

If weak-form market efficiency holds, technical analysis (based on past price and volume information) has no value, and it cannot be used to earn positive abnormal returns on average.

If semistrong-form efficiency holds, neither technical nor fundamental analysis has any value because both are based on public information. Remember, semistrong-form efficiency is based on market information and other publicly available information, so it includes weak-form efficiency.

Implications of Efficient Markets, the Portfolio Management Process, and the Role of the Portfolio Manager

Portfolio management. In an efficient market, portfolio managers must create and maintain the appropriate mix of assets to meet their clients' needs. In other words, portfolio management should be centered on client objectives and constraints and the construction of the appropriate portfolio through effective asset allocation decisions.

Portfolio managers should help:

- Quantify their clients' risk tolerances and return needs within the bounds of the client's liquidity, income, time horizon, and legal and regulatory constraints.
- Verbalize their clients' portfolio policies and strategies needed to meet the client's needs, then construct an optimal portfolio by allocating funds between financial and real assets. This is referred to as asset allocation.
- Diversify their clients' portfolios (on a global basis) to eliminate unsystematic risk.
- Monitor and evaluate changing capital market expectations as they affect the risk/return expectations of the assets in the client's portfolio.
- Monitor their clients' needs and circumstances.
- Rebalance their clients' portfolios when changes are necessary.

Portfolio managers should also help their clients minimize their total transaction costs. There are three ways to lower costs: minimize taxes, reduce trading turnover, and minimize liquidity costs by trading relatively liquid stocks.

Performance measurement. One of the major outcomes of the EMH tests is that the proper way to gauge performance is to measure investment professionals against a randomly selected buy-and-hold strategy of stocks within the same risk class.

Tests do show that it may be possible to achieve above-average performance by selecting stocks that are neglected by other analysts, have high book value/market value ratios, and are small market capitalization firms. Also, strong-form tests of the Value Line enigma indicate that analysts have outperformed expectations in the past.

Money managers. The implication of the strong-form tests is that money managers as a group have not outperformed the buy-and-hold policy. It is argued that the investor's job is to separate good managers from average and poor managers. This approach is supported by the research showing that some analysts (e.g., Value Line) have the ability to separate the best and the worst stocks from a universe of stocks.

The rationale for investing in index funds. The conclusion you might draw from the efficient market literature is that since you cannot, in general, expect to beat the market, you should attempt to match the market while minimizing your costs. One way to match the market's performance is to put your money into an index fund. An index fund is designed to duplicate the composition and performance of a specific index or market segment. There are index funds for domestic and international markets and for various market segments.

Proper diversification is the key to utilizing index funds. Most investors do not have the resources to purchase individual securities in the correct proportions so that their portfolio mimics the market. Moreover, certain securities may lack proper market liquidity to warrant inclusion in a market replication strategy. The result is that market index funds like the Vanguard 500 (which mimics the S&P 500) or unit trusts such as the Standard and Poor's Depositary Receipts (SPDRs or "spiders") are an easy, cost-effective way for most investors to gain the proper exposure to a market index.

LOS 54.d: Define behavioral finance and describe prospect theory, over-confidence bias, confirmation bias, and escalation bias.

Behavioral finance considers the psychological bases for perceived investor behavior that creates some degree of systematic mispricing of securities and may explain some anomalies that tend to refute the efficient markets hypothesis. Research and conclusions about such alleged psychological tendencies as selling winners too soon and holding losing positions too long, and making systematic errors of perception and errors of estimation, would fall under the general heading of behavioral finance.

The behaviors that give rise to behavioral finance explanations violate the axioms of expected utility that have driven much of the theory of optimal decision-making under uncertainty. An alternative to the principles of expected utility is **prospect theory**. Prospect theory is based on the idea that individuals rank risky outcomes based on where the outcome lies relative to some reference point (e.g., initial wealth). Expected utility theory is based on the idea that decisions are made based on the possible outcomes, regardless of an individual's beginning wealth position. The motivation for the development of prospect theory was a finding that individuals exhibit risk aversion with respect to gains, but exhibit a preference for risk when faced with uncertain losses. Such "loss aversion" may explain other behaviors that are inconsistent with maximization of expected utility, such as a tendency of investors to hold losing positions too long and to sell winning positions too soon.

Overconfidence bias. With respect to growth companies, researchers have presented evidence that analysts' overconfidence in their earnings forecasts and their (high) estimated growth rates of earnings lead them to overemphasize the impact of good news and to underestimate the negative value implications of bad news.

Confirmation bias. There appears to be tendency for people to seek out supporting information after making a decision and to avoid or ignore new information that would call the decision into question. This can also extend to prior beliefs. A belief that Microsoft is a "good" company with high growth may be extended by investors to include a belief that Microsoft stock is a "good" stock.

Escalation bias. Some of the human tendencies that lead to confirmation bias may also be associated with a phenomenon referred to as escalation bias. This is the tendency of investors to commit more funds to a position that has gone down, often referred to as *averaging* (the purchase price) *down*. Deciding whether a significant decline in the price of a recently acquired position means that it is even a more compelling buy, or whether the original analysis was flawed or now insupportable, is often difficult. To the extent that investors undervalue information in opposition to the original purchase decision, and overweight the importance of information indicating the original decision was a "proper" one, they will tend to average down too often, escalating the size of their positions.

KEY CONCEPTS

LOS 54.a
Market prices are efficient with respect to a particular set of information if investors cannot earn positive abnormal (risk-adjusted) returns on average by selecting portfolio securities based on that information.

The three forms of market efficiency refer to efficiency with respect to different information sets. The three forms and the respective information they refer to are:
- Weak-form efficiency: market information, including all past price and volume information.
- Semistrong-form efficiency: all public information, including market information, financial reports, and other publicly released information.
- Strong-form efficiency: all information, including private, insider, financial, and market information.

LOS 54.b
Tests of the three forms of market efficiency can be categorized as:
- Weak-form tests: statistical tests of returns independence over time and mechanical trading rules (filter rules).
- Semistrong-form tests: time series tests, cross-sectional tests, and event studies.
- Strong-form tests: test the performance of insiders, specialists, money managers, and analyst recommendations.

Six anomalies with respect to semistrong-form efficiency have been well supported. Abnormal returns have been shown to be predictable using:
- Earnings surprises.
- Calendar effects.
- P/E ratios.
- Firm size.
- Analyst neglect.
- Book-to-market ratios.

Overall, tests have supported weak-form efficiency, offered mixed results with respect to semistrong-form efficiency, and shown violations of strong-form efficiency based on the trading results of corporate insiders and exchange specialists.

LOS 54.c

If weak-form efficiency holds, technical analysis produces no performance advantage.

If semistrong-form efficiency holds, neither technical nor fundamental analysis has any value in stock selection and portfolio construction.

Even if markets are informationally efficient, portfolio managers can still add value by matching portfolios to each client's constraints and risk tolerance, providing diversification, and minimizing transactions costs.

Index funds provide broad diversification at very low cost. To the extent that markets are efficient, index funds will outperform the average money manager who devotes time and resources to "beating the market."

LOS 54.d

Behavioral finance examines systematic investor behavior thought to be based in innate psychological tendencies that lead to predictable securities mispricing.

- Prospect theory: investors view outcomes based on where they lie relative to a reference point such as initial wealth.
- Fear of losses: investors tend to sell winners too soon and hold losers too long due to a fear of loss and avoidance of realizing a loss by selling losing positions.
- Confirmation bias: investors tend to overweight confirming evidence and underweight contrary evidence.
- Escalation bias: investors too often increase the size of a position that has declined in value (often referred to as "averaging down").

CONCEPT CHECKERS

1. The two major tests employed to test the weak-form efficient market hypothesis (EMH) are:
   A. event studies and runs tests.
   B. autocorrelation tests and runs tests.
   C. event studies and performance tests.

2. Which of the following forms of the EMH assumes that no group of investors has monopolistic access to relevant information?
   A. Weak form.
   B. Strong form.
   C. Semistrong-form.

3. The strong-form EMH asserts that stock prices fully reflect which of the following types of information?
   A. Market.
   B. Market and public.
   C. Public and private.

4. The strong-form EMH goes beyond the semistrong-form in that it calls for:
   A. perfect markets.
   B. a large number of profit-maximizing participants.
   C. information to come to the market on a random basis.

5. A stock's abnormal rate of return is defined as the:
   A. the market rate of return less the actual rate of return.
   B. actual rate of return less the expected risk-adjusted rate of return.
   C. expected risk-adjusted rate of return minus the market rate of return.

6. Which of the following is *least likely* an assumption behind the semistrong form of the EMH?
   A. In regard to timing, news announcements are independent of each other.
   B. All information is cost free and available to everyone at the same time.
   C. Investors adjust their expectations rapidly when confronted with new information.

7. Research has revealed that the performance of professional money managers compared to the performance of the market is:
   A. equal.
   B. inferior.
   C. superior.

8. Under the EMH, the major effort of the portfolio manager should be:
   A. to maximize transactions costs.
   B. to achieve complete diversification of the portfolio.
   C. to help clients underperform the market benchmark.

9. Which of following efficient market studies suggests that securities markets are semistrong-form efficient?
    A. Event studies.
    B. Small-firm effect studies.
    C. Neglected-firm effect studies.

10. An analyst has gathered the following data about a stock:
    • A beta of 1.375.
    • An actual return of 10.5%.
    • The market rate of return is 6%.
    • The risk-free rate is 2%.

    Compute the stock's abnormal return.
    A. 3%.
    B. 4%.
    C. 5%.

11. A portfolio manager who uses fundamental security analysis to select large-cap U.S. stocks has outperformed the S&P 500 index in each of the last three years, by 2% on average. She believes that this fact alone offers evidence that the prices of large-cap U.S. equities are not semistrong-form efficient. She:
    A. is correct, because the semistrong version of the efficient markets hypothesis says fundamental analysis should not produce abnormal returns on average.
    B. is incorrect, because markets are semistrong-form efficient, especially the market for large firms traded in U.S. markets.
    C. is incorrect, because her portfolio may have a beta greater than one.

12. The implication of the weak-form EMH is:
    A. all public and private information is rapidly incorporated into security prices.
    B. technical analysts can make excess returns on filter rules but not runs rules.
    C. there should be no relationship between past price changes and future price changes.

13. The January anomaly, the neglected firm effect, and the book value/market value ratio are studies examining which form of the EMH?
    A. Weak form of the EMH.
    B. Strong form of the EMH.
    C. Semistrong form of the EMH.

14. If a firm announces an unexpected large cash dividend, the EMH would predict which of the following price changes at the announcement?
    A. No price change.
    B. An abnormal price change to occur at the time of the announcement.
    C. A gradual price change to occur for several weeks after the announcement.

15. Which of the following is *least likely* one of the assumptions that underlie an efficient capital market?
    A. Expected returns implicitly include risk in the price of the security.
    B. A large number of profit-maximizing participants are analyzing and valuing securities independent of each other.
    C. Investors adjust their estimates of security prices slowly to reflect their interpretation of the new information received.

16. Autocorrelation tests and tests of the predictive power of earnings surprises apply to which forms of the EMH?

Autocorrelation	Earnings surprises
A. Semistrong	Strong
B. Weak	Semistrong
C. Semistrong	Weak

17. An investor who ignores news about the effect of rising oil prices on fertilizer production, primarily because she recently bought fertilizer stocks, *most likely* is exhibiting:
    A. escalation bias.
    B. overconfidence.
    C. confirmation bias.

ANSWERS – CONCEPT CHECKERS

1. **B**   The two types of tests used to examine the weak form of the EMH are:

    1. Statistical tests of the independence of security returns (runs and autocorrelation tests).

    2. Trading rule tests to examine if mechanical trading rules can generate excess returns.

2. **B**   Strong-form EMH states that stock prices fully reflect all information from public and private (inside) sources. Thus, no group of investors has an advantage. Note that the semistrong form only deals with public information.

3. **C**   Strong-form EMH states that stock prices fully reflect all information from public and private (inside) sources.

4. **A**   The strong-form EMH assumes perfect markets in which all information is cost free and available to everyone at the same time. The other answer choices apply to all forms of the EMH.

5. **B**   Abnormal returns are measured by taking the security's actual return less the security's expected return based on its beta risk.

6. **B**   The semistrong form of EMH assumes that stock prices reflect all public information. The semistrong form of EMH does not dispute that information could be held by insiders. All information being cost free and available to everyone at the same time is actually an assumption of strong-form EMH.

7. **B**   Tests indicate that mutual funds, bank trust departments, pension plans, and endowment funds are not able to match the performance of a simple buy-and-hold policy. The performance of professionals has been inferior to that of the market.

8. **B**   Portfolio managers should minimize transaction costs, help clients try to outperform the market benchmark, and diversify the portfolio to minimize risk.

9. **A**   The majority of studies that have looked at firm-related events have concluded that there are no predictable short-run or long-run impacts on security returns because of these events. This supports the EMH. The neglected firm, small firm, and P/E ratio studies have found significant positive risk-adjusted abnormal returns to small, underfollowed, and low P/E firms, results which do not support the semistrong form of the EMH.

10. **A** $10.5\% - [2\% + 1.375(6\% - 2\%)] = 3\%$

11. **C**   Tests of semistrong-form efficiency are based on risk-adjusted returns. If her portfolio has a beta significantly greater than one, then it would have an expected return significantly greater than the expected return on the index, which has a beta of one. Put another way, returns greater than the index are no guarantee of positive abnormal (risk-adjusted) returns.

12. **C**   Weak-form EMH states that security prices reflect all historical market information, meaning that there should be no relationship between past price changes and future price changes.

13. **C** The January anomaly, neglected firm effect, and book/market value ratio all deal with public information and are studies of semistrong-form EMH.

14. **B** EMH would suggest that stock prices adjust rapidly to new information—this implies that the stock dividend would cause an abnormal change in price to occur at the time of the announcement.

15. **C** Investors adjust rapidly (not slowly) to new information.

16. **B** Autocorrelation tests test the weak form (past price information), and tests of the predictive power of earnings surprises test the semistrong form (publicly available information).

17. **C** Confirmation bias describes a tendency to overweight new information supporting a recent decision and to underestimate the importance of new information that tends to call that decision into question.

MARKET EFFICIENCY AND ANOMALIES

EXAM FOCUS

This topic review is fairly straightforward. Know the limitations to the claim that market prices should be perfectly efficient, and know the limitations on arbitrage as a mechanism for forcing securities prices to their informationally efficient levels. Know the main reasons that research evidence suggesting anomalous returns behavior may suffer from bias.

LOS 55.a: Explain the three limitations to achieving fully efficient markets.

There are three primary limitations on the market's ability to produce informationally efficient prices.

1. Processing new information has costs and takes time. If market prices are efficient, there are no returns to the time and effort spent on fundamental analysis. But if no time and effort is spent on fundamental analysis, there is no process for making market prices efficient. We can resolve this apparent conundrum by looking to the time lag between the release of new value-relevant information and the adjustment of market prices to their new efficient levels.

    There must be an adequate return to fundamental analysis and trading based on new information to compensate analysts and traders for their time and effort. Those who act rapidly and intelligently to the release of new information will be rewarded. If stock prices adjust to their new efficient levels within minutes or hours of the release of new information, we can consider markets to be efficient. If this price-adjustment process takes days or weeks, stock prices are not efficient. In this case, we expect that more activity by analysts, traders, and arbitrageurs will tend to reduce the adjustment period over time.

2. Market prices that are not precisely efficient can persist if the gains to be made by information trading are less than the transaction costs such trading would entail. The difficulties associated with short sales can be viewed as relatively high transaction costs. This means that deviations from efficient prices on the upside (overvalued stocks) may be more prevalent than downside deviations (undervalued stocks) since the transaction costs of increasing long positions are low relative to those of short selling. In general, for securities with larger transaction costs, the deviations from informationally efficient prices should be greater.

3. There are limits on the ability of the process of arbitrage to bring about efficient prices. Arbitrage is frequently not riskless. Just because fundamentals indicate that one stock is overpriced relative to another, or absolutely over- or underpriced, does not mean that trading based on this information will be immediately profitable. For example, one risk of shorting overvalued stocks during the internet stock bubble of the late 1990s was that a shorted company might be taken over at a significantly

higher stock price than the one at which a trader sold short. The fact that the acquiring firm paid too much for the shares offers no solace to short sellers who have to cover their positions at the takeover price.

LOS 55.b: Describe four problems that may prevent arbitrageurs from correcting anomalies.

The ability of arbitrage to correct anomalies is limited by four factors.

1. There is no guarantee concerning when, or even if, apparent mispricings will be corrected and prices will return to efficient equilibrium levels.

2. It may be difficult or impossible to find two securities with exactly the same risk so that a mispricing can be exploited by taking a long (short) position in an underpriced (overpriced) security and an offsetting position in a correctly priced security with the same risk. To the extent that the risks of the two securities are not exactly offsetting, such a strategy will have risk that may make it unattractive, so the mispricing can persist.

3. Arbitrageurs do not have unlimited funds. Given the limitations on the funds that investors make available for exploiting mispricings, only the more significant mispricings may be exploited while others are allowed to persist. During bull markets, this effect may be greater since investments seeking profit from small pricing errors will be less attractive relative to long (or leveraged long) positions just at a time when mispricings are more prevalent.

4. Arbitrageurs must depend on their sources of capital. The providers of capital to arbitrageurs may place limits on the arbitrage trades and position sizes that restrict the ability of arbitrageurs to completely exploit mispricings. Further, if the arbitrageur's strategies do not produce positive near-term results or lose money because mispricings get temporarily worse instead of better, capital will be withdrawn and new capital to devote to arbitrage activities will be in short supply.

LOS 55.c: Explain why an apparent anomaly may be justified and describe the common biases that distort testing for mispricings.

Some apparent mispricings may be justified by risk factors. Two examples of such risk-based justifications are presented here.

Risk Measurement and Abnormal Returns

One of the most persistent criticisms of studies that document anomalous returns based on firm characteristics is that the model used to estimate normal returns may be flawed. Researchers often use the CAPM to model normal returns based on estimated firm betas. The fact that small firms show positive abnormal (risk-adjusted) returns on average may indicate that small firms are persistently underpriced, or that investing in small firms entails risk that is not captured by the firms' betas. This is especially problematic when tests for abnormal returns involve returns over longer periods. Since normal returns over a day or a week are close to zero, measuring abnormal returns is not as heavily influenced

by the returns model used. Using such factors as firm size and price-book values may mitigate such problems, but the theoretical support for these characteristics as risk factors is weak.

The bottom line here is that we must be aware that firm characteristics associated with positive abnormal returns may be characteristics associated with a type of risk that is not captured by the returns model estimates to which actual returns are compared. In this case, the apparent "mispricing" is justified.

Strategy Risk

In addition to the concerns with the inadequate specification of firm risk in estimating normal returns, investors should consider strategy risk. Capturing the abnormal returns of a trading strategy is not without risk, even if the anomalous returns behavior persists. If the strategy is based on returns over a 20-year period, abnormal returns may be positive in only some of those years. Investors seeking to exploit the predictability of abnormal returns may have one or more down years in a row, even if the firm characteristics upon which the strategy is based continue to have predictive power over the long term. Any strategy designed to exploit anomalous returns behavior has the inherent risk that the behavior will either not continue, or be significantly reduced by other investors pursuing similar or identical strategies. Additional strategy risk such as this must be rewarded with higher returns and can justify the persistence of some mispricings.

BIAS IN ABNORMAL RETURNS ESTIMATION

Biases in tests for abnormal returns that offer evidence of systematic security mispricing may explain some anomalous results.

Data Mining Bias `

Recall from quantitative methods, that statistical tests have a probability of a type I error equal to their significance level. A test of the hypothesis that stock prices are efficient (no abnormal returns) at the 5% level of significance will be rejected at the 5% level of significance 1 out of 20 times by chance, even when it is actually true.

Consider a researcher who tests 20 different factors using the same sample of data. In each test he tries to determine whether abnormal returns could have been earned by forming portfolios based on one of these factors. Even if none of the factors is actually valuable in predicting abnormal returns, chances are that one of the tests will show a statistically significant relation between a factor and subsequent abnormal returns. Now imagine thousands of researchers doing a hundred thousand tests all on the same data sample. This results in a data mining problem.

There are certainly many relationships in the data resulting purely from chance. Standard statistical tests will identify these as statistically significant when they are in fact not driven by any real characteristics of markets and are unlikely to be repeated outside the sample period. While a less-than-ethical researcher could be guilty of

purposely mining the data, a large number of independent skilled researchers who just use the same data (e.g., U.S. stock returns) can also be mining the data.

Survivorship Bias

When constructing samples, researchers must be careful not to include just surviving companies, mutual funds, or investment newsletters. Since survivors tend to be those that have done well (by skill or chance), samples of mutual funds that have 10-year track records, for example, will exhibit performance histories with upward bias. Mutual fund companies regularly discontinue funds with poor performance histories or roll their assets into better-performing funds.

Sample Selection Bias

Sample selection bias (of the unintentional variety) occurs when the method of selecting a sample is not truly random. It is present when the researcher has inadvertently selected a sample that exhibits characteristics that are not present, or not present to the same degree of significance, in the overall population. If a researcher finds evidence of an anomaly in sample data, but the data are predominantly from small firms because that was the only information available to the researcher, it could be a mistake to make inferences about characteristics of the whole population of publicly traded firms based on that sample.

Small Sample Bias

Inferences about an entire population drawn from tests on a small sample may be incorrect. One type of small sample bias is to use a short time period. What is true over one time period is not necessarily true over longer periods.

Nonsynchronous Trading

Closing stock prices in market data may be actual trading prices very close to the market close for large-cap, heavily traded stocks. For stocks that trade infrequently, closing prices may be prices from much earlier in the day. Using these "stale" prices can make strategies appear more attractive than they really are. Assuming that one could actually trade at closing prices at or near the close of the market, may make a strategy look profitable when the strategy could not really be implemented.

LOS 55.d: Explain why a mispricing may persist and why valid anomalies may not be profitable.

There are several reasons that pricing anomalies can persist, but all are rooted in the fact that the pricing anomaly is not quickly exploited by traders or arbitrageurs.

1. *Lack of Theoretical Explanation*

If the reasons underlying a persistent pricing anomaly are not well understood, it is difficult to exploit. Arbitrageurs will use their funds to exploit other mispricings which they believe they understand better and are, therefore, better able to exploit and profit from.

2. *Transactions Costs*

The trades necessary to exploit any apparent mispricing may not be profitable because the costs of the trades are greater than the potential abnormal returns. Transactions costs include the bid-ask spread, brokerage commissions, and the impact that larger trades may have on the price of the securities involved. Mispricings of the stocks of smaller companies will be more likely to persist because the transactions costs for smaller firms' stocks will typically include higher percentage bid-ask spreads and higher costs from price impact of trades due to their lower liquidity.

3. *Small Profit Opportunities*

The total profit to be gained by exploiting a mispricing may be small enough that it does not represent a significant profit opportunity to large funds. Again, mispricings of the stocks of smaller companies may be persistent because the small size of the positions that can be established limits the profits to be realized by exploiting the mispricing.

4. *Trading Restrictions*

Restrictions on short selling make some strategies impossible for some period of time. Note that when a stock is first offered to the public, it typically cannot be shorted immediately after the IPO since shares cannot be borrowed. Initial overpricing of a new IPO can persist for days because of traders' inability to short the shares.

5. *Irrational Behavior*

Investor tendencies of perception and analysis that run counter to rational trading and investing may lead to persistent mispricings that are not rapidly exploited by arbitrageurs for one or more of the reasons we have noted thus far.

6. *Other Limits on Arbitrage*

The limits on arbitrageur activities previously discussed (e.g., limited capital, strategy risk, investor short-term performance demands) also can explain the persistence of some market pricing anomalies.

There may be valid anomalies (persistent, backed by theory, and not the result of measurement bias) that do not or will not result in profitable trading strategies. One reason for this is that evidence of mispricings is typically based on average returns for large samples over significant time periods. While there may be evidence that the market initially underreacts to positive earnings surprises, for any particular stock or time period there is no guarantee that purchasing a stock after a positive earnings surprise will result in positive returns or positive abnormal returns.

A second reason that trades based on valid anomalies may not be profitable is that even when abnormal returns (returns adjusted for risk and overall market performance) are positive, raw (unadjusted) returns can be negative during periods of market decline.

A third reason that arbitrage based on valid anomalies may be unprofitable is that the conditions causing the mispricing may change. This is especially true when the accepted explanation for the anomalous pricing is not well understood or is mistaken. In this case a change in the conditions that actually are causing the mispricing may not be recognized, so arbitrageurs are seeking to exploit a pricing anomaly that will not occur in the future.

A final reason that attempting to exploit a documented pricing anomaly may be unprofitable is the fact that arbitrage itself may have eliminated the associated mispricing. If enough investors purchase stocks after positive earnings surprises, the prices of these securities will rise to their efficient levels and the strategy of buying "positive earnings surprise" stocks will no longer be profitable.

KEY CONCEPTS

LOS 55.a
Three limitations to achieving full market efficiency:
- There must be some reward for analyzing the impact on value of new information, but that reward may be earned only by investors who process and act on the new information rapidly and skillfully.
- Transactions costs prevent trading and arbitrage from resulting in perfectly efficient securities prices. Securities and strategies with higher transaction costs permit greater deviations from perfectly efficient prices.
- Information-based arbitrage strategies are not riskless and there is no guarantee that prices will move to more rational levels over the near term or that such strategies will consistently perform well. Arbitrageurs have limited capital and so pursue only the most attractive opportunities, and have constraints imposed on them by the suppliers of investment capital.

LOS 55.b
Four problems prevent arbitrage from fully correcting anomalies:
- Apparent mispricings will not necessarily be corrected within any specific time frame.
- Securities with identical risk characteristics might not be available, which limits pairs trading (taking offsetting long and short positions).
- Because funds available to arbitrageurs are limited, often only the most significant mispricings will be exploited.
- Arbitrage strategies that do not result in near-term profits may cause capital to be withdrawn from the arbitrageur.

LOS 55.c
If abnormal returns actually reflect risk factors unaccounted for by the model used to estimate normal returns, the apparent mispricings are justified. Abnormal returns from exploiting pricing anomalies may in fact be normal compensation for the strategy risk inherent in exploiting them.

Research purporting to identify anomalous returns behavior may be subject to biases.
- Data mining bias.
- Incorrect measurement of risk and abnormal returns.
- Small sample bias.
- Survivorship bias.
- Sample selection bias.
- Use of stale prices due to nonsynchronous trading.

LOS 55.d

In addition to transactions costs and the inherent limitations of arbitrage, reasons a mispricing may persist include:

- Lack of a theoretical explanation for the anomaly.
- Small size of the potential profit from exploiting the anomaly.
- Trading restrictions.
- Irrational investor behavior.

Trading on pricing anomalies is not necessarily profitable:

- Strategies that work on average may not be profitable over a particular time period or during a broad market decline.
- The factors that caused securities mispricing in prior periods may change.
- Arbitrage may have eliminated the mispricing opportunities evident in prior periods.

CONCEPT CHECKERS

1. The effect on market efficiency of restricting short sales is *most likely* to:
    A. create a band of efficient prices.
    B. improve market efficiency.
    C. lead to upside bias in stock prices.

2. A researcher has examined the performance of the shares of firms that went public during the period 1998 to 1999 and found evidence of positive abnormal returns over the three months after the firms' shares began trading. This evidence of anomalous returns behavior is *least likely* subject to:
    A. survivorship bias.
    B. small sample bias.
    C. measurement problems for abnormal returns.

3. A researcher has examined a sample of shares of smaller firms that trade infrequently and found that they have had greater volatility of the price change between the market closing price and the opening price the next trading day than large-cap stocks in similar industries. Based on this information, he suggests entering into an options trading strategy to exploit the differences in overnight volatility. The researcher has *most likely:*
    A. misestimated normal returns.
    B. overestimated overnight volatility of his sample.
    C. introduced small sample bias into his results.

ANSWERS – CONCEPT CHECKERS

1. **C** The higher the transactions costs of short sales, the more security prices may be above efficient levels without causing short sales to drive them down to efficient levels. This will limit adjustment when stocks are overpriced.

2. **A** The researcher has used a relatively small time period during which the post-initial public offering (IPO) returns of new issues may not have been representative of those over longer time periods. Any time abnormal returns are being measured over longer periods, such as three months, there are potential measurement errors. Additionally, since the stocks had no trading history, estimating risk is problematic. There is no indication that the sample suffers from survivorship bias, since IPOs were included regardless of their fates.

3. **B** The estimating of normal returns is not an issue here and we have no information suggesting that his sample or sample period is necessarily small. The most likely problem here is one of nonsynchronous trading. For stocks that trade infrequently, market closing prices may be those from trades many hours earlier and the opening trades the next day may come many hours after the opening. The problem, then, is that he is measuring volatility over a potentially much longer period for the small-cap stocks than for the large-cap stocks that likely trade near both the close and the opening.

AN INTRODUCTION TO SECURITY VALUATION AND INDUSTRY ANALYSIS

Study Session 14

EXAM FOCUS

To estimate the market value of any investment, find the present value of its future cash flows: estimate the number and dollar amount of future cash flows, estimate when they will be received and what form they will take, and discount these cash flows to the present using the required rate of return. The required return on any investment is the real rate of interest plus premiums for inflation and risk. To make an investment decision, compare the estimated value of the security to its current market price. For success on the Level 1 exam, candidates should be prepared to calculate the value of an investment with the valuation formulas presented in this review. All of them are variations of the same discounted cash flow technique. We also include LOS 57 concerning structural changes in the economy.

OVERVIEW OF SECURITY VALUATION TECHNIQUES

The security valuation techniques presented in this review can be divided into two basic types:

1. Valuation based on the present value of expected future cash flows.

2. Relative valuation techniques based on an expected multiple of a firm's expected performance, such as earnings per share or sales per share.

For firms that pay dividends and are mature (growing at a fairly constant and predictable rate), calculating the present value of expected future dividends is an appropriate valuation technique. Since dividends are a payment to equity owners, the appropriate discount rate to use when calculating the present value of a future stream of dividends is the required return on equity. For a firm that does not pay dividends, the present value of operating free cash flow or of free cash flow to equity are often used for calculating a value.

Operating free cash flow is typically calculated as operating cash flow minus the cash to fund the increases in working capital and fixed assets necessary to support the growth rate assumed for the firm. Free cash flow to equity is a similar concept, but payments to or proceeds from debt holders are included. So, while the cost of equity is the appropriate discount rate for free cash flow to equity, the firm's WACC is the appropriate discount rate when valuing expected operating free cash flow, since these are cash flows to the entire firm, not just equity owners.

Present value techniques are certainly theoretically correct. The problems arise when we attempt to estimate future cash flows and their growth rates. Small differences in estimated growth rates and the duration of periods of rapid growth can lead to large differences in estimated values. An ability to estimate the future growth rates of

dividends, earnings, or various measures of cash flow is often what distinguishes the best equity analysts. We will present the mathematics of valuing an infinite stream of future cash flows—a constant steam in the case of preferred stock valuation, and a stream that grows at a constant rate, at least beyond some estimated future period, for common stock valuation.

Relative valuation techniques, such as valuation based on multiples of price to earnings, are based on current equity valuations in the market. Price/earnings multiples for an industry or a firm can be compared to multiples for comparable industries or firms within an industry. If the market is severely overvalued, a stock or industry that is not as overvalued will be identified as a relatively good value. On the other hand, when the market as a whole is severely undervalued, a stock or industry that appears to be overvalued relative to the market may, in fact, be at an attractive price for long-term purchase. For this reason, relative valuation techniques are more appropriate when the market itself is neither severely over- or undervalued.

LOS 56.a: Explain the top-down approach, and its underlying logic, to the security valuation process.

The **top-down, three-step approach** to security valuation starts with a forecast of the direction of the general economy. Next, based on this economic forecast, project the outlook for each industry under review. Third, within each industry, select the firms most likely to perform the best given these economic and industry forecasts. As indicated, this approach is a three-step analytical process:

economic analysis → industry analysis → stock analysis

Step 1: Forecast macroeconomic influences.

Fiscal policy is a direct approach to affect aggregate demand in an attempt to manage the rate of economic growth. Tax cuts encourage spending (demand) and speed up the economy; tax increases discourage spending and slow economic growth. Government spending creates jobs, thus increasing aggregate demand.

Monetary policy is used by the central bank to manage economic growth. Decreasing the money supply causes interest rates to rise, putting upward pressure on costs and downward pressure on demand. Increasing the money supply reduces interest rates and increases demand. Inflation can result from increasing the money supply too fast. Rising interest rates reduce the demand for investment funds and rising consumer prices reduce product demand.

From a global (import/export) perspective, the potential domestic economic impact from political changes in major international economies must be considered.

Step 2: Determine industry effects.

Identify industries that should prosper or suffer from the economic outlook identified in Step 1. Consider how these industries react to economic change: some industries are cyclical, some are counter-cyclical, and some are noncyclical.

Consider global economic shifts: an industry's prospects within the global business environment determine how well or poorly individual firms in the industry will do. Thus, industry analysis should precede company analysis.

Step 3: Perform firm analysis.

After performing an industry analysis, compare firms within each attractive industry using financial ratios and cash flow analysis. For stock purchases, identify the company with the most upside potential. For short selling, identify the firm whose stock should perform the worst. This involves not only examining a firm's past performance, but also its prospects.

LOS 56.b: State the various forms of investment returns.

The returns (broadly defined) on an investment can be measured in several ways, including cash flows from projects, interest income on bonds, and dividend income on stocks. Capital gains, the increase in the price of an asset, are another form of investment returns.

We might also measure investment returns as earnings (per share of common stock), operating cash flow, or some other cash flow measure. In this topic review, we focus on dividends and capital gains as the relevant return measures for valuing shares of stock. Based on the dividend discount model's assumptions, we will also value a share of stock based on its earnings per share.

LOS 56.c: Calculate and interpret the value of both a preferred stock and a common stock using the dividend discount model (DDM).

Valuing preferred stock is easy since the dividend is fixed and the income stream (dividends) is theoretically infinite (it's a perpetuity):

$$\text{preferred stock value} = \frac{D_p}{(1 + k_p)^1} + \frac{D_p}{(1 + k_p)^2} + \ldots + \frac{D_p}{(1 + k_p)^\infty} = \frac{D_p}{k_p}$$

Again, the only problem is determining the required return, k_p. Because of default risk factors, the firm's required rate on preferred (k_p) should be above the firm's bond rate (k_d). However, since dividends paid to corporate investors are subject to the *dividends received deduction* (i.e., 80% of dividends paid are tax exempt), preferred yields are below the yields on the firm's highest grade bonds.

Throughout this review, we will be computing "values," all of which are simply the present value of expected future dividends and an eventual sale price, or of an infinite stream of expected cash dividends. Keep in mind that value is the same as price if markets are in equilibrium (efficient), so we are essentially calculating what the price "should" be. This is often referred to as **intrinsic value**.

Example: Preferred stock valuation

A company's bonds are currently yielding 8.5%, and its preferred shares are selling to yield 50 basis points (0.5%) below the firm's bond yield. Calculate the value of the company's 5%, $100 par preferred stock.

> *Professor's Note: The dividend on preferred stock is usually expressed as a percentage of par. If CFA Institute gives you a preferred dividend in this manner, take care not to confuse the dividend rate with the discount rate, or the par value with the price.*

Answer:

Determine the discount rate: 8.5% − 0.5% = 8.0%

Value the preferred stock: $D_p / k_p = \$5.00 / 0.08 = \$62.50$

The general DDM. Valuing common stock is more difficult than valuing bonds and preferred stock because the size and timing of future cash flows are uncertain, and the required rate of return on common equity, k_e, is unknown. However, a stock's value is still the PV of its future expected cash flows. Since the only cash flows a stockholder ever receives from the firm are dividends (cash or liquidating), the model used is called the *dividend discount model* (DDM).

$$\text{value} = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \frac{D_3}{(1+k_e)^3} + ... + \frac{D_\infty}{(1+k_e)^\infty}$$

A couple of important comments must be made here. First, if an investor sells the stock, the purchaser is buying the remaining dividend stream, so a stock's value at any point in time is still determined by the dividends it is expected to pay after that point.

Second, if a company declares it will never pay dividends, its shares should be worthless because the stockholders would never receive anything of value from the firm. However, since we see shares of firms that pay no dividends being actively traded in the market, investors must expect to receive something of value, like a liquidating dividend, at some point in the future.

One-year holding period. If your holding period is one year, the value you will place on the stock today is the PV of any dividends you will receive during the year plus the PV of the price you can sell the stock for at the end of the year.

The valuation equation is:

$$\text{value} = \frac{\text{dividend to be received}}{(1+k_e)^1} + \frac{\text{year-end price}}{(1+k_e)^1}$$

Steps used to determine a stock's value:

- Identify all expected future cash flows (dividends and future price).
- Estimate the equity discount rate: $k_e = \text{RFR} + \beta(R_{mkt} - \text{RFR})$.
- Discount the expected dividend and selling price at the required return.

Example: One-period DDM valuation

Calculate the value of a stock that paid a $1 dividend last year. You think next year's dividend will be 5% higher (g = 0.05), and the stock will sell for $13.45 at year end. The risk-free rate of interest is 6%, the market return is 12%, and the stock's beta is 1.2.

Answer:

The next dividend is the current dividend increased by the estimated growth rate. In this case, we have:

$$D_1 = D_0 \times (1 + g) = \$1.00 \times (1 + 0.05) = \$1.05$$

Next, we must estimate the required return on equity. Using the CAPM we have:

$$
\begin{aligned}
k_e \quad &= RFR + \beta(R_{mkt} - RFR) \\
&= 0.06 + 1.2(0.12 - 0.06) \\
&= 13.2\%
\end{aligned}
$$

Now we can compute the present value of the expected future cash flows as follows:

Dividend: $\dfrac{\$1.05}{1.132} = \$0.93$

Year-end price: $\dfrac{\$13.45}{1.132} = \$11.88$

Add the PV estimates. The current value based on the investor's expectations is:

Stock value = $0.93 + $11.88 = $12.81

Multiple-year holding period DDM. With a multiple-year holding period, we simply estimate all the dividends to be received as well as the expected selling price at the end of the holding period.

For a 2-year holding period, we have:

$$\text{value} = \frac{D_1}{(1 + k_e)^1} + \frac{D_2}{(1 + k_e)^2} + \frac{P_2}{(1 + k_e)^2}$$

> *Professor's Note: It is useful to think of the subscript, t, on dividends (D_t) and prices (P_t) as the "end" of period t. For example, in the preceding equation, P_2 is the price at the end of period (year) 2. Think of it as the price you can sell the stock for, just after you collect D_2.*

Example: Multiple period DDM valuation

Using the stock in the preceding example, we had a current dividend of $1.00, an expected growth rate of 5%, and the CAPM-determined required rate of return of 13.2%. Calculate the value of this stock assuming that you expect to sell it for $14.12 in two years.

Answer:

Find the PV of the future dividends:

$$D_1 : \frac{\$1.05}{1.132} = \$0.93$$

$$D_2 : \frac{\$1.05(1.05)}{(1.132)^2} = \frac{\$1.103}{1.2814} = \$0.86$$

PV of dividends = 0.93 + 0.86 = $1.79

Find the PV of the future price:

$$\frac{\$14.12}{(1.132)^2} = \$11.02$$

Add the present values. The current value based on the investor's expectations is $1.79 + $11.02 = $12.81.

The **infinite period DDM** assumes the growth rate, g, in dividends from year to year is constant. Hence, next period's dividend, D_1, is $D_0(1 + g_c)$, the second year's dividend, D_2, is $D_0(1 + g_c)^2$, and so on, where g_c is a constant growth rate. The extended equation using this assumption gives the time = 0 value as:

$$PV_0 = \frac{D_0(1+g_c)^1}{(1+k_e)^1} + \frac{D_0(1+g_c)^2}{(1+k_e)^2} + \frac{D_0(1+g_c)^3}{(1+k_e)^3} + ... + \frac{D_0(1+g_c)^\infty}{(1+k_e)^\infty}$$

Thank goodness this equation simplifies to:

$$PV_0 = \frac{D_0(1+g_c)}{k_e - g_c} = \frac{D_1}{k_e - g_c}$$

This is the infinite period dividend discount model. Note that the dividend in the numerator is for time = 1 and the value, PV_0, is for time = 0. Note also that rearranging the terms yields:

$$k_e = \frac{D_1}{PV_0} + g_c$$

The intuition here is that the required rate of return on an equity investment has two sources, the dividend yield and the growth in value (capital gains) over time.

Professor's Note: In much of the finance literature, you will see this model referred to as the constant growth DDM, the constant growth dividend valuation model, or the Gordon Growth Model. Whatever you call it, D_1 over k minus g should be memorized. Note that our valuation model for preferred stock is the same as the constant growth model with no growth (g = 0).

Example: Infinite period DDM valuation

Calculate the value of a stock that paid a $2 dividend last year, if dividends are expected to grow at 5% forever. The risk-free rate is 6%, the expected return on the market is 11%, and the stock's beta is 1.2.

Answer:

Determine D_1: $D_0(1 + g_c) = \$2(1.05) = \$2.10$

Determine k_e: $RFR + \beta(R_{mkt} - RFR)$
$\qquad\qquad = 0.06 + 1.2(0.11 - 0.06)$
$\qquad\qquad = 12\%$

Calculate the stock's value $= D_1/(k_e - g_c)$
$\qquad\qquad\qquad\qquad = \$2.10/(0.12 - 0.05)$
$\qquad\qquad\qquad\qquad = \$30.00$

This example demonstrates that the stock's value is determined by the relationship between the investor's required rate of return on equity, k_e, and the projected growth rate of dividends, g_c.

Notice the critical relationship between k_e and g_c:

- As the difference between k_e and g_c widens, the value of the stock falls.
- As the difference narrows, the value of the stock rises.
- Small changes in the difference between k_e and g_c cause large changes in the stock's value.

Also, remember the assumptions of the infinite period DDM:

- The stock pays dividends, and they grow at a constant rate.
- The constant growth rate, g_c, is never expected to change.
- k_e must be greater than g_c. If not, the math will not work.

If any one of these assumptions is not met, the model breaks down.

Professor's Note: When doing stock valuation problems on the exam, watch for words like "forever," "infinitely," "indefinitely," etc. This will tell you that the infinite period DDM should be used. Also watch for words like "just paid" or "recently paid." These will refer to the last dividend, D_0. Words like "will pay" or "is expected to pay" refer to D_1.

Value of a Common Stock for a Company Experiencing Temporary Supernormal Growth

A firm may temporarily experience a growth rate that exceeds the required rate of return on the firm's equity, but no firm can maintain this relationship indefinitely. We must assume the firm will return to a more sustainable rate of growth at some point in the future. Since the assumptions of the infinite period model (constant g and $k_e > g_c$) don't hold, the infinite period DDM cannot be used to value growth companies that are experiencing very rapid growth that will not continue forever.

A valuation approach for supernormal growth companies (and companies that don't currently pay dividends) is to combine the multi-period and infinite period models. This is referred to as the **multistage dividend discount model** in many finance textbooks.

$$\text{value} = \frac{D_1}{(1+k_e)} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n}{(1+k_e)^n}$$

where:
D_n = last dividend of the supernormal growth period
D_{n+1} = the first dividend that *will grow* at a constant rate, g_c, forever
$P_n \quad = \dfrac{D_{n+1}}{k_e - g_c}$

Steps in using the temporary supernormal growth model:

- Project the size and duration of the supernormal dividend growth rate, g^*.
- Using this supernormal growth rate, estimate dividends during the supernormal period.
- Forecast what the normal (constant) growth rate will be at the end of the supernormal growth period, g_c.
- Project the first dividend at the resumption of normal growth.
- Estimate the price of the stock at the end of the supernormal growth period.
- Determine the discount rate, k_e.
- Add the PV of all dividends and the terminal stock price.

Example: Supernormal growth

Consider a stock with dividends that are expected to grow at 20% per year for four years, after which they are expected to resume their normal growth rate of 5% per year, indefinitely. The last dividend paid was $1.00, and $k_e = 10\%$. Calculate the value of this stock.

Answer:

Calculate the dividends throughout the supernormal growth period using g^*:

$$D_1 = D_0(1 + g^*) = 1.00(1.20) = \$1.20$$

$$D_2 = D_1(1 + g^*) = 1.20(1.20) = \$1.44$$

$$D_3 = D_2(1 + g^*) = 1.44(1.20) = \$1.73$$

$$D_4 = D_3(1 + g^*) = 1.73(1.20) = \$2.08$$

Although we increase D_3 by the supernormal growth rate of 20% to get D_4, D_4 *will grow* at the constant growth rate of 5% for the foreseeable future. This property of D_4 allows us to use the constant (infinite) growth model formula with D_4 to get a time = 3 value for all the expected dividends from time = 4 onward.

$$PV_3 = \frac{D_4}{k_e - g_c} = \frac{2.08}{0.10 - 0.05} = 41.60$$

Finally, we can sum the present values of dividends 1, 2, and 3 and of PV_3 to get the present value of all the expected future dividends:

$$\frac{1.20}{1.1} + \frac{1.44}{1.1^2} + \frac{1.73}{1.1^3} + \frac{41.60}{1.1^3} = \$34.83$$

Many finance textbooks solve supernormal growth problems like this one by calculating the expected dividends for one more period than we have here. If we were to use the infinite dividend discount model with D_5 to get a time = 4 value, and add the present value of this to the present values of the four expected dividends, D_1 to D_4, we would get the same answer as with the above technique (except for differences due to rounding).

> *Professor's Note: A common mistake with supernormal growth problems is to calculate the future value, PV_3 in this example, then forget to discount it back to the present. Don't make this mistake because CFA Institute is sure to present this common error as one of the choices.*

Example: Delayed dividend payments

This example reflects the fact that high growth firms normally don't pay dividends during their supernormal growth phase.

The firm will have three years of extraordinary growth during which no dividends will be paid. Beginning in year 4, earnings will stabilize and grow at a sustainable 5% rate indefinitely, and the firm will pay out 50% of its earnings in dividends. Given $E_4 = \$1.64$ and $k_e = 10\%$, calculate the value of this stock.

Answer:

Project the dividend that will be paid at the end of year 4:

D_4 = (dividend payout ratio)(E_4) = (0.5)(1.64) = \$0.82

Find the value of the stock at the end of year 3. Remember, P_3 is the value of dividends four through infinity at the end of year 3, one period *before* the firm resumes normal growth.

$P_3 = D_4 / (k_e - g_c) = \$0.82 / (0.1 - 0.05) = \$16.40$

Find P_0: I/Y = 10%; N = 3; FV = \$16.40; CPT → PV = \$12.32 = P_0

Remember, there can be two types of supernormal growth problems:

1. The company pays dividends, and there are two or more growth rates that are not zero. To work these problems, you find the PV of all the projected dividends, and the PV of $P_n = D_{n+1} / (k - g_c)$.

2. The company initially pays no dividends but then pays out some or all of its earnings as dividends at the resumption of normal growth. In this type of problem, you find the PV of the future price, $P_n = D_{n+1} / (k - g_c)$, which is determined by the delayed dividend stream.

> *Professor's Note: I am placing subscript "c" under the constant growth g_c to help distinguish it from other growth rates. CFA Institute will not likely do this, so you should be sure that you identify which growth rate is the constant one on the exam when you are working with different growth rates.*

LOS 56.d: Show how to use the DDM to develop an earnings multiplier model and explain the factors in the DDM that affect a stock's price-to-earnings (P/E) ratio.

How does the DDM relate to the P/E ratio? Start with the general form of the infinite period DDM:

$$P_0 = \frac{D_1}{k - g}$$

Divide both sides of the equation by next year's projected earnings, E_1:

$$\frac{P_0}{E_1} = \frac{D_1 / E_1}{k - g}$$

This illustrates that the P/E ratio is a function of:

* D_1/E_1 = the expected dividend payout ratio.
*   k = the required rate of return on the stock.
*   g = the expected constant growth rate of dividends.

Since we started with the equation for the infinite period (constant growth) DDM, the P/E ratio calculated in this way is the P/E ratio consistent with the infinite period dividend discount model valuation. We can see from the formula that, *other things equal*, the P/E ratio we have defined here will increase with: (1) a higher dividend payout rate; (2) a higher growth rate; or (3) a lower required rate of return.

Does this mean that a firm can increase its stock price by increasing its dividend payout ratio? Not necessarily, because other things will not remain the same. Increasing the dividend payout ratio will decrease the growth rate of earnings and dividends, since the firm will be investing less of its earnings for future growth. We will address the problem of estimating the growth rate for a firm and illustrate this negative relationship between the payout ratio and the return on equity as g = ROE × (1 – payout ratio), which is also g = ROE × retention ratio. Because of this tradeoff, the value of the firm could increase or decrease in response to a change in the expected dividend payout ratio.

Example: P/E valuation method

A firm has an expected dividend payout ratio of 60%, a required rate of return of 11%, and an expected dividend growth rate of 5%. Calculate the firm's expected P/E ratio. If you expect next year's earnings (E_1) to be $3.50, what is the value of the stock today?

Answer:

Expected P/E ratio: 0.6 / (0.11 – 0.05) = 10.

Value of the stock: $(E_1)(P/E_1) = (\$3.50)(10) = \$35.00$.

What you should know about the earnings multiplier approach to valuation is that:

- The main determinant of the size of the P/E ratio is the difference between k and g, which, as shown earlier, has a significant impact on stock price.
- The relevant P/E ratio you should study is the expected or leading P/E ratio (P_0/E_1), *not* the historical or lagging P/E ratio (P_0/E_0).
- The P/E ratio is just a restatement of the DDM, so anything that influences stock prices in the DDM will have the same effect on the P/E ratio.

There are several problems with using P/E analysis:

- Earnings are historical cost accounting numbers and may be of differing quality.
- Business cycles may affect P/E ratios. Currently reported earnings may be quite different from your expectations of earnings in the future (E_1).
- Also, like the infinite growth model, when $k < g$, the model cannot be used.

LOS 56.e: Explain the components of an investor's required rate of return (i.e., the real risk-free rate, the expected rate of inflation, and a risk premium) and discuss the risk factors to be assessed in determining an equity risk premium for use in estimating the required return for the investment in each country.

As we have discussed, the required rate of return on equity, k, is influenced by:

- The real risk-free rate (RFR_{real}), which is determined by the supply and demand for capital in the country. The real risk-free rate is the rate investors would require if there were absolutely no risk or inflation.
- An inflation premium (IP), which investors require to compensate for their expected loss of purchasing power.
- A risk premium (RP) to compensate investors for the uncertainty of returns expected from an investment. Since different investments have different patterns of return and different guarantees, risk premiums can differ substantially.

$$k = \text{required rate of return} = (1 + RFR_{real})(1 + IP)(1 + RP) - 1$$
$$k = \text{required rate of return (approximate)} \approx RFR_{real} + IP + RP$$

The real risk-free rate and the inflation premium together comprise the nominal risk-free rate, $RFR_{nominal}$. That is:

$$RFR_{nominal} = (1 + RFR_{real})(1 + IP) - 1$$

This may be approximated as:

$$RFR_{nominal} = RFR_{real} + IP$$

Professor's Note: A real rate is a rate that does not include inflation, while a nominal rate does. If a rate is not specified as being a real rate on the exam, it is safe for you to assume that it is a nominal rate.

The risk premium, RP, is a premium demanded for internal and external risk factors. *Internal risk factors* are diversifiable and include business risk, financial risk, liquidity risk, exchange-rate risk, and country risk. *External risk factors*, known as market risk factors, are macroeconomic in nature and are nondiversifiable.

Example: Computing the nominal risk-free rate

Calculate the nominal risk-free rate if the real risk-free rate is 4% and the expected inflation rate is 3%.

Answer:

$$
\begin{aligned}
\text{RFR}_{\text{nominal}} &= (1.04)(1.03) - 1 \\
&= 1.0712 - 1 \\
&= 7.12\%
\end{aligned}
$$

Alternatively, the nominal rate is frequently approximated by summing the real rate and expected inflation:

$$\text{RFR}_{\text{nominal}} = 4\% + 3\% = 7\%$$

The required rate of return on *any* investment is a combination of the nominal risk-free rate plus a risk premium. For equity investments, the risk premium can be determined by reference to a risk premium curve or by using the capital asset pricing model (CAPM):

$$k = \text{RFR}_{\text{nominal}} + \text{RP}$$

Using the CAPM, we have:

$$k = \text{RFR} + \beta[E(R_{\text{mkt}}) - \text{RFR}]$$

Professor's Note: Notice here that RFR is a nominal rate.

Estimating the Required Return for Foreign Securities

Security valuation models and their variables are essentially the same all over the world. However, there are significant differences in the determination of these variables.

To estimate the required rate of return for foreign securities, we can calculate the real risk-free rate, adjust it for the expected inflation rate, then determine the risk premium.

The **equity risk premium** for foreign securities is estimated with consideration of five types of risk that will differ substantially from country to country.

1. *Business risk* represents the variability of a country's economic activity, along with the degree of operating leverage for firms within the country.

2. *Financial risk* will be different in countries throughout the world.

3. *Liquidity risk* is often found in countries with small or inactive capital markets.

4. *Exchange rate risk*, the uncertainty in exchange rates, must always be taken into account when considering foreign investments.

5. *Country risk* arises from unexpected economic and political events.

LOS 56.f: Estimate the dividend growth rate, given the components of the required rate of return incorporating the earnings retention rate and current stock price.

Assuming past investments are stable and dividends are calculated to allow for maintenance of past earnings power, the firm's earnings growth rate, *g*, can be defined as the firm's earnings plowback or retention rate (RR) times the return on the equity (ROE) portion of new investments.

$$g = (RR)(ROE)$$

Note that if RR is the earnings retention rate, (1 – RR) must be the firm's dividend payout rate.

> *Professor's Note: Recall that we used the DuPont method to decompose ROE into its component parts: net profit margin × asset turnover × financial leverage = ROE. You can use these components, along with the retention rate, to calculate ROE × RR = g, the implied (sustainable) growth rate.*

Let's work through an example to illustrate why *g* equals RR × ROE for a stable but expanding company.

Example: Sustainable growth

Assume ROE is constant and that new funds come solely from earnings retention. Calculate the firm's growth rate, given that the firm earns 10% on equity of $100 per share and pays out 40% of earnings in dividends.

Answer:

Period 1 per share earnings = EPS_1 = ROE × equity per share = (0.10)($100) = $10 per share.

Period 1 dividend per share = D_1 = payout × EPS_1 = (0.40)($10) = $4.00 per share.

Period 1 retained earnings = RR_1 × EPS_1 = ($10)(1 − 0.4) = $6.00 per share.

So:

Period 2 earnings per share = (0.10)($100) + (0.10)($6) = $10.60 per share.

Period 2 dividend per share = D_2 = (0.40)($10.60) = $4.24 per share.

Analysis of growth:

   Earnings growth = (EPS_2 − EPS_1) / EPS_1 = ($10.60 − $10) / $10 = 6%

   Dividend growth = ($4.24 − $4) / $4 = 6%

   Analysis of stock price: assume k = 10%

   Price at the beginning of period 1 = D_1 / (k − g_c) = $4.00 / (0.10 − 0.06) = $100

   Price at the beginning of period 2 = D_2 / (k − g_c) = $4.24 / (0.10 − 0.06) = $106

The stock's price will grow at a 6% rate, just as earnings and dividends will.

   growth = g_c = (ROE)(Retention rate) = (0.1)(1 − 0.4) = 6%

The growth rate here, g_c = ROE × RR, is called the *internal* or *sustainable* growth rate—the rate of growth sustainable without resorting to external sources of capital (relying on retained earnings only).

To summarize what we know about dividend growth, we can state that other things equal:

- If a firm's net profit margin increases, ROE will increase.
- If ROE increases, *g*, which is (ROE)(RR), will increase.
- If *g* increases, the difference between *k* and *g* will decrease.
- If k − g decreases, the price of the stock will increase.

LOS 56.g: Describe a process for developing estimated inputs to be used in the DDM, including the required rate of return and expected growth rate of dividends.

As we have indicated, the DDM holds that the value of a share of stock is the present value of its cash flows. Thus, the DDM requires the following three inputs:

1. An estimate of the stock's future cash flows, which are dividends and future price.

2. A dividend growth rate, g.

3. A discount rate, which is the appropriate required return on equity, k.

Once the present value of the asset has been estimated, compare it to the current market price.

Example: Application of DDM

Assume you are analyzing the XYZ company. Its current stock price is $18.00. After reviewing XYZ's financial data, you find that last year's earnings were $2.00 per share. The firm's ROE is 10%, and you expect it to stay that way for the foreseeable future. The firm has a stable dividend payout policy of 40%. The current nominal risk-free rate is 7%, the expected market return is 12%, and XYZ's beta is 1.2. Calculate the value of XYZ and indicate whether this stock is a "buy" based on your estimate.

Answer:

Step 1: Determine the required rate of return:

$$k = 0.07 + 1.2(0.12 - 0.07) = 13\%$$

Step 2: Determine the growth rate:

Step 2a: $RR = (1 - \text{dividend payout}) = 1 - 0.4 = 0.6$

Step 2b: $g = (RR)(ROE) = (0.6)(0.10) = 0.06 \text{ or } 6\%$

Step 3: Determine last year's dividend:

$$D_0 = E_0(\text{dividend payout ratio}) = \$2(0.4) = \$0.80$$

Step 4: Determine next year's dividend:

$$D_1 = D_0(1 + g_c) = \$0.80(1 + 0.06) = \$0.85$$

Step 5: Estimate the value:

$$V_0 = D_1 / (k - g_c) = \$0.85 / (0.13 - 0.06) = \$12.14$$

Professor's Note: Rounding differences may occur, not unlike those you might encounter on the exam.

Step 6: Compare the stock's value to its current market price:

$12.14 vs. $18.00

Do not buy and possibly sell this stock short.

If estimated value > market price → buy

If estimated value < market price → don't buy

INDUSTRY ANALYSIS

LOS 57: Describe how structural economic changes (e.g., demographics, technology, politics, and regulation) may affect industries.

An analyst should take into account how broad structural changes will affect specific industries over time. Four types of structural changes are:

1. **Demographics.** Demographic factors include age distribution and population changes, as well as changes in income distribution, ethnic composition of the population, and trends in the geographical distribution of the population. As a large segment of the population reaches their twenties, residential construction, furniture, and related industries see increased demand. An aging of the overall population can mean significant growth for the health care industry and developers of retirement communities.

2. **Lifestyles.** Examples of the effect of changing lifestyles on industry growth prospects are the increases in meals consumed outside the home and catalog sales, as the percentage of families with two employed spouses has increased. Consumption patterns are also affected by current perceptions of what is "in style" and trends in consumer tastes in recreation, entertainment, and other areas of discretionary expenditure.

3. **Technology.** Changes in technology have had very important consequences for many industries over time. Change in the technology of transportation and communications has certainly had important effects on these industries, both in terms of products and services consumed but also in their production and pricing. Technological advances in computers and microprocessors in general have lead to sweeping changes in how inventory is managed and how products are distributed in many industries, particularly in the retailing industry.

4. **Politics and regulation.** Changes in the political climate and changes in specific government regulations can also have significant effects on particular industries. The imposition of tariffs on steel will lead to increased domestic production and profitability; the rise of terrorist activity has helped some industries and imposed costs on others, such as the airline and shipping industries; and requirements of a minimum wage and the widespread expectation of employment benefits packages have affected hiring practices and production methods, especially in labor intensive industries. Regulation of the introduction and sale of everything from new drugs to genetically engineered crops has important implications for many industries as well.

KEY CONCEPTS

LOS 56.a

The bottom-up approach to building portfolios begins with the analysis of individual stocks but ignores the important influence of a firm's industry and the overall economy on securities performance.

The top-down approach to security valuation has three steps:
1. Forecast overall economic trends and performance to make allocations among cash, stocks, and bonds and allocations across countries.

2. Use the economic forecast to identify industries within specific countries that will do well.

3. Analyze the individual firms in the industries/countries identified as attractive.

LOS 56.b

The returns from any investment can be measured as price change (capital gain/loss), cash income (i.e., interest, dividends, rental income, etc.), earnings, or a variety of cash flow measures for equities.

LOS 56.c

Preferred stock valuation model:

$$P_0 = \frac{D_{ps}}{K_{ps}}$$

One-period common stock valuation model:

$$P_0 = \frac{D_1}{1 + k_{ce}} + \frac{P_1}{1 + k_{ce}}$$

Multiple-year holding period model:

$$P_0 = \frac{D_1}{1 + k_{ce}} + \frac{D_2}{(1 + k_{ce})^2} + ... + \frac{D_n}{(1 + k_{ce})^n} + \frac{P_n}{(1 + k_{ce})^n}$$

Infinite period model:

$$P_0 = \frac{D_1}{k_{ce} - g} \text{ or } P_0 = \frac{D_0 (1 + g)}{k_{ce} - g}$$

A firm with supernormal growth (g_1) over n periods followed by a constant growth rate of dividends forever (g_2) can be valued as:

$$P_0 = \frac{D_1}{1 + k_{ce}} + \frac{D_2}{(1 + k_{ce})^2} + ... + \frac{D_{n-1}}{(1 + k_{ce})^{n-1}} + \frac{\dfrac{D_n}{k_{ce} - g_2}}{(1 + k_{ce})^{n-1}}$$

where : $D_1 = D_0 (1 + g_1) ... D_n = D_0 (1 + g_1)^n$

LOS 56.d

Dividing both sides of the infinite period DDM by E_1 produces an earnings multiplier model:

$$\frac{P_0}{E_1} = \frac{\dfrac{D_1}{E_1}}{k_{ce} - g}$$

Other things equal, either a higher dividend payout ratio or a faster growth rate of dividends would lead to a higher P/E ratio.

LOS 56.e

An investor's required rate of return is composed of:
*   The real risk-free rate, which reflects the supply and demand for capital.
*   The expected rate of inflation, which compensates the investor for the loss of purchasing power due to rising prices.
*   A risk premium to compensate for the uncertainty of the return on the investment.

The following five factors are used to develop estimates of the risk premium appropriate for a specific country.
*   Business risk (combines economic risk and operating leverage).
*   Financial risk (due to differences in leverage).
*   Liquidity risk (liquidity of country's markets).
*   Exchange rate risk (variability of the exchange rate).
*   Specific country risk.

LOS 56.f

The firm's internal or sustainable growth rate, g, is equal to the return on equity times the firm's earnings retention ratio (1 – dividend payout ratio). ROE can be forecast by examining the trends in and factors expected to influence the components of ROE: net profit margin, total asset turnover, and financial leverage.

LOS 56.g

Estimates of the required rate of return on equity include the real risk-free rate, a premium for the expected rate of inflation, and a risk premium that depends not only on the uncertainty about a security's cash flows but can change over time due to economic and capital market conditions.

The growth rate of dividends can be estimated from fundamentals (ROE and retention rates) as well as from examination of historical growth rates and their trends and cycles relative to either time or economic conditions.

LOS 57

An analyst should consider structural changes in demographics, technology, politics, and regulation and how they will affect the growth and profitability of specific industries.

CONCEPT CHECKERS

1. Which of the following describes the flow of the top-down valuation process?
    A. Economic analysis, industry analysis, company analysis.
    B. Company analysis, industry analysis, economic analysis.
    C. Economic analysis, company analysis, industry analysis.

2. An analyst used the infinite period valuation model to determine that XYZ Corporation should be valued at $20. The current market price is $30. The analyst should do which of the following?
    A. Issue a buy recommendation on XYZ.
    B. Issue a sell recommendation on XYZ.
    C. Do nothing since the results conflict each other.

3. What would an investor be willing to pay for a share of preferred stock that paid an annual $7 dividend if the yield on preferred was 25 basis points *below* the A bond yield of 8%?
    A. $77.50.
    B. $87.50.
    C. $90.32.

4. An analyst projects that a stock will pay a $2 dividend next year and that it will sell for $40 at year-end. If the required rate of return is 15%, what is the value of the stock?
    A. $33.54.
    B. $36.52.
    C. $43.95.

5. An analyst expects a stock selling for $25 per share to increase to $30 by year-end. The dividend last year was $1, but the analyst expects next year's dividend to be $1.50. The expected holding period yield on this stock is *closest* to:
    A. 20%.
    B. 24%.
    C. 26%.

6. A stock paid a $2 dividend last year. An investor projects that next year's dividend will be 10% higher and that the stock will be selling for $40 at the end of the year. The risk-free rate of interest is 8%, the market return is 13%, and the stock's beta is 1.2. The value of the stock is *closest* to:
    A. $37.
    B. $39.
    C. $42.

7.   A stock will pay a $2 dividend next year, $2.25 the year after, and $2.50 the following year. An investor believes that she can then sell the stock for $50 at the end of a 3-year holding period. The risk-free rate of interest is 7%, the market return is 13%, and the stock's beta is 1. What is the value of the stock?
     A. $35.76.
     B. $37.44.
     C. $39.92.

8.   The infinite period dividend discount model (DDM) implies that a stock's value will be greater:
     A. the larger its expected dividend.
     B. the lower the expected growth rate.
     C. the higher the required rate of return.

9.   Holding all other factors constant, which of the following is expected to grow at the same rate as dividends in the infinite period DDM?
     A. Sales.
     B. ROE.
     C. Stock price.

10. The infinite period DDM assumes which of the following?
     A. $g < k$.
     B. $g > k$.
     C. $g \neq k$.

11. What is the intrinsic value of a company's stock if next year's expected dividend is projected to be 5% greater than today's $1 dividend? The sustainable growth rate is 5% and investor's required rate of return for this stock is 10%.
     A. $20.00.
     B. $21.00.
     C. $22.05.

12. Next year's dividend is expected to be $2, $g = 7\%$, and $k = 12\%$. What is the stock's intrinsic value?
     A. $28.57.
     B. $40.00.
     C. $42.80.

13. A stock paid a $1 dividend last year. The risk-free rate is 5%, the expected return on the market is 12%, and the stock's beta is 1.5. If dividends are expected to grow at a 5% rate forever, what is the value of the stock?
     A. $10.00.
     B. $15.25.
     C. $21.50.

14. The XX Company paid a $1 dividend last year. The company is expecting dividends to grow at a 6% rate into the future. What is the value of this stock if an investor requires a 15% rate of return on stocks of this risk class?
     A. $10.60.
     B. $11.11.
     C. $11.78.

15. If a company currently has a high and unsustainable g that exceeds k, what is the appropriate valuation model?
     A. Infinite growth DDM.
     B. Price earnings multiple.
     C. Temporary supernormal growth (multistage) DDM.

16. Assume that a stock is expected to pay dividends at the end of year 1 and year 2 of $1.25 and $1.56, respectively. Dividends are expected to grow at a 5% rate thereafter. Assuming that k_e is 11%, the value of the stock is *closest* to which of the following?
     A. $22.30.
     B. $23.42.
     C. $24.55.

17. An analyst feels that Brown Company's earnings and dividends will grow at 25% for two years, after which growth will fall to a market-like rate of 6%. If the projected discount rate is 10% and Brown's most recently paid dividend was $1, value Brown's stock using the supernormal growth (multistage) dividend discount model.
     A. $31.25.
     B. $33.54.
     C. $36.65.

18. Firms with abnormally high return on equity (ROE) will probably do which of the following?
     A. Pay out all earnings in dividends.
     B. Retain a large portion of their earnings.
     C. Be indifferent between retention and payout.

19. How would an investor *best* solve for the intrinsic value of a stock that currently pays no dividends but is expected to start in five years?
     A. Use the P/E ratio.
     B. Use the infinite period (constant growth) DDM.
     C. Use the temporary supernormal growth (multistage) DDM.

20. The ABC Company will experience a 25% growth rate over the next three years and pay no dividends over that time period. Growth will then fall to 6%, at which time the company will institute a 40% payout ratio. If the expected dividend in year 4 is projected to be $2 per share and the required return is 10%, the firm's intrinsic value today is *closest* to:
     A. $37.57.
     B. $41.66.
     C. $48.00.

21. A firm has an expected dividend payout ratio of 60% and an expected future growth rate of 7%. What should the firm's price-to-earnings (P/E) ratio be if the required rate of return on stocks of this type is 15%?
     A. 5.0×.
     B. 7.5×.
     C. 10.0×.

22.   An investor is analyzing a firm that has a historical earnings retention rate of
       60%, which is projected to continue into the future, and a constant ROE of
       15%. The stock's beta is 1.2. The nominal risk-free rate is 8%, and the expected
       market return is 13%. If the investor thinks that next year's earnings will be $3
       per share, the stock's value would be *closest* to:
       A. $15.
       B. $24.
       C. $35.

23.   If a company has an earnings retention rate of zero, the firm's P/E ratio will be
       which of the following?
       A. 1 / g.
       B. 1 / k.
       C. D / k – g.

24.   A stock's P/E ratio based on the DDM is which of the following?
       A. (1 – RR) / [k – RR(ROE)].
       B. (1 + RR) / [k – RR(ROE)].
       C. (1 – RR) / [k + (RR)(ROE)].

25.   Which of the following yields the growth rate of dividends?
       A. Subtracting the earnings retention ratio from the ROE.
       B. Dividing the firm's earnings retention rate by the ROE.
       C. Multiplying the firm's earnings retention rate by the ROE.

26.   A stock just paid a dividend of $1. The dividend for the next three years is
       expected to grow at a 30% rate, after which the dividend in the fourth year and
       all future years is expected to grow at a rate consistent with an ROE of 10% and
       a dividend payout ratio of 60%. If the discount rate is 14%, the value of the
       stock is *closest* to:
       A. $19.37.
       B. $20.89.
       C. $22.90.

27.   Eisen Company paid a $1 dividend last year and is expected to continue to pay
       out 30% of its earnings as dividends in the foreseeable future. The firm's ROE is
       10%. What is the value of Eisen stock if you require a 13% return on stocks in
       Eisen's risk class?
       A. $10.70.
       B. $17.83.
       C. $19.56.

ANSWERS – CONCEPT CHECKERS

Professor's Note: Although your answer may vary slightly from the given choices, this is often the case on the actual CFA exam. Pick the closest one and move on!

1. **A** Top-down analysis works from the macro to the micro level—economic analysis, industry analysis, company analysis.

2. **B** Because the stock is selling for more than its intrinsic value, the stock is overvalued. The analyst should issue a sell recommendation.

3. **C** Preferred stock uses the PV of perpetuity model. Required return = 0.08 – 0.0025 = 0.0775.

   7.0 / 0.0775 = $90.32.

4. **B** ($40 + $2) / 1.15 = $36.52.

5. **C** ($31.50 / $25) – 1 = 0.26.

6. **A** Required return using CAPM = 0.08 + 1.2(0.13 – 0.08) = 14%. [$40 + $2(1.1)] / 1.14 = $37.02.

7. **C** k = 0.07 + 1(0.13 – 0.07) = 0.13; V_0 = ($2 / 1.13) + [$2.25 / (1.13)^2] + [($2.50 + $50) / (1.13)^3] = $39.92.

8. **A** A larger expected dividend, a *higher* expected growth rate, and *lower* required return will all increase the expected value of a stock.

9. **C** The infinite period DDM implies that the stock price will grow at the (constant) growth rate of dividends. A crucial assumption of the DDM is that ROE is constant; sales growth rate could be the same as the growth rate of dividends and earnings, but this is not required.

10. **A** For the infinite period DDM, the constant growth rate must be less than the required rate of return or else the math will not work.

11. **B** Using the infinite period DDM, $1(1.05) / (0.1 – 0.05) = $21.00.

12. **B** Using the infinite period DDM, $2 / (0.12 – 0.07) = $40.00.

13. **A** k = 0.05 + 1.5(0.12 – 0.05) = 15.5%; V_0 = $1(1.05) / (0.155 – 0.05) = $10.00.

14. **C** Using the infinite period DDM, $1(1.06) / (0.15 – 0.06) = $11.78.

15. **C** Companies may sometimes have temporary supernormal growth where g > k. If this is the case, the temporary supernormal growth DDM is appropriate.

16. **C** ($1.25 / 1.11) + [1.56 / (0.11 – 0.05)] / 1.11 = $24.55.

17. **C** $1(1.25) / 1.1 + [$1(1.25)^2 / (0.10 – 0.06)] / 1.1 = $36.65.

18. **B** Firms with abnormally high return on equity will likely retain a high portion of their earnings because the firm will likely be able to earn higher returns by reinvesting those earnings than investors could earn if the earnings were paid out in dividends.

19. **C** If a company does not pay dividends but is expected to in the future, the temporary supernormal growth DDM would be the best method to use. Work with earnings to find the PV of the future price that is determined by the future projected revenue stream.

20. **A** Note that this problem gives you more information than you need. Simply use the period 4 dividend with the infinite period DDM, and discount that (time = 3) value back to the present. $[\$2 / (0.10 - 0.06)] / (1.1)^3 = \$37.57$.

21. **B** Using the earnings multiplier model, $0.6 / (0.15 - 0.07) = 7.5\times$.

22. **B** $g = 0.6 \times 0.15 = 9\%$; $k = 0.08 + 1.2(0.13 - 0.08) = 14\%$; $P_0 = (\$3 \times 0.4) / (0.14 - 0.09) = \$24.00$.

23. **B** If a company is paying out all of its earnings as dividends, the constant growth DDM and earnings multiplier model simplify into the PV of a perpetuity formula = $1/k$, because $g = 0$ (in the denominator) and payout = 1 (in the numerator).

24. **A** The earnings multiplier model calculates P/E as follows: payout / $k - g$. Substituting terms, payout = $1 - RR$, and $g = ROE(RR)$.

25. **C** $g = RR \times ROE$.

26. **A** $g = 0.4 \times 0.1 = 4\%$; $P_0 = \$1.30 / 1.14 + \$1.69 / (1.14)^2 + \$2.20 / (1.14)^3 + [\$2.20(1.04) / (0.14 - 0.04)] / (1.14)^3 = \$19.37$.

27. **B** $g = 0.7 \times 0.1 = 7\%$; $P_0 = \$1(1.07) / (0.13 - 0.07) = \$17.83$.

Study Session 14

COMPANY ANALYSIS AND STOCK VALUATION

EXAM FOCUS

This topic review applies estimated P/Es and earnings to the valuation process for an individual common stock. Candidates should note that the formulas and process behind the calculations are identical whether we are talking about market and industry indexes or individual companies. Note well the distinction between "good" companies and "good" (undervalued) stocks.

COMPANY VS. STOCK ANALYSIS

After analyzing the economy and determining which industries offer the most promise, the next step in the top-down approach is selecting stocks. This is not simply a matter of identifying a "good company," defined as one with solid earnings and growth potential.

Company analysis might identify the best firms, but it does not necessarily identify the best investments. A good company might be overpriced in the market, while a bad company might be underpriced and represent a better investment. To select the best stocks, the investor must answer two questions: (1) What are the best companies in the best industries? (2) Are the stocks of these companies priced correctly? This is where the valuation techniques that we have learned come into play.

LOS 58.a: Differentiate between 1) a growth company and a growth stock, 2) a defensive company and a defensive stock, 3) a cyclical company and a cyclical stock, 4) a speculative company and a speculative stock, and 5) a value stock and a growth stock.

Growth company vs. growth stock. A *growth company* is one whose management has the ability to consistently select investments (projects) that earn higher returns than required by their risk. A *growth stock* is one that earns higher returns than other stocks of equivalent risk.

Even though a firm might be recognized as a growth company, its price may already reflect those growth expectations, and the stock will earn only the risk-adjusted required return. In addition, investor enthusiasm regarding the stock may be excessive, and this excess buying pressure may have pushed the price too high. In this case, even though the firm earns above-normal returns, its stock can actually earn below-normal returns.

Regardless of whether the firm is defined as a growth company, if a firm's stock price is below its intrinsic value, it can be a *growth stock*. Assuming the market estimates the correct value at some point, the stock price will rise, and the stock will (temporarily) earn above-normal risk-adjusted returns.

> *Professor's Note: This terminology is specific to Reilly and Brown[1] as far as I know. In common usage in the investment community, a "growth stock" is one with rapidly growing earnings. See "growth stock versus value stock" below.*

Defensive company vs. defensive stock. A *defensive company* has earnings that are relatively insensitive to downturns in the economy. Utility companies and retail grocery chains are good examples of defensive companies. These types of firms typically have low business risk and moderate financial risk. A *defensive stock* is a stock that will not decline as much as the market when the overall market declines. The returns of defensive stocks have a low correlation with the returns of the market. Recalling our review of portfolio theory, defensive stocks are characterized by low betas.

Cyclical company vs. cyclical stock. A *cyclical company* has earnings that tend to follow the business cycle. Steel, automobile, and heavy equipment producers are good examples of cyclical companies. Cyclical companies often have high levels of fixed costs (business risk) or leverage (financial risk). A *cyclical stock* is a stock with rates of return that will change more than the return on the overall market. These are stocks with betas greater than one, indicating more than a one-to-one reaction to changes in the return on the market.

Speculative company vs. speculative stock. A *speculative company* has assets that are very risky, but the assets have the potential to generate very large earnings. Companies that are involved with diamond mining, oil exploration, or some types of real estate are good examples of speculative companies. A *speculative stock* is a stock that is highly likely to have very low or negative returns because it is almost always overpriced. These stocks have a low probability of a return near that of the market but a slight probability of an enormous return.

Growth stock vs. value stock. Often the term "growth stock" is used to mean something different than the definition we used in contrasting growth stocks with growth companies. In the context of growth versus value, "growth" refers to the earnings growth rate. The S&P 500/Barra Growth Index® and S&P 500/Barra Value Index® separate the stocks in the S&P 500 index into growth stock and value stock portfolios. Operationally, this is done based on price-book ratios, but separating index stocks based on their price-earnings ratios would also be a good approximation for this purpose.

The shares of firms with high earnings growth rates tend to have both higher price-book and higher price-earnings ratios than slower-growing firms. The term *value stock* is used to describe stocks that are priced low in relation to their current earnings (rather than expected growth in their earnings) or in relation to the value of their fixed assets, real estate, or cash. Value stocks are characterized by low price-book ratios, low price-earnings ratios, and often, high dividends.

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1. Frank K. Reilly and Keith C. Brown, Investment Analysis and Portfolio Management, 8th ed. (Dryden Press, 2005).

LOS 58.b: Describe and estimate the expected earnings per share (EPS) and earnings multiplier for a company and use the multiple to make an investment decision regarding the company.

Estimated EPS. Estimating a company's earnings requires the analyst to forecast the company's sales and estimate its profit margin.

- A sales forecast is typically based on identifying the factors that influence the company's sales, such as general economic trends or factors specific to the company and its industry, using these to estimate sales growth for the forecast period.
- The expected profit margin can be estimated by analyzing the company's competitive strategy, internal performance trends, and relationship to its industry.
- Expected EPS is estimated earnings (forecast sales × expected profit margin) divided by the number of shares outstanding.

Estimated P/E. A firm's expected earnings multiplier (P/E) can be calculated using either of two methods:

1. *Macroanalysis of the Earnings Multiplier.* This approach estimates the company's P/E ratio by comparing it to industry and market P/E ratios.

2. *Microanalysis of the Earnings Multiplier.* Calculate a point estimate of the firm's expected P/E ratio.
   - Estimate the firm's projected dividend payout ratio, D_1/E_1. This is done with comparative analysis of the firm's payout history, stated goals, and industry.
   - Estimate the firm's required rate of return on equity: $k = RFR + \beta(R_{mkt} - RFR)$.
   - Estimate the firm's expected growth rate: g = (retention rate)(ROE). ROE can be estimated by analyzing the factors in the DuPont decomposition (net profit margin, total asset turnover, and the leverage ratio).
   - Compute the firm's future earnings multiplier: $(P/E)_1 = (D_1/E_1) / (k - g)$.

The Earnings Multiplier and Investment Decisions

One way to evaluate the purchase of a stock is to compare the intrinsic value (based on the present value of expected dividends or cash flows) to the current market price. An alternative is to assume that the market price will move to the intrinsic value over some period and then compare the expected total return over the period to the investor's required rate of return. The following example illustrates this second method.

Example: Expected return based on intrinsic value

Apton Corp. shares are currently trading at $32/share and are expected to pay a dividend of $0.96 over the coming year. An analyst has estimated that next year's earnings will be $3 and that the year-end P/E will be 12. Should an investor with a required rate of return of 14.5% purchase Apton shares based on this analysis?

Answer:

Based on the estimated earnings (E_1) of $3 and the estimated P/E of 12, the year-end price is forecast to be $3 \times 12 = 36$ and the total return will be:

$$\frac{36 - 32 + 0.96}{32} = 15.5\%$$

The investor should purchase the shares since the estimated return of 15.5% is greater than the required return of 14.5%.

KEY CONCEPTS

LOS 58.a
Company (earnings) characteristics and the characteristics of the company's stock as an investment may be different.

- A growth company is one that consistently selects projects that earn higher returns than required for their level of risk. A growth stock is one that earns above-normal risk-adjusted returns.
- A defensive company has earnings that are insensitive to economic recessions. A defensive stock is one that declines less than the market when the overall market is declining (low beta stocks).
- A cyclical company has earnings that are sensitive to the business cycle. A cyclical stock has returns that increase and decrease more than the overall market (high beta stocks).
- A speculative company has assets with high risk and the potential to generate high earnings. A speculative stock has a large probability of low or negative returns and a small probability of very high returns.
- In common usage, a growth stock has high expected earnings growth, a high P/E ratio, and a high price-book ratio. In contrast, a value stock is characterized by slower growth, a lower P/E ratio, a lower price-book ratio, and often a relatively high dividend yield.

LOS 58.b
A company's earnings per share can be estimated based on a sales forecast, an estimate of net profit margin, and the number of shares outstanding.

A company's earnings multiplier (P/E ratio) can be estimated by macroanalysis of the market and the industry or by microanalysis to estimate the company's dividend payout ratio, sustainable growth rate, and required rate of return.

To make an investment decision on a company, estimate the stock's value by multiplying its estimated EPS and expected P/E ratio and compare this value to the current stock price to determine whether the stock is overvalued or undervalued.

CONCEPT CHECKERS

1. Which of the following could be a growth stock?
   A. Expected return = required return.
   B. Expected return < required return.
   C. Required return < expected return.

2. Which of the following statements about company and stock analysis is *least likely* correct?
   A. A growth stock always indicates a growth company.
   B. A growth company's stock can have below-average risk-adjusted returns.
   C. A weak firm can experience temporary above-average risk-adjusted returns.

3. Which of the following statements about growth companies and growth stocks is *least likely* correct?
   A. A growth company can be over- or undervalued.
   B. A growth stock is overvalued relative to its risk.
   C. A growth company has above-average investment opportunities.

4. An analyst gathered the following financial information about a firm:
   - Estimated EPS $10 per share
   - Dividend payout ratio   40%
   - Required rate of return   12%
   - Expected long-term growth rate of dividends   5%

   What should the analyst estimate the value of this company's stock to be?
   A. $33.
   B. $57.
   C. $80.

5. Which of the following statements about stock valuation is *least likely* correct?
   A. If estimated value < the market price, buy the stock; it's underpriced.
   B. If the expected rate of return > the required rate, buy the stock; it's underpriced.
   C. If the expected rate of return < the required rate, don't buy the stock; it's overpriced.

6. Which of the following statements is *least likely* correct? A speculative:
   A. stock is usually underpriced.
   B. company has highly risky assets.
   C. stock has a low probability of earning a market rate of return.

7.   An analyst has made the following estimates for a stock:
   - Dividends over the next year $0.60
   - Long-term growth rate   13%
   - Intrinsic value $24

   The shares are currently priced at $22.

   Assuming the stock price moves to intrinsic value over the next year, what is the expected return on the stock?
   A. 9.1%.
   B. 11.8%.
   C. 15.7%.

ANSWERS – CONCEPT CHECKERS

1. **C**   If the required return is less than the expected return, the stock is underpriced and should temporarily earn above-normal risk-adjusted returns.

2. **A**   Classifying a stock as a growth stock means it is expected to earn above-average risk-adjusted returns, regardless of whether it is issued by a strong or weak firm.

3. **B**   A growth stock is one that is expected to produce a high return relative to its risk. If a stock is overvalued relative to its risk, it should be expected to underperform. A growth company can be overvalued or undervalued, and is characterized by above-average investment opportunities.

4. **B** $(P/E)_1 = (D_1/E_1)/ (k - g) = (0.4)/(0.12 - 0.05) = 5.7$

   $P_1 = \$10(5.7) = \$57$

5. **A**   Buy (sell) a stock when the estimated value is more (less) than the market price.

6. **A**   Speculative stocks are almost always overpriced.

7. **B** $\dfrac{24 - 22 + 0.60}{22} = 11.8\%$

INTRODUCTION TO PRICE MULTIPLES

EXAM FOCUS

This review covers the estimation of several market-based price multiples. Specifically, this review addresses the pros and cons of using the price-to-earnings ratio, price-to-book value ratio, price-to-sales ratio, and the price-to-cash flow ratio. You should be familiar with the advantages and drawbacks of each of these price multiples. You should also know how to compute each of these multiples, given the relevant market and firm financial information. As you read the material, remember that an analyst doesn't have to pick a ratio but can use the information in all of them. Just understand their strengths and weaknesses.

LOS 59.a: Discuss the rationales for, and the possible drawbacks to, the use of price-to-earnings ratio (P/E), price-to-book value (P/BV), price-to-sales ratio (P/S), and price-to-cash flow (P/CF) in equity valuation.

LOS 59.b: Calculate and interpret P/E, P/BV, P/S, and P/CF.

> *Professor's Note: This review is organized according to the types of price multiples. The LOS are addressed within each category.*

PRICE/EARNINGS RATIO

Rationales for using price-to-earnings (P/E) ratios in valuation:

- Earnings power, as measured by earnings per share (EPS), is the primary determinant of investment value.
- The P/E ratio is popular in the investment community.
- Empirical research shows that P/E differences are significantly related to long-run average stock returns.

The drawbacks of using the P/E ratio are:

- Earnings can be negative, which produces a useless P/E ratio.
- The volatile, transitory portion of earnings makes the interpretation of P/E difficult for analysts.
- Management discretion within allowed accounting practices can distort reported earnings and thereby lessen the comparability of P/E ratios across firms.

We can **define two versions of the P/E ratio**: trailing and leading P/E. The difference between the two is how earnings (the denominator) are calculated. *Trailing P/E ratios* use earnings over the most recent 12 months in the denominator. The *leading P/E ratio* (also known as forward or prospective P/E) uses "next year's expected earnings," which

is defined as either expected EPS for the next four quarters or expected EPS for the next fiscal year.

$$\text{trailing P/E} = \frac{\text{market price per share}}{\text{EPS over previous 12 months}}$$

$$\text{leading P/E} = \frac{\text{market price per share}}{\text{forecast EPS over next 12 months}}$$

Professor's Note: The trailing P/E is what we see published in much of the popular financial press. The leading P/E, P_0 / E_1, is the one we calculated from the dividend discount model (DDM).

Example: Calculating a P/E ratio

Byron Investments, Inc., reported €32 million in earnings during fiscal year 20X6. An analyst forecasts an EPS over the next 12 months of €1.00. Byron has 40 million shares outstanding at a market price of €18.00 per share. Calculate Byron's trailing and leading P/E ratios.

Answer:

$$20\text{X6 EPS} = \frac{\text{€32,000,000}}{40,000,000} = \text{€0.80}$$

$$\text{trailing P/E} = \frac{\text{€18.00}}{\text{€0.80}} = 22.5$$

$$\text{leading P/E} = \frac{\text{€18.00}}{\text{€1.00}} = 18.0$$

There are several issues to consider when calculating P/Es in practice. While price is observable, we can come up with several different numbers that are all arguably EPS.

When calculating trailing EPS, an analyst should focus on that portion of earnings that are expected to be recurring. The footnotes to the financial statements must be used to exclude gains, and possibly losses, on asset sales, foreign currency gains and losses included in net income, and any other items with an effect on earnings better described as transitory than permanent (likely to recur).

Firms may have cyclical earnings. P/Es will be high when earnings are at the bottom of a cycle and low when earnings are cyclically high. One method to adjust for earnings cyclicality is to use "normalized earnings" based on a full cycle or, equivalently, a normalized P/E averaged over a full business cycle. Alternatively, an analyst can estimate normal earnings by using the firm's average ROE over a cycle times the current value of shareholders' equity as an estimate of normalized earnings.

Analysts must also adjust earnings for differences in accounting methods among firms in order to be able to judge their relative valuations based on P/Es. A firm that is

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capitalizing expenses or using FIFO inventory accounting during a period of rising prices will report higher earnings than a firm that does not, and its trailing P/Es will be lower as a result. Finally, significant differences can exist between P/Es calculated with basic EPS and those calculated using diluted EPS. Diluted EPS are typically less (and never greater) than basic EPS, so P/Es using diluted EPS will be higher, perhaps significantly so.

Value rankings based on the P/E ratio can be misleading if they include companies with negative earnings. Suppose an analyst wants to identify potentially undervalued stocks (those with relatively low prices per dollar of earnings) by ranking companies from lowest to highest P/E ratio. If a company has negative earnings, it will have a lower P/E ratio than the company with the lowest price per dollar of positive earnings, as shown in Figure 1. To rank the stocks in the desired order, the analyst can use the **earnings yield**, or E/P, and list the results from highest to lowest. As Figure 1 shows, a descending earnings yield ranking will list companies with positive earnings in the same order as an ascending P/E ranking, while appropriately ranking companies with negative earnings lower than companies with positive earnings.

Figure 1: Stocks Ranked by P/E Ratio and Earnings Yield

Stock	Price	EPS	P/E Ratio
Midwest	16	−0.25	−64.0
Front	7	0.15	46.7
Palace	28	0.45	62.2
National	33	0.35	94.3

Stock	Price	EPS	Earnings Yield
Front	7	0.15	2.1%
Palace	28	0.45	1.6%
National	33	0.35	1.1%
Midwest	16	−0.25	−1.6%

PRICE/BOOK VALUE RATIO

Advantages of using the price-to-book value ratio (P/BV) include:

- Book value is a cumulative amount that is usually positive, even when the firm reports a loss and EPS is negative. Thus, P/BV can typically be used when P/E cannot.
- Book value is more stable than EPS, so it may be more useful than P/E when EPS is particularly high, low, or volatile.
- Book value is an appropriate measure of net asset value for firms that primarily hold liquid assets. Examples include finance, investment, insurance, and banking firms.
- P/BV can be useful in valuing companies that are expected to go out of business.
- Empirical research shows that P/BV ratios help explain differences in long-run average returns.

Disadvantages of using P/BV include:

- P/BV ratios do not recognize the value of nonphysical assets, such as human capital.
- P/BV ratios can be misleading when there are significant differences in the asset intensity of production methods among the firms under consideration.
- Different accounting conventions can obscure the true investment in the firm made by shareholders, which reduces the comparability of P/BV ratios across firms and countries. For example, research and development (R&D) costs are expensed in the United States, which can understate investment and overstate income over time.
- Inflation and technological change can cause the book and market value of assets to differ significantly, so book value is not an accurate measure of the value of the shareholders' investment. This makes it more difficult to compare P/BV ratios across firms.

The P/BV ratio is defined as:

$$P/BV = \frac{\text{market value of equity}}{\text{book value of equity}} = \frac{\text{market price per share}}{\text{book value per share}}$$

where:
book value of equity = common shareholders' equity
$$= \left(\text{total assets} - \text{total liabilities}\right) - \text{preferred stock}$$

We often make adjustments to book value that allow the P/BV ratio to more accurately measure the value of the shareholders' investment and to create more useful comparisons across different stocks.

A common adjustment is to use *tangible book value*, which is equal to book value of equity less intangible assets. Examples of intangible assets include goodwill from acquisitions (which makes sense because it is not really an asset) and a patent, which is more questionable since the asset (patent) can be sold separately from the firm. Furthermore, balance sheets should be adjusted for significant off-balance-sheet assets and liabilities and for differences between the fair and recorded value of assets and liabilities. Finally, book values often need to be adjusted to ensure comparability. For example, companies using the FIFO inventory accounting method cannot be accurately compared with peers using the LIFO method. Thus, book values must be restated on a consistent basis. This is also the case when liabilities for pension or other post-retirement benefits are over- or understated and where one company revalues assets upward (IFRS) while another does not (U.S. GAAP).

Example: Calculating a P/BV ratio

Based on the information in the following table, calculate the current P/BV for Alpha Corp. and Beta Corp.

Data for Alpha Corp. and Beta Corp.

Company	Book Value of Equity 20X6 (USD millions)	Sales 20X6 (USD millions)	Shares Outstanding 20X6 (millions)	Price 08/14/X6
Alpha Corp.	28,039	18,878	7,001	$17.83
Beta Corp.	6,320	9,475	5,233	$12.15

Answer:

Alpha Corp.:

$$\text{book value per share} = \frac{\text{book value of equity}}{\text{number of shares outstanding}} = \frac{\$28,039}{7,001} = \$4.00$$

$$P/BV = \frac{\text{market price per share}}{\text{book value per share}} = \frac{\$17.83}{\$4.00} = 4.46$$

Beta Corp.:

$$\text{book value per share} = \frac{\text{book value of equity}}{\text{number of shares outstanding}} = \frac{\$6,320}{5,233} = \$1.21$$

$$P/BV = \frac{\text{market price per share}}{\text{book value per share}} = \frac{\$12.15}{\$1.21} = 10.04$$

PRICE/SALES RATIO

The rationales for using the price-to-sales (P/S) ratio include:

- P/S is meaningful even for distressed firms, since sales revenue is always positive. This is not the case for P/E and P/BV ratios, which can be negative.
- Sales revenue is not as easy to manipulate or distort as EPS and book value, which are significantly affected by accounting conventions.
- P/S ratios are not as volatile as P/E multiples. This may make P/S ratios more reliable in valuation analysis.
- P/S ratios are particularly appropriate for valuing stocks in mature or cyclical industries and for start-up companies with no record of earnings.
- Like P/E and P/BV ratios, empirical research finds that differences in P/S are significantly related to differences in long-term average stock returns.

The disadvantages of using P/S ratios are:

- High growth in sales does not necessarily indicate operating profits as measured by earnings and cash flow.
- P/S ratios do not capture differences in cost structures across companies.

- While less subject to distortion than earnings or cash flows, revenue recognition practices can still distort sales forecasts. For example, analysts should look for company practices that speed up revenue recognition. An example is sales on a bill-and-hold basis, which involves selling products and delivering them at a later date. This practice accelerates sales into an earlier reporting period and distorts the P/S ratio.

Calculating a P/S ratio. P/S multiples are computed by dividing a stock's price per share by sales or revenue per share, or by dividing the market value of the firm's equity by its total sales:

$$P/S \text{ ratio} = \frac{\text{market value of equity}}{\text{total sales}} = \frac{\text{market price per share}}{\text{sales per share}}$$

Example: Calculating a P/S ratio

Based on the information in the table, calculate the current P/S ratio for Alpha Corp. and Beta Corp.

Data for Alpha Corp. and Beta Corp.

Company	Book Value of Equity 20X6 (USD millions)	Sales 20X6 (USD millions)	Shares Outstanding 20X6 (millions)	Intraday Price 08/14/X6
Alpha Corp.	28,039	18,878	7,001	$17.83
Beta Corp.	6,320	9,475	5,233	$12.15

Answer:

Alpha Corp.:

$$\text{sales per share} = \frac{\text{sales}}{\text{number of shares outstanding}} = \frac{\$18,878}{7,001} = \$2.70$$

$$P/S = \frac{\text{market price per share}}{\text{sales per share}} = \frac{\$17.83}{\$2.70} = 6.60$$

Beta Corp.:

$$\text{sales per share} = \frac{\text{sales}}{\text{number of shares outstanding}} = \frac{\$9,475}{5,233} = \$1.81$$

$$P/S = \frac{\text{market price per share}}{\text{sales per share}} = \frac{\$12.15}{\$1.81} = 6.71$$

PRICE/CASH FLOW RATIO

Rationales for using the price-to-cash flow (P/CF) ratio include:

- Cash flow is more difficult for managers to manipulate than earnings.
- Price to cash flow is more stable than price to earnings.
- Reliance on cash flow rather than earnings addresses the problem of differences in the quality of reported earnings (a problem when using P/Es).
- Empirical evidence indicates that differences in P/CF ratios are significantly related to differences in long-run average stock returns.

There are two **drawbacks to the P/CF ratio**, both of which are related to the definition of cash flow used. We discuss the specific cash flow definitions next.

- Some items affecting actual cash flow from operations are ignored when the *EPS plus noncash charges estimate* is used. For example, noncash revenue and net changes in working capital are ignored.
- From a theoretical perspective, *free cash flow to equity* (FCFE) is probably preferable to cash flow. However, FCFE is more volatile than straight cash flow.

> *Professor's Note: FCFE is the cash flow available to common stockholders after all operating expenses, interest and principal payments, investment in working capital, investment in fixed assets, and proceeds of debt issuance are incorporated.*

Calculating P/CF Ratios. There are at least **four definitions of cash flow** available for use in calculating the P/CF ratio: earnings-plus-noncash charges (CF), adjusted cash flow (adjusted CFO), free cash flow to equity (FCFE), and earnings before interest, taxes, depreciation, and amortization (EBITDA). Expect to see any one of them on the exam.

One commonly used proxy for cash flow is *earnings-plus-noncash charges* (CF):

CF = net income + depreciation + amortization

The limitation of this definition, as we mentioned previously, is that it ignores some items that affect cash flow, such as noncash revenue and changes in net working capital.

Another proxy for cash flow is *cash flow from operations* (CFO) from the cash flow statement. The limitation of CFO, however, is that it includes items related to financing and investing activities. Therefore, analysts often adjust CFO by adding back the after-tax interest cost:

adjusted CFO = CFO + [(net cash interest outflow) × (1 − tax rate)]

In addition, analysts sometimes further adjust CFO for items that are not expected to persist in the future.

Analysts also often use FCFE and EBITDA as proxies for cash flow. As we mentioned above, theory suggests that FCFE is the preferred way to define cash flow, but it is more volatile than straight cash flow. EBITDA is a pretax, pre-interest measure that represents a flow to both equity and debt. Thus, it is better suited as an indicator of total company value than just equity value. Analysts typically use trailing price to cash, which relies on the most recent four quarters of cash flow per share.

Given one of the four definitions of cash flow, the P/CF ratio is calculated as:

$$\text{P/CF ratio} = \frac{\text{market value of equity}}{\text{cash flow}} = \frac{\text{market price per share}}{\text{cash flow per share}}$$

where:
cash flow = CF, adjusted CFO, FCFE, or EBITDA

Example: Calculating P/CF

Data Management Systems, Inc. (DMS) reported net income of $32 million, depreciation and amortization of $41 million, net interest expense of $12 million, and cash flow from operations of $44 million. The tax rate is 30%. Calculate the P/CF ratio using CF and adjusted CFO as proxies for cash flow. DMS has 25 million shares of common stock outstanding, trading at $47 per share.

Answer:

CF = $32 million +$41 million = $73 million

adjusted CFO = $44 million + $[(\$12\text{ million})(1-0.30)]$ = $52.4 million

market value of equity = $(25\text{ million shares})(\$47\text{ per share})$ = $1,175 million

$$\text{P/CF} = \frac{\$1,175\text{ million}}{\$73\text{ million}} = 16.1$$

$$\text{P/adjusted CFO} = \frac{\$1,175\text{ million}}{\$52.4\text{ million}} = 22.4$$

KEY CONCEPTS

LOS 59.a,b
Advantages of using P/E ratios in valuation are:
- Earnings power is the primary determinant of investment value.
- The P/E ratio is widely used in the investment community.
- Empirical research shows that P/E rankings are significantly related to long-run average stock returns.

Disadvantages of using P/E ratios in valuation are:
- Earnings can be negative, which produces a useless P/E ratio.
- The volatile, transitory portion of earnings makes the interpretation of P/E ratios difficult for analysts.
- Management discretion within allowed accounting practices can distort reported earnings, and thus P/Es.

Advantages of using P/BV are:
- Book value is a cumulative amount that is usually positive and can be used even when EPS is negative.
- Book values are more stable than EPS, so it may be more useful than P/E when EPS is particularly high, low, or volatile.
- Book value is an appropriate measure of net asset value for firms that primarily hold liquid assets, including finance, investment, insurance, and banking firms.
- P/BV can be useful in valuing companies that are expected to go out of business.
- Empirical research shows that differences in P/BV ratios help explain differences in long-run average returns.

Disadvantages of using P/BV are:
- P/BV ratios do not recognize the value of assets not shown on the balance sheet, such as human capital.
- P/BV ratios can be misleading when there are significant differences in the net balance sheet values of the assets used by the firms being compared.
- Different accounting conventions can obscure the true investment in the firm made by shareholders.
- Inflation and technological change can cause the book and market value of assets to differ significantly.

Advantages of using P/S ratios are:
- The ratio is meaningful even for distressed firms.
- Sales figures are not as easy to manipulate or distort as EPS and book value.
- P/S ratios are not as volatile as P/E multiples.
- P/S ratios are particularly appropriate for valuing stocks in mature or cyclical industries, as well as start-up companies with no record of earnings.
- Empirical research finds that differences in P/S are significantly related to differences in long-term average stock returns.

Disadvantages of using P/S ratios are:
- High sales do not necessarily indicate operating profits as measured by earnings and cash flow.
- P/S ratios do not capture differences in cost structures across companies.
- While less subject to distortion than earnings, sales figures are affected by revenue recognition methods.

Advantages of using P/CF include:
- Cash flow is harder for managers to manipulate than earnings.
- Price to cash flow is more stable than price to earnings.
- Using cash flow addresses the problem of differences in quality of earnings that arises when using P/Es.
- Differences in price to cash flow are significantly related to differences in long-run average stock returns.

Disadvantages of using P/CF include:
- Some items affecting actual cash flow from operations are ignored when the EPS plus noncash charges estimation method is used. For example, noncash revenue and net changes in working capital are ignored.
- Some measure of free cash flow is theoretically preferred to operating cash flow. Free cash flow to equity can be used, but can be negative and is generally more volatile than operating cash flow.

CONCEPT CHECKERS

1. Which of the following *least accurately* describes the advantages and disadvantages of valuation with the P/E multiple?
    A. Advantage: P/E differences are significantly related to long-run average stock returns.
        Disadvantage: The volatile, transitory portion of earnings makes the interpretation of P/Es difficult for analysts.
    B. Advantage: Earnings power is the primary determinant of investment value.
        Disadvantage: Management discretion within allowed accounting practices can distort reported earnings.
    C. Advantage: P/E valuation can accommodate negative earnings.
        Disadvantage: P/E valuation is difficult to use for firms with relatively few fixed assets (e.g., service firms).

2. Which of the following *least accurately* describes the advantages and disadvantages of valuation with the P/S multiple?
    A. Advantage: P/S is meaningful, even for firms in financial distress.
        Disadvantage: Sales growth is not always an indicator of profitability.
    B. Advantage: Sales forecasts are not susceptible to distortion from revenue recognition practices.
        Disadvantage: Reported sales figures are easier to manipulate than earnings or book values.
    C. Advantage: P/S ratios are particularly appropriate for valuing stocks in mature or cyclical industries, as well as start-up companies with no record of earnings.
        Disadvantage: P/S ratios do not capture differences in cost structures across companies.

3. Valuation using discounted cash flow techniques is preferred to the P/E multiples approach when:
    A. earnings per share are negative.
    B. the dividend payout is low.
    C. the expected growth rate is very high.

4. The Larson Corp. had revenue per share of $400 in 2002, earnings per share of $5.00, and paid out 50% of its earnings as dividends. If the return on equity (ROE) and required rate of return of Larson are 15% and 11%, respectively, what is the appropriate P/S multiple for Larson?
    A. 0.12.
    B. 0.16.
    C. 0.19.

5. Which of the following regarding the use of P/BV measures is *least likely* correct?
    A. Book values are not very meaningful for firms in service industries.
    B. P/BV ratios can be compared across similar firms if accounting methods differ.
    C. Book value is often positive, even when earnings are negative.

6.   P/BV ratio analysis is *most* suitable for a firm:
      A. with accounting standards consistent with those of other firms.
      B. with a negative book value.
      C. in the service industry without significant fixed assets.

7.   Which of the following statements regarding the use of P/S multiples in stock valuation is *least likely* correct?
      A. P/S multiples are positive, even when earnings and book value are negative.
      B. Revenue is relatively easy to manipulate compared to earnings.
      C. The use of P/S multiples facilitates analysis of the effects of changes in pricing policy and other corporate strategic decisions.

8.   An analyst gathered the following financial data about Argott, Inc.
      • Market value $500
      • Sales $2,000
      • Earnings   –$50
      • Book value $250
      • Cash flow $50

      What is the price-to-book value ratio for Argott, Inc.?
      A. 0.10.
      B. 0.25.
      C. 2.00.

9.   Which of the following statements about price multiples is *least likely* correct?
      A. Cash flow figures are typically more stable than earnings figures.
      B. P/BV and P/CF ratios should be used in conjunction P/E ratios in fundamental analysis.
      C. Firms with low P/BV ratios tend to underperform high P/BV ratio firms on a risk-adjusted basis.

10.   Which of the following accounting variables is *least* subject to manipulation?
      A. Sales.
      B. Earnings.
      C. Inventory.

Use the following data to answer Questions 11 through 13.

An analyst gathered the following information for JoJo Enterprises, Inc.

- Share price $25
- Stockholders' equity $100 million
- Retention rate   60%
- Return on equity (ROE)   10%
- Shares outstanding   10 million
- Expected sales $36 million
- Total operating expenses $17 million
- Operating expenses include $1,400,000 in depreciation and amortization

11.   JoJo's P/BV ratio is *closest* to:
       A. 1.77.
       B. 2.50.
       C. 3.15.

12.   JoJo's P/S ratio is *closest* to:
       A. 4.18.
       B. 5.31.
       C. 6.94.

13.   JoJo's P/CF ratio (using EBITDA for cash flow) is *closest* to:
       A. 12.25.
       B. 13.16.
       C. 15.71.

ANSWERS – CONCEPT CHECKERS

1. **C** P/E is useless when earnings are negative. P/E may be effectively used to value firms in the services industry.

2. **B** It is an advantage of the P/S ratio that sales figures are not as easy to manipulate or distort as EPS and book value, but revenue recognition practices can distort sales forecasts, although less so than P/E or P/BV. The lower volatility of P/S ratios is an advantage compared to P/E ratios.

3. **A** When the earnings per share are negative, the P/E ratio is not meaningful. This problem can be offset somewhat by using normalized or average EPS values.

4. **C** First, use the DDM to get the current price:

$$P_0 = \frac{D_1}{k-g} = \frac{D_0(1+g)}{k-g} = \frac{\$2.50(1.075)}{0.11-0.075} = \$76.79$$

where:
$D_0 = E_0(\text{payout ratio}) = \$5.00(0.50) = \$2.50$
$g \ = ROE(\text{retention rate}) = 0.15(0.50) = 0.075$

Then compute price-to-sales as: $\dfrac{P_0}{S_0} = \dfrac{\$76.79}{\$400.00} = 0.19.$

5. **B** Differences in accounting methods make comparisons based on P/BV problematic.

6. **A** P/BV ratios can uncover signs of misvaluation across firms that have consistently applied accounting standards.

7. **B** Relative to earnings, revenue is difficult to manipulate.

8. **C** Market value / book value = $500 / $250 = 2.

9. **C** On a risk-adjusted basis, firms with low P/BV ratios tend to outperform high P/BV ratio firms.

10. **A** Sales figures are not as easy to manipulate or distort as EPS, net income, and book value, which are significantly affected by accounting methods and estimates.

11. **B** BV = $100,000,000; BV/share = 10; P/BV = 25 / 10 = 2.50

12. **C** sales per share = 36,000,000 / 10,000,000 = 3.60; P/S = 25 / 3.60 = 6.94

13. **A** EBITDA/share = (36,000,000 – 17,000,000 + 1,400,000) / 10,000,000 = $2.04; P/CF = 25 / 2.04 = 12.25

12 questions: 18 minutes

1. An investor purchased 550 shares of Akley common stock for $38,500 in a margin account and posted initial margin of 50%. The maintenance margin requirement is 35%. The price of Akley, below which the investor would get a margin call, is *closest* to:
    A. $45.00.
    B. $54.00.
    C. $59.50.

2. Adams owns 100 shares of Brikley stock, which is trading at $86 per share, and Brown is short 200 shares of Brikley. Adams wants to buy 100 more shares if the price rises to $90, and Brown wants to cover his short position and take profits if the price falls to $75. The orders Adams and Brown should enter to accomplish their stated objectives are:

Adams	Brown
A. Limit buy @ 90	Limit buy @ 75
B. Limit buy @ 90	Stop buy @ 75
C. Stop buy @ 90	Limit buy @ 75

3. The minimum legal initial margin requirement for stocks is *least likely*:
    A. the greatest percentage of initial value that a brokerage house can require on stock purchases.
    B. set by the Federal Reserve in the United States.
    C. independent of a stock's expected price volatility.

4. Price-to-book value ratios are *most appropriate* for measuring the relative value of a:
    A. bank.
    B. manufacturing company.
    C. mature technology company.

5. The table below lists information on price per share and shares outstanding for three stocks: Rocking, Payton, and Strand.

	January 1, 20X7		December 31, 20X8	
Stock	Price per Share	# Shares Outstanding	Price per Share	# Shares Outstanding
Rocking	$10	10,000	$15	10,000
Payton	$50	5,000	$50	5,000
Strand	$100	500	$85	500

    Which of the following statements is *least accurate?*
    A. An investor portfolio with 1,000 shares of each stock would track an unweighted index.
    B. An unweighted index computed as an arithmetic mean would show higher returns than if it was calculated as a geometric mean.
    C. Returns on Payton would have the largest influence of the three on a market value-weighted index.

6. When ranking stocks based on their relative values, the earnings yield *most likely*:
    A. should not be used to rank stocks of companies with negative earnings.
    B. will identify the stock with the greatest earnings per share as the most undervalued stock.
    C. produces the same value rankings as the price/earnings ratio for companies with positive earnings.

7. Which of the following statements about the ability of markets to achieve perfectly efficient prices is *least accurate?*
    A. Restrictions on short sales cause overvalued stocks to be relatively more common than undervalued stocks.
    B. Arbitrage trading is characterized by too much capital chasing too few pricing inefficiencies, limiting the ability of arbitrage to bring about fully efficient prices.
    C. The returns to trading strategies based on analysis of new information must be sufficient to compensate for the time and effort required to analyze new information.

8. Joseph Globe is estimating the equity risk premium for equity investments in a foreign country. He would be *least likely* to consider the:
    A. transactions costs of trading in the foreign securities.
    B. volatility of the country's currency exchange rates.
    C. liquidity of the country's equity markets.

9. Rogers Partners values stocks using a dividend discount model and the CAPM. Holding all other factors constant, which of the following is *least likely* to increase the estimated value of a stock?
   A. An increase in the next period's expected dividend.
   B. A decrease in the stock's systematic risk.
   C. A decrease in the expected growth rate of dividends.

10. Brandy Clark, CFA, has forecast that Aceler, Inc. will pay its first dividend two years from now in the amount of $1.25. For the following year she forecasts a dividend of $2.00 and expects dividends to increase at an average rate of 7% for the foreseeable future after that. If the risk-free rate is 4.5%, the market risk premium is 7.5%, and Aceler's beta is 0.9, Clark would estimate the current value of Aceler shares as being *closest* to:
    A. $37.
    B. $39.
    C. $47.

11. Monfort, Inc., had EPS of $1.20 over its most recent period on sales of $50 per share. Its asset turnover is typically 3 and its debt to equity ratio is 2. Based on only this information and the fact that Monfort paid a dividend of $0.30 for the most recent period, the estimated growth rate of Monfort's dividends is *closest* to:
    A. 5.4%.
    B. 10.8%.
    C. 16.2%.

12. Jay Rybold bought 500 shares of Genoa Corp at $42 on July 1. The price of Genoa shares declined to $40 on August 1. Rybold bought additional shares. The behavioral characteristic *most closely* associated with Rybold's actions is:
    A. escalation bias.
    B. confirmation bias.
    C. overconfidence bias.

SELF-TEST ANSWERS: EQUITY INVESTMENTS

1. **B** The price below which the investor would receive a margin call is:

$$\left(\frac{38,500}{550}\right)\left(\frac{1-0.5}{1-0.35}\right) = \$53.85$$

2. **C** Adams should enter a stop buy at 90, which will be executed only if the stock price rises to 90. Brown should enter a buy order with a limit at 75 since he wants to buy stock to close out his short position if he can purchase it at 75 (or less).

3. **A** Individual brokerage houses can require more than the legal minimum initial margin percentage (set by the Federal Reserve in the United States) and the minimum can differ for different stocks based on the brokerage house's criteria. The legal minimum initial margin requirement is not dependent on a specific stock's volatility.

4. **A** Price-to-book value is an appropriate measure of relative value for firms that hold primarily liquid assets, such as banks. Manufacturing companies typically have a large proportion of fixed assets for which the book value (historical cost less depreciation) may be less relevant as a measure of their economic value. A mature technology company likely has valuable intangible assets, such as patents and human capital, that may not be reflected fully (or at all) on the balance sheet.

5. **A** A portfolio with an equal number of shares of each stock in the index would track a price-weighted index. A purchase of equal dollar amounts of each stock would create a portfolio that would track an unweighted index. The other statements are correct.

6. **C** Ranking stocks from highest to lowest earnings yield will assign the highest ranking to the company with the largest positive price-to-earnings ratio (not necessarily the one with the greatest EPS). The earnings yield is preferred to the P/E ratio for this purpose because it gives companies with negative earnings the lowest value rankings.

7. **B** Arbitrage capital is limited, especially as impatient investors withdraw funds from arbitrage-oriented managers who do not show positive short-term results. As a result, some opportunities from mispricings are not exploited because arbitrageurs will only pursue the most attractive opportunities. Restrictions on short sales cause deviations from efficient prices to persist more among overvalued stocks than among undervalued stocks. Fundamental analysis, the process that moves prices toward their efficient levels, must offer an adequate return for the time and effort expended on the analysis.

8. **A** The transactions costs of trading securities in the foreign country are not a component of the risk premium estimate but will influence the expected return and attractiveness of any specific transaction. Exchange rate risk and liquidity risk are among the factors to consider when estimating an equity risk premium for foreign investments.

9. **C** Other things equal, a decrease in the expected growth rate of dividends (g) will decrease the value of a stock estimated with the dividend discount model. Using the CAPM, a decrease in the stock's systematic risk would decrease the required return on equity and increase the present value of the future dividends.

10. **B**   The required rate of return on Aceler shares is $4.5 + 0.9(7.5) = 11.25\%$.

The dividend at $t = 3$, \$2.00, is expected to grow at 7% for the foreseeable future so the DDM value of Aceler shares at $t = 2$ is $2/(0.1125 - 0.07) = 47.06$.

The $t = 0$ value of the shares is $(47.06 + 1.25)/1.1125^2 = \$39.03$.

11. **C**   Estimated growth rate = retention ratio × return on equity

Dividend payout ratio = \$0.30/\$1.20 = 0.25
Retention ratio = $1 - 0.25 = 0.75$

ROE = net profit margin × total asset turnover × financial leverage ratio
Net profit margin = EPS/sales per share = \$1.20/\$50 = 2.4%
Financial leverage ratio = assets/equity = (debt + equity)/equity
If debt/equity = 2, (debt + equity)/equity = 3.

ROE = $2.4\% \times 3 \times 3 = 21.6\%$
$g = 0.75 \times 21.6\% = 16.2\%$

12. **A**   Escalation bias is the tendency to commit more funds to a security that has fallen in value after an initial purchase, sometimes referred to as "averaging down." Overconfidence bias is analysts' tendency to overemphasize the impact of news supporting prior analysis and to underestimate the impact of contrary news. Confirmation bias refers to a tendency to seek out supporting information and to ignore new information calling a prior decision into question.

FORMULAS

$$NPV = CF_0 + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + ... + \frac{CF_n}{(1+k)^n} = \sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}$$

$$IRR: 0 = CF_0 + \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \cdots + \frac{CF_n}{(1+IRR)^n} = \sum_{t=0}^{n} \frac{CF_t}{(1+IRR)^t}$$

$$payback\ period = full\ years\ until\ recovery + \frac{unrecovered\ cost\ at\ the\ beginning\ of\ the\ last\ year}{cash\ flow\ during\ the\ last\ year}$$

$$PI = \frac{PV\ of\ future\ cash\ flows}{CF_0} = 1 + \frac{NPV}{CF_0}$$

$$WACC = (w_d)[k_d(1-t)] + (w_{ps})(k_{ps}) + (w_{ce})(k_{ce})$$

after-tax cost of debt $= k_d(1-t)$

cost of preferred stock $= k_{ps} = D_{ps} / P$

cost of common equity:

$$k_{ce} = \frac{D_1}{P_0} + g$$

$$k_{ce} = RFR + \beta[E(R_m) - RFR]$$

$$k_{ce} = bond\ yield + risk\ premium$$

unlevered asset beta: project beta:

$$\beta_{ASSET} = \left[\frac{1}{1 + \left((1-t)\frac{D}{E}\right)}\right] \qquad \beta_{PROJECT} = \left[1 + \left((1-t)\frac{D}{E}\right)\right]$$

cost of common equity with a country risk premium:

$$k_{ce} = R_F + \beta\left[E(R_{MKT}) - R_F + CRP\right]$$

where:
CRP = country risk premium

$$CRP = \text{sovereign yield spread}\left(\dfrac{\text{annualized standard deviation of equity index of developing country}}{\substack{\text{annualized standard deviation of the developing}\\ \text{country sovereign bond market in terms of the}\\ \text{developed market currency}}}\right)$$

where:
sovereign yield spread = difference between yields of government bonds in the developing country and Treasury bonds of similar maturities

$$\text{break point} = \dfrac{\text{amount of capital at which the component's cost of capital changes}}{\text{weight of the component in the capital structure}}$$

$$\text{current ratio} = \dfrac{\text{current assets}}{\text{current liabilities}}$$

$$\text{quick ratio} = \dfrac{\text{cash + short-term marketable securities + receivables}}{\text{current liabilities}}$$

$$\text{receivables turnover} = \dfrac{\text{credit sales}}{\text{average receivables}}$$

$$\text{number of days of receivables} = \dfrac{365}{\text{receivables turnover}} = \dfrac{\text{average receivables}}{\text{average day's credit sales}}$$

$$\text{inventory turnover} = \dfrac{\text{cost of goods sold}}{\text{average inventory}}$$

$$\text{number of days of inventory} = \dfrac{365}{\text{inventory turnover}} = \dfrac{\text{average inventory}}{\text{average day's COGS}}$$

$$\text{payables turnover ratio} = \dfrac{\text{purchases}}{\text{average trade payables}}$$

$$\text{number of days of payables} = \dfrac{365}{\text{payables turnover ratio}} = \dfrac{\text{average payables}}{\text{average day's purchases}}$$

operating cycle = average days of inventory + average days of receivables

$$\begin{matrix} \text{cash} \\ \text{conversion} \\ \text{cycle} \end{matrix} = \begin{pmatrix} \text{average days} \\ \text{of receivables} \end{pmatrix} + \begin{pmatrix} \text{average days} \\ \text{of inventory} \end{pmatrix} - \begin{pmatrix} \text{average days} \\ \text{of payables} \end{pmatrix}$$

$$\% \text{ discount} = \left(\frac{\text{face value} - \text{price}}{\text{face value}} \right)$$

$$\text{discount-basis yield} = \left(\frac{\text{face value} - \text{price}}{\text{face value}} \right)\left(\frac{360}{\text{days}} \right) = \% \text{ discount} \times \left(\frac{360}{\text{days}} \right)$$

$$\text{money market yield} = \left(\frac{\text{face value} - \text{price}}{\text{price}} \right)\left(\frac{360}{\text{days}} \right) = \text{holding period yield} \times \left(\frac{360}{\text{days}} \right)$$

$$\text{bond equivalent yield} = \left(\frac{\text{face value} - \text{price}}{\text{price}} \right)\left(\frac{365}{\text{days to maturity}} \right)$$

$$= \text{holding period yield} \times \left(\frac{365}{\text{days}} \right)$$

$$\text{cost of trade credit} = \left(1 + \frac{\% \text{ discount}}{1 - \% \text{ discount}} \right)^{\frac{365}{\text{days past discount}}} - 1$$

where:
days past discount = the number of days after the end of the discount period

expected rate of return from a probability model: $E(R) = \sum_{i=1}^{n} P_i R_i$

variance of returns from a probability model: $\text{variance} = \sigma^2 = \sum_{i=1}^{n} P_i \left[R_i - E(R) \right]^2$

covariance from a probability model: $\text{Cov}_{1,2} = \sum_{i=1}^{n} \left\{ P_i \left[R_{i,1} - E(R_1) \right]\left[R_{i,2} - E(R_2) \right] \right\}$

sample covariance from historical data: $\text{Cov}_{1,2} = \dfrac{\sum_{t=1}^{n} \left\{ \left[R_{t,1} - \bar{R}_1 \right]\left[R_{t,2} - \bar{R}_2 \right] \right\}}{n-1}$

$$\rho_{1,2} = \frac{\text{Cov}_{1,2}}{\sigma_1 \times \sigma_2}$$

standard deviation for a two-asset portfolio:

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_1\sigma_2\rho_{1,2}} \text{ or } \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\text{Cov}_{1,2}}$$

equation of the CML: $E(R_P) = RFR + \sigma_P\left\{\dfrac{\left[E(R_M) - RFR\right]}{\sigma_M}\right\}$

total risk = systematic risk + unsystematic risk

$$\beta_i = \frac{\text{Cov}_{i,mkt}}{\sigma_{mkt}^2}$$

capital asset pricing model (CAPM): $E(R_i) = RFR + \beta_i[E(R_{mkt}) - RFR]$

zero-beta CAPM: $E(R_{stock}) = E(R_{zero\ beta\ portfolio}) + \beta_{stock}\left[E(R_{market}) - E(R_{zero\ beta\ portfolio})\right]$

margin call trigger price $= P_0\left(\dfrac{1 - \text{initial margin}}{1 - \text{maintenance margin}}\right)$

$$\text{price-weighted index} = \frac{\text{sum of stock prices}}{\text{number of stocks in index adjusted for splits}}$$

$$\text{market value-weighted index} = \frac{\sum\left[(\text{price}_{today})(\text{number of shares outstanding})\right]}{\sum\left[(\text{price}_{base\ year})(\text{number of shares outstanding})\right]}$$

$$\times \text{ base year index value}$$

preferred stock valuation model: $P_0 = \dfrac{D_P}{k_P}$

one-period stock valuation model: $P_0 = \dfrac{D_1}{1 + k_e} + \dfrac{P_1}{1 + k_e}$

infinite period model: $P_0 = \dfrac{D_1}{k_e - g} = \dfrac{D_0 \times (1 + g)}{k_e - g}$

multistage model: $P_0 = \dfrac{D_1}{(1 + k_e)} + \dfrac{D_2}{(1 + k_e)^2} + \dots + \dfrac{D_n}{(1 + k_e)^n} + \dfrac{P_n}{(1 + k_e)^n}$

where :

$\qquad P_n = \dfrac{D_{n+1}}{k_e - g_c}$, and D_{n+1} is a dividend that will grow

$\qquad\qquad$ at the constant rate of g_c forever

earnings multiplier: $\dfrac{P_0}{E_1} = \dfrac{\dfrac{D_1}{E_1}}{k - g}$

expected growth rate: g = (retention rate)(ROE)

$$\text{trailing P/E} = \frac{\text{market price per share}}{\text{EPS over previous 12 months}}$$

$$\text{leading P/E} = \frac{\text{market price per share}}{\text{forecast EPS over next 12 months}}$$

$$\text{P/BV ratio} = \frac{\text{market value of equity}}{\text{book value of equity}} = \frac{\text{market price per share}}{\text{book value per share}}$$

where :
book value of equity = common shareholders' equity
= (total assets – total liabilities) – preferred stock

$$\text{P/S ratio} = \frac{\text{market value of equity}}{\text{total sales}} = \frac{\text{market price per share}}{\text{sales per share}}$$

$$\text{P/CF ratio} = \frac{\text{market value of equity}}{\text{cash flow}} = \frac{\text{market price per share}}{\text{cash flow per share}}$$

earnings plus noncash charges = net income + depreciation + amortization

adjusted CFO = CFO +[(net cash interest outflow) × (1 – tax rate)]

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Notes